SOCIETY OF ACTUARIES
REINSURANCE SECTION

Reinsurance News

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CEO Interview with Ulrich Wallin, Hannover Re Group

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By *Reinsurance News*

Reinsurance News

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This newsletter is free to section members. Current issues are available on the SOA website (www.soa.org).

To join the section, SOA members and non-members can locate a membership form on the Reinsurance Section Web page at http://www.soa.org/reinsurance.

Call for articles for next issue of *Reinsurance News*.

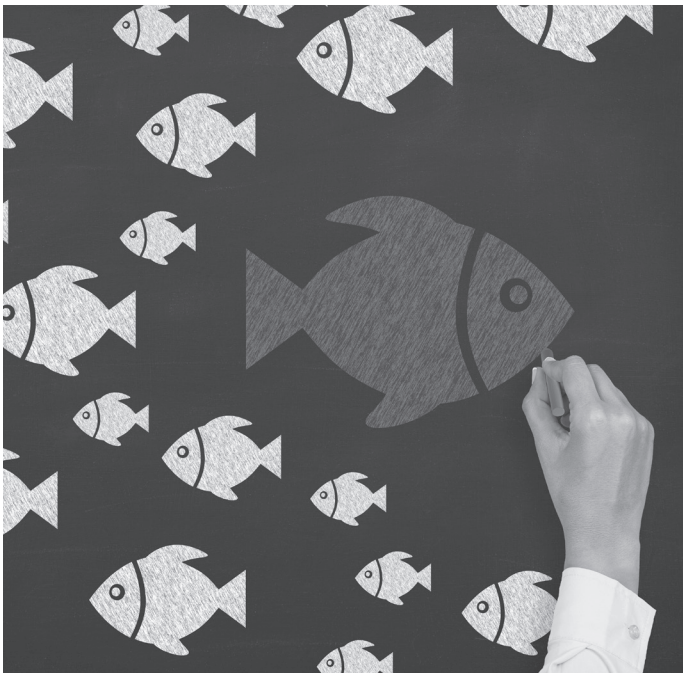
While all articles are welcome, we would especially like to receive articles on topics that would be of particular interest to Reinsurance Section members.

Please email your articles to Ronald Poon-Affat (rpoonaffat@rgare.com). Some articles may be edited or reduced in length for publication purposes.

Publication Schedule
Publication Month: July
Articles Due: 4/24/17

Chairperson's Corner

By Mary Broesch



Change is in the air and spring is right around the corner. After a peaceful transition of new roles for eight of nine Reinsurance Section Council members, the team is busy at work serving the interests of Reinsurance Section members and other parties interested in reinsurance.

At the end of 2016, more than 200, or almost 11 percent, of Reinsurance Section members responded to our survey and provided valuable feedback on the topics of key areas of interest, podcasts and desire to volunteer. For those of you who filled out the survey, thank you for your time and insights. Members were most supportive of the following areas of interest (in rank order):

- Impact of streamlined underwriting and big data on mortality estimates,
- Principle-based approaches to reserves and capital,
- Opportunities for reinsurance growth globally and across product lines, and
- Annuities and longevity.

The diversity of these topics suggests that our members have a variety of interests related to reinsurance. The feedback is useful as we fulfill our mission of identifying and communicating emerging issues and trends for the global reinsurance community.

We kicked off the year with a full-day meeting focused on strategic planning and the goals we plan to achieve in 2017. The responses to the survey are being used to guide our activities and agenda for the year. I'm grateful to have such a great team serving the Reinsurance Section this year, including elected council members, dedicated friends of the council and engaged staff of the SOA.

Here are some of the ways that volunteers are planning to serve the reinsurance community in 2017.

Education

- Create meaningful conference sessions at four key SOA meetings.
- Produce three webinars on various topics of interest.
- Offer an SOA Reinsurance Boot Camp seminar on reinsurance topics.
- Publish three Reinsurance News newsletters, with articles on diverse topics.
- Educate regulators about reinsurance through the LEARN program.

Research

- Coordinate funding of new research projects, related to the areas of interest our members support.
  - "Genetic Testing" and "Comparison of Captive Regimes" are two examples of research projects currently in progress.
- Write articles for Reinsurance News and present at meetings to share research results.

Networking

- Highlight ways to engage and connect with other reinsurance section members and reinsurance professionals.
  - For example, activities or events at SOA-sponsored conferences or seminars.
- Participate in volunteer opportunities.

We are always looking for volunteers to help us fulfill our mission and achieve our goals. At our face-to-face meeting, we identified more than a dozen opportunities to be filled. The varied opportunities can be short term or long term, one off or ongoing. They will be published online in a volunteer database, which is under development and could use some volunteers to help set up.

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Actuaries and the Growth Mindset

By Ronald Poon-Affat

MINDSETS

An elite ballet company selects dancers the following way: Eager ballerinas perform their solos, then the ballet master offers a critique and asks them to perform again. Only dancers who show the most improvement are selected to join the *corps de ballet*, and these may not necessarily be the best dancers. The ballet master is looking for the dancers who best respond to feedback—those who have a growth mindset.

The right mindset is essential to success in any number of arenas. Dr. Carol Dweck's *Mindset: The New Psychology of Success* goes in-depth on the topic. A leading global CEO recently recommended the book to me, and I promptly devoured it.

> The right mindset is essential to success in any number of arenas.

In the book, Dr. Dweck discusses how NASA recruits "the right stuff." All of the applicants, she explains, have gleaming resumes; even Batman would struggle to make the cut. To unearth the astronauts who will really excel, NASA provokes the aspiring spacewalkers to share their biggest failures and how they bounced back. If ever there was a profession that needed a growth mindset, it's definitely that of an astronaut.

My two personal favorite growth mindset heroes are Michael Jordan and Steve Jobs. Jordan's genius was not that he changed the game of basketball, but that he changed *with* the game. Steve Jobs never rested on his laurels but instead was always trying to improve on his own success. Maybe talent can get you to the top, but it's the combination of an evolving growth mindset and character that keeps you at the top of your game season after season or one new-product launch after another.

Dr. Dweck distinguishes the growth mindset from what she calls a fixed mindset as follows: "In a fixed mindset, students believe their basic abilities, their intelligence, their talents, are just fixed traits. They have a certain amount and that's that, and then their goal becomes to look smart all the time and never look dumb. In a growth mindset students understand that their talents and abilities can be developed through effort, good teaching and persistence. They don't necessarily think everyone's the same or anyone can be Einstein, but they believe everyone can get smarter if they work at it." In this article I aim to apply Dr. Dweck`s observations to actuaries.

ACTUARIES

I would argue that the actuarial profession is populated by growth mindset professionals. It might be that the demanding exam process is a natural filter. I would guess that the percent of FSAs (fellow of the Society of Actuaries—U.S. qualification) or FIAs (fellow of the Institute of Actuaries—U.K. qualification) who have never failed an actuarial exam is in the single digits. I am definitely not in that select group. When I failed my first actuarial exam, I was utterly devastated, having never failed anything in my life. But like others who had failed and passed before me, I learned to pick myself up, study harder or use a different study strategy and start all over again.

When I qualified in the U.K., FIA exams were offered only once a year, so there was a whole depressing year to ponder your poor effort. And of course the actuarial profession is known to change the reading/syllabus/exam structure on a regular basis. Indeed, comparing the evolving actuarial education syllabuses over the last several 10-year intervals, the study topics from cadre to cadre

are so different, you might think they were prepared by a different profession altogether. So failed actuarial students could not assume that all they needed was a "refresher" to pass the next year's exam. The test material could be completely different, requiring the study of a lot of new material. Under the circumstances, fixed mindset people might have groaned, knowing they would have to study new topics before retaking the test. Growth mindset people, on the other hand, would see the new material as a welcome challenge. Given the resilience required, it is highly likely that the majority of those who emerge from the exam process as successful FSAs and FIAs are growth mindset individuals.

Those who complete the arduous examination process and are lucky enough to hang up the actuarial shingle quickly discover that they cannot rest on their laurels. The only constant in the actuarial profession is change. It is impossible to compare some of the present actuarial challenges (e.g., low interest rate environment, longevity, Solvency II, Big Data, incorporation of the Affordable Care Act, keeping pace with medical technological advances) to those of 40 or even 10 years ago. So once again, actuaries with fixed mindsets, who are unwilling to continuously develop professionally, become obsolete.

Even for those with a growth mindset, failures can be painful—but it doesn't define them as inept learners or actuaries. Yes, the actuarial profession could have been quicker on the ball regarding unfavorable issues in the past. However, in the end we have been able to weather the storm of these events. As Nietzsche quipped, "What does not kill you makes you stronger"; but I would perhaps amend Nietzsche's famous quote by adding "provided that you have a growth mindset."

CHANGING YOUR MINDSET

The really great news, according to Dr. Dweck, is that one can change from having a fixed mindset to a growth mindset. The first step is to recognize the difference between the two mindsets. How you interpret challenges, setbacks and criticism is your choice. I have read many self-help books that purport to open the door to happiness, but learning to switch to a growth mindset might truly unshackle us from leading unhappy lives. Unhappiness can be a consequence of thinking that your sorry lot is going to be with you for a lengthy and undeterminable period of time. Growth mindset individuals, however, believe that tomorrow could be the best day of their lives. ■

Ronald Poon-Affat, FSA, FIA, MAAA, CFA, is editor of the Society of Actuaries' *Reinsurance News* newsletter and is a recipient of a 2016 SOA Presidential Award. He can be contacted at *rpoonaffat@rgare.com*

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Here are the volunteer roles we are looking to fill. Perhaps there is one on this list that is calling out to you? We'd love to have you on the team!

Coordinators—all of these are new roles

- Website content and updates
- Volunteer database content and updates
- Social media strategy development and implementation
- SOA Regulatory Resource content and updates
- Charity fundraising, such as support for the Actuarial Foundation

Reinsurance News

- Co-editor of the newsletter
- Write an article for the newsletter and win a trophy if it's the best article in 2017

Presenters

- Conference sessions
- Webinars
- Seminars
- LEARN

Podcast producer

Research committee member or research project oversight group (POG) member

In 2017, our focus will be on developing tools to better communicate with our members about emerging trends and hot topics, reinsurance regulatory resources, interesting articles and sessions, plus volunteer and networking opportunities. We hope you find these tools useful and they serve you in a way that supports your professional curiosity and development.

Feel free to contact me or any of the council members, if you have any questions, feedback or suggestions, or if you would like to volunteer. Yes, I'm asking you. I personally look forward to connecting with you this year and can't wait to see how you decide to engage and participate as a volunteer! ■

Mary Broesch, FSA, MAAA, is SVP–Life Solutions Group, Willis Re. She can be contacted at *Mary.Broesch@WillisTowersWatson.com.*

SOA Reinsurance News 2016 Best Article Prize

By Ronald Poon-Affat

Dr. Daniel D. Zimmerman (R), vice president and medical director, RGA Reinsurance Company, receives his prize for best Reinsurance News article in 2016 from Tim Rozar (L), SOA Board director.

Last year, the Reinsurance Section launched a prize for the best article that appeared in Reinsurance News in 2016. To be eligible articles needed to have been published first in Reinsurance News and could not be authored by a member of SOA's Reinsurance Section council.

The inaugural prize was awarded to Dr. Daniel D. Zimmerman, vice president and Medical Director, RGA Reinsurance Company, for his article titled, "Zika Virus in Brazil: The Insurance Perspective." The article, which appeared in the March 2016 issue, outlined and illuminated one of the primary medical underwriting issues of this past year.

Why the prize? To recognize the tremendous effort of our volunteer authors, without whom it would be impossible to publish three information-packed editions per year.

> Why the prize? To recognize the tremendous effort of our volunteer authors. ...

The winning article was voted for by three sitting members of the Reinsurance Council. Over the past year, Reinsurance News received a large volume of high quality articles. The judges were sufficiently impressed and decided to award two additional prizes.

Second prize went to S. Michael McLaughlin, FSA, CERA, FIA, MAAA, for his article "Trees That Feed," which appeared in the July 2016 issue. The article described his Trees That Feed Foundation, a nonprofit he co-founded with his wife Mary with the mission of planting fruit trees in the Caribbean and sub-Saharan Africa. At this point, the foundation has planted more than 100,000 food-bearing trees throughout the globe.

Kai Kaufhold, Aktuar DAV, managing director of Ad Res Advanced Reinsurance Services, was awarded third prize for his article, "The Economic Value of Reinsurance." The article, which appeared in the November 2016 issue, addressed the age-old question of how to measure the value-for-money cedants receive for their reinsurance premium dollars.

Please feel free to contact Ronald Poon-Affat rpoonaffat@rgare.com if you are interested in submitting an article for 2017. We are always looking for interesting articles on a range of actuarial and related topics, and who knows? You might become one of our Best Reinsurance News article winners. ■

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SOA Explorer Tool

Find Fellow Actuaries Around the Block or Around the Globe

The SOA Explorer Tool is a global map showing locations of fellow SOA members and their employers, as well as actuarial universities and clubs.

Explorer.SOA.org

SOCIETY OF ACTUARIES

CEO Interview with Ulrich Wallin, Hannover Re Group

By Ronald Poon-Affat

Ulrich Wallin is the CEO of Hannover Re Group. He was born in 1954 and studied law at the University of Hamburg. After his Second Final Exam in Law, he obtained his assessor grade.

In 1982, Wallin started his career at HDI Haftpflichtverband der Deutschen Industrie V.a.G., Hannover. In 1984, he joined E+S Rückversicherung AG, Hannover, as a treaty specialist in the Foreign Section, responsible for the establishment of the aviation reinsurance portfolio. From 1987, E+S Rück's Foreign Section was integrated into Hannover Re's group of U.S. departments. Wallin held various responsibilities there, primarily in the areas of aviation and space as well as U.S. liability business. Nine years later, in 1996, Wallin became vice president at Hannover Re Group with responsibility for worldwide aviation and marine business. He was appointed managing director in 2000, with responsibility for Hannover Re's worldwide facultative property and casualty business in addition to worldwide aviation and marine business.

Since 2001, Wallin has been a member of the executive board of Hannover Re Group. He was named chief executive officer in 2009. He is responsible for business opportunity management, compliance, controlling, corporate communications, corporate development, human resources management, internal auditing and risk management.

RN: You have successfully led Hannover Re since 2009. What have been the key drivers in this success story?

UW: Without a doubt, one of the most important parameters was reducing the volatility of our results to a considerably greater extent than had been the case in prior years. What is more, we have been able to generate stronger organic growth than the market and our major competitors, and we have maintained a rigorous focus on the profitability of our business. Another key factor in our success has been our continued ability to operate with the lowest expense ratio among all reinsurers. Needless to say, a modicum of good fortune has also played its part.

RN: Life and health reinsurance has shown strong growth at Hannover Re in recent years. Do you see further growth potential here and, if so, in which areas?

UW: Since 2009 Hannover Re's books of life and health as well as property and casualty reinsurance business have grown at virtually the same pace—on an organic basis. We have pursued quite a number of growth initiatives in life and health reinsurance, including, for example, vitality products and our point-of-sale systems. Strong growth has also been recorded in the financial solutions business. Going forward, then, we see further considerable potential. What matters to us more than boosting the premium volume, though, is growing our profitability—both in terms of the profitability reported under IFRS and when it comes to increasing the economic value of our life and health reinsurance portfolio.

RN: How would you describe the current market environment in life and health, and where do you currently see the greatest challenges for reinsurers in life business?

UW: The environment in life and health reinsurance is highly competitive. That said, the competition is less intense than it is in property and casualty reinsurance, quite simply because there are far fewer players. The life reinsurance market is significantly more concentrated than the P&C market. This is because life and health reinsurance is dominated by the inforce business, whereas in property and casualty reinsurance the tone is set by new and renewal business.

Among the challenges, I would point first to the need for sufficient accuracy in determining future and long-term mortality and morbidity trends as well as for the most reliable possible predictions of so-called policyholder behavior, i.e., lapse and other options available to policyholders. After all, these risks make up a sizable part of the risks that we assume in our role as reinsurer.

What we accept on only a very limited scale is the risk of guarantees for investment income; consequently, the challenge here may be to identify the strategies that we, as a reinsurer, can adopt in order to assist primary insurers with their greatest problems, namely the protracted phase of low interest rates and the interest rate guarantees given to their customers. This is by no means a uniquely German issue; Anglo-Saxon markets with whole-of-life policies, for example, work with an underlying actuarial interest rate that must be generated in order to be able to actually pay out the benefit on maturity.

Ulich Wallin, CEO of Hannover Re Group

RN: What future trends can you identify in life insurance going forward?

UW: Particularly in mature markets, products geared to retirement provision certainly offer growth potential—for the reinsurance industry above all—on account of the aging society. There will surely be growth in longevity products, pension swaps and such, and we are already observing rising demand in this area.

We shall doubtless see increasingly widespread initiatives directed toward greater digitization; we intend to support such moves, which include the online selling of—among other things—term life insurance policies. Particularly in the United States, United Kingdom, Australia and some Asian markets, where life insurance business is already more heavily dominated by risk-oriented products, this will likely emerge as a trend. In countries such as Germany, where savings products have the upper hand, the situation will surely become more challenging.

Over-the-counter sales through banks will remain a crucial pillar of business on the life side, because this distribution channel offers a good touchpoint for customers to buy life insurance policies. Traditional sales through insurance agents, especially when it comes to savings products, will, however, have to become more efficient because low interest rates mean that the business no longer offers a sufficient margin to finance distribution in its current form.

Lifestyle products, which deliver risk protection tailored to the policyholder's specific life situation, will likely continue to gain ground—a trend that absolutely has our backing. Another trend is the shift toward risk-oriented products rather than savings products on account of the low interest rate environment.

RN: Investors often see life and health reinsurance as a "black box." What makes this business so difficult to understand?

UW: Investors tend to see life reinsurance as a black box largely because assessing the value of a life reinsurance portfolio is, after all, a rather complex matter and needs to factor in numerous evaluations of the future mortality and future lapse rates, policyholder behavior, as well as, in some cases, interest rate assumptions. Along with this complexity, it is important to bear in mind that such assumptions are not as stable as they are in, for example, property and casualty reinsurance, which is dominated by new business. This makes things tricky, given that changes in assumptions relating to large treaties or mortality give rise to substantial changes in the value of a

life reinsurance portfolio. The same is also true of changes in interest rate assumptions.

Our task is to explain as plausibly and comprehensibly as possible the structure of the expected future cash flows, broken down according to the various risk categories. Furthermore, there are often reservations as far as longevity risks are concerned, owing to the assumption that the trend toward living longer means that this business cannot make a profit. On the other hand, it must be noted that in view of the average age of the insureds, the range of variation is considerably narrower than in traditional mortality business.

RN: Vitality products reward active and health-conscious individuals with more reasonable premiums. Do you think that over the long term the life insurance industry can play a part in improving quality of life and life expectancy?

UW: Vitality products are included among lifestyle products. They sell very well in Anglo-Saxon and Asian markets. There are concerns in some countries—Germany, to name just one—owing to fears that the solidarity of the community of insureds could be eroded and especially individuals at greater risk will no longer be able to obtain affordable life and health insurance. On the other hand, it has to be said that these products incentivize a healthier lifestyle and should therefore ultimately help to reduce overall health care costs. From a social perspective, such products certainly have a positive impact.

RN: Buzzwords digitization/automation—with hr|ReFlex you have brought a new generation of automated UW systems to market. What is special about them?

UW: Our hr|ReFlex system is all about making the sale of life insurance as simple as possible. It is a modular automated underwriting system that provides immediate and risk-adequate decisions directly at the point of sale. Due to its unique flexibility, it enables new products to be integrated very easily. The purpose of such point-of-sale systems is to be able to write as much life protection insurance business as possible. This is done on the basis of detailed questionnaires without any need for a medical examination by a physician. This substantially increases the probability of policy sales for standardized risks and hence also the new business volume. With this system we can directly support our customers' sales and provide commensurate reinsurance covers.

RN: What impact do regulatory measures have on your company and how does solvency II change the industry?

UW: The task companies are facing is to fulfill regulatory requirements in such a way that they are implemented as effectively as possible and to a high quality standard, while at the same time limiting costs. As regulatory requirements grow, meeting this challenge is becoming an increasingly significant competitive factor in the business environment. The European Solvency II directive can certainly be assessed favorably for life business because it takes into account the entire expected future cash flows, and hence, the future risks are also captured significantly better than they are under, for example, IFRS accounting and solvency regimes based thereon or other statutory accounting practices. Similarly, the nature of life reinsurance business—with its very long duration, future, positive and negative cash flows—is better mapped by Solvency II than it is under other solvency systems.

RN: What criteria do you have when it comes to M&A in the life sector? And what is your lesson learned from previous acquisitions?

UW: Mergers and acquisitions tend to be rather difficult in the life reinsurance sector because there are only six or seven sizable life reinsurers. The number of potential targets is therefore very small. Of course, this can be sidestepped by acquiring primary insurers, although this happens much less frequently in life reinsurance than it does on the P&C side. To this extent, I tend to view M&A activities in life and health reinsurance as quite minimal, at least as far as corporate acquisitions are concerned. When it comes to the acquisition of individual portfolios, on the other hand, there will likely be more scope for action.

RN: In your project "Journey Re" you offer young professionals a platform for disruptive ideas that can enable them to develop "the next big thing" for the reinsurance industry. What value added are you hoping for from this extraordinary approach to fostering young talent?

UW: Yes, with Journey Re we launched a competition for young professionals, graduates and students with the aim of creating innovative new business models. In very general terms, I believe it is incumbent upon us to get the younger generation, in particular, interested in our business. I say this not only because insurance as an industry does not enjoy the best of reputations in the eyes of many young people, but also in order to show just what an exciting field reinsurance is. I would add, by the way, that we were more than satisfied with the results of the individual innovation hubs that took part in the Journey Re project. ■

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The U.S. Health Care System Before and After the Affordable Care Act: Better or Worse and What's Next?

By Achim Dauser and Tina Dai

STATUS BEFORE THE AFFORDABLE CARE ACT

The opinion that the U.S. health care system before the Patient Protection and Affordable Care Act (ACA) was the best in the world appeared more widespread than facts and numbers support. There is no doubt that the system was by far the most expensive worldwide measured as a percentage of GDP, and also one of the most expensive in terms of dollars spent per capita. In 2009, the year before ACA kicked in, national health expenditure was $2.5 trillion, which represented 17.0 percent of GDP, or $8,023 for each person.[1] Table 1 shows the 10 most expensive health care systems in the world in 2009 assuming that at least $1,000 was spent per capita.

Table 1
Most Expensive Health Care Systems by National Health Expenditure as % of GDP (2009)[2]

	Health expenditure % of GDP	Health expenditure per capita
United States	**17.0**	**$8,023**
Denmark	11.5	$6,465
Germany	11.4	$4,753
France	11.3	$4,722
New Zealand	11.2	$3,145
Austria	11.2	$5,154
Canada	11.2	$4,582
Switzerland	11.0	$7,277
Portugal	10.4	$2,404
Belgium	10.4	$4,575

Moreover, quality metrics such as life expectancy at birth, life expectancy at age 60, infant mortality and mortality under age 5 suggested that overall, the system's performance was lacking. Table 2 shows these quality metrics among the same countries listed in Table 1.

Granted, some U.S.-specific characteristics that impact mortality have little or nothing to do with an efficient health care system, although this doesn't have the effect some have claimed. In one article from 2011, the author stated that if deaths from car accidents and violent crimes were removed, life expectancy

Table 2.
Countries as Selected in Table 1 Including Quality Categories and Corresponding Rankings (2009)[6]

	Life Expectancy at Birth[2]	Rank[3]	Life Expectancy at Age 60[3]	Rank[4]	Infant Mortality Rate[4]	Rank[4]	Under-5 Mortality Rate[5]	Rank[4]
United States	78.5	31	23.1	25	6.4	41	7.5	42
Denmark	78.9	30	22.1	34	3.5	14	4.2	15
Germany	80.0	21	23.0	26	3.6	17	4.3	16
France	81.1	10	24.7	2	3.5	14	4.3	16
New Zealand	80.5	15	23.8	13	5.2	36	6.3	36
Austria	80.2	18	23.3	22	3.7	20	4.5	21
Canada	81.0	11	24.1	9	5.0	34	5.7	33
Switzerland	82.1	2	24.7	3	3.9	25	4.6	22
Portugal	79.3	26	22.9	29	3.2	11	4.0	12
Belgium	79.8	22	23.2	23	3.7	20	4.6	22

in the United States would be the highest worldwide.[6] We tested this hypothesis and removed deaths due to homicides, traffic deaths and drug deaths, all notoriously high compared to other industrialized nations, from the life expectancy calculation. On average, we added 43 deaths per 100,000 for males and 20 deaths per 100,000 for females, which can be attributed to these three causes, back to the number of people alive at each age up to age 100.[7] The recalculated life expectancy is about 1.1 years higher for males and a meager 0.6 years higher for females. With these adjusted life expectancies, we would rank 28 (up from 33) for males and rank 30 (up from 33) for females among 183 countries, still well below countries such as Japan, Switzerland and Singapore, with life expectancies of about 83 years for males and females combined. These hypothetical rankings do not even take into account similar adjustments to other countries' life expectancies. Therefore, the quality of our system might well be the reason behind a relatively high mortality and other key indicators that other countries fare better in.

This all appears to be supported by several analyses that explicitly ranked health care systems from different countries:

- The World Health Organization (WHO), in its *World Health Report* of 2000, ranked the U.S. system 37th out of 191 countries in overall health system performance.
- According to a ranking by the Commonwealth Fund based on data from 2011, i.e., before main features of the ACA were implemented, the United States ranked dead last of 11 countries that included six G7 nations, the Netherlands, New Zealand, Norway, Sweden and Switzerland.[8]

We conclude objective parties would agree that the U.S. health care system, prior to implementation of the ACA, and as measured against goals of a functioning system, was mediocre at best.

STATUS AFTER THE AFFORDABLE CARE ACT

The ACA was signed into law on March 23, 2010, with goals that highly correlate with goals the WHO has stated for an efficient health care system:

1. Provide greater access to health coverage and reduce the number of uninsured
2. Bring down health care cost increases by encouraging a shift toward more efficient delivery and payment models
3. Add new consumer benefits and protection

The question now becomes, seven years after the ACA went into effect, is there evidence that our system has improved?

At first glance, quite a few features would seem to improve access and protection. The introduction of no pre-existing condition rejection, no rating for health conditions, essential health benefits mandate, no annual or lifetime cap on benefits and the ability to maintain young adults on their parent's plan are all new key provisions that could have a favorable impact on the system's quality. Could that already be supported by changes in some key metrics? Table 3 shows the development since provisions of the ACA have been introduced.

Although the measures appear to have improved numerically, the relative ranking in comparison to other nations has not shown any progress at this early stage of the post-ACA era. Life expectancy in recent years was certainly negatively affected by the concerning development of traffic deaths[11] and drug deaths, most notably as a result of the opioid addiction epidemic,[12] a negative trend that is not as pronounced in other industrialized nations. However, it is a little surprising that trend in infant mortality does not show a relative improvement considering the improved access to health care for individuals and expecting parents.

Table 3.
Quality Categories and Corresponding Rankings for the United States by Year from 2010 to 2015[10]

	Life Expectancy at Birth	Rank	Life Expectancy at Age 60	Rank	Infant Mortality Rate	Rank	Under-5 Mortality Rate	Rank
2010	78.7	30	23.1	25	6.3	41	7.4	42
2011	78.7	32	23.2	29	6.1	41	7.2	42
2012	78.8	31	23.3	29	6.1	42	7.1	42
2013	78.9	31	23.3	30	5.9	43	6.9	43
2014	79.1	31	23.5	30	5.7	44	6.7	44
2015	79.3	31	23.6	30	5.6	44	6.5	44

Regarding access, it is undeniable that an important goal of the ACA was achieved—the increase of the insured population. Possibly the most disturbing fact about the old system was the high number of uninsured, which in 2009 stood at 17.5 percent, or 54 million people. In 2016, this ratio was estimated to be about 10.4 percent, which implied a reduction of around 20 million individuals who were previously without insurance. It was in particular the main features of the ACA that were introduced in 2014 that had a positive impact on the insured population. Figure 1 shows the uninsured rate among the nonelderly population from 2009 to 2016.[13]

According to a report released by the Department of Health and Human Services, 13.8 million people are expected to have selected a plan by the end of this year's open enrollment period, an increase of 1.1 million people, or nearly 9 percent, over the 12.7 million plan selections at the end of 2016 open enrollment.[14]

However, the substantial reduction of the uninsured population has come with a hefty price tag. National health expenditures have continued to climb and are expected to have reached an unprecedented level of 17.8 percent of GDP, or $3.2 trillion, in 2015—rising tendency.[15] No other nation's system ever has caused this degree of financial burden. It is fair to state that the ACA has achieved practically nothing to reduce health care costs to a sustainable level.

Going back to the seminal question raised, the ACA has set the stage for a better health care system. Several provisions and a high insurance penetration rate correlate with the quality of a health care system. However, it is also clear that the current status is unsustainable and significant modifications need to be made. The key area that needs to be fixed is to curb costs while maintaining or gradually improving the quality of treatment. As it is typical in other industries, costs may need to be reduced where incurred to produce corresponding goods or services. In our industry, this mainly means costs for hospital care, physician services and prescription drugs.

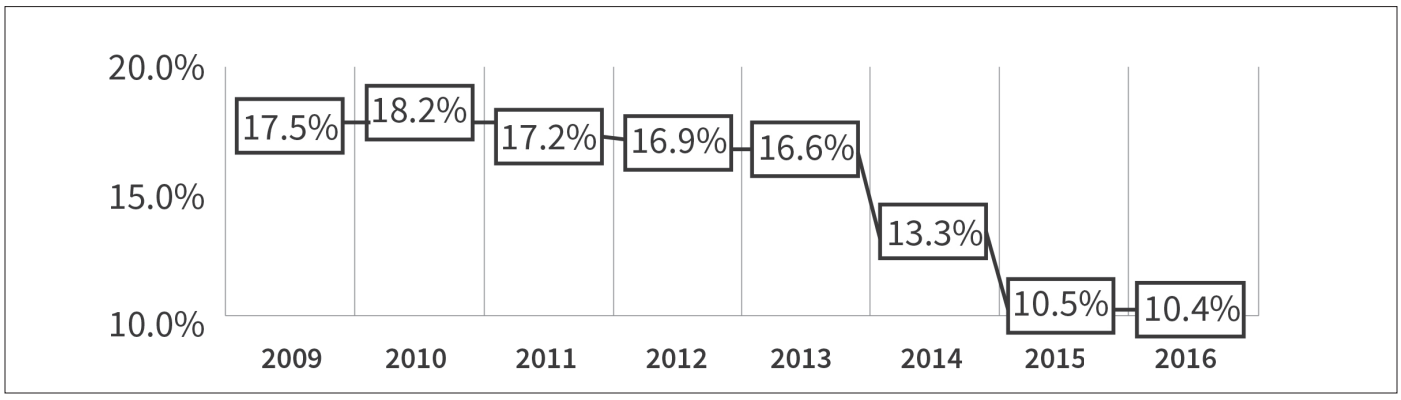
WHAT IS NEXT?

Together with the Republican control of Congress, the Trump administration is certain to bring about dramatic changes to the existing system. Even though the GOP does not have a 60-vote majority in the Senate to quickly repeal the ACA entirely, reconciliation, a complex procedural process that allows for certain pieces of legislation to pass by a simple majority, may be used to push changes through. This in combination with a series of executive orders that the new president is likely to put into effect will allow the Republicans to keep their promise to repeal quickly.

The second part of the repeal-and-replace commitment, however, will take longer, most likely much longer. There have been discussions of a two- to three-year horizon or even putting an alternative plan off until the next presidential election. It is obvious that our health care system is approaching an uncertain, political and complicated phase. Concrete details or early indications around what the upcoming repeal and following replacement might entail are sparse, and any potential market disruption is impossible to predict at this point. However, at time of writing, the following have surfaced early in this process as items that will potentially be repealed or most likely will stay.

- Dependent coverage to age 26 will likely stay, as might unlimited policy maximums.
- The most popular provision of the ACA, no exclusions for pre-existing conditions, will most likely be left in place. It simply seems politically impossible to remove this regulation entirely, since millions of President Trump's supporters would lose coverage. A softer version, however, such

Figure 1.
Uninsured Rate Among the Nonelderly Population, 2009–2016



as limiting protection to individuals who maintain continuous coverage, appears to be possible.

- Medical underwriting may return in a limited capacity, such as when an individual does not enroll during the open enrollment period.
- The individual and employer mandates and penalties imposed on individuals without insurance and employers that do not offer coverage may be eliminated. The consequences of repealing the individual mandate without other incentives introduced might result in dropout of the healthiest people, leaving a sicker population in the system.
- Premium subsidies for coverage that could be obtained through the existing public exchanges may end and could be replaced by tax credits.
- Financial support provided to states that have expanded access to Medicaid could be eliminated. Instead, Medicaid may be converted into a block grant type of program, giving individual states more flexibility to adopt what appears to work locally.
- State high-risk pools to cover sick uninsured people may come back. However, at this stage of the discussion it is unclear how this could be financed.[14]
- Variations or flexibility in product design and pricing capabilities may resurface, which would help reduce the risk of adverse selection in the individual and small group markets.
- ACA-mandated benefit requirements such as mental-health services and maternity care may be scrapped or limited.
- Health savings accounts that allow tax-free contributions may be expanded.
- Selling insurance across all state lines may be allowed, to increase competition.

Beyond coverage expansion, the ACA has also had an impact on how health care is delivered today compared to the pre-ACA environment. Preventive care is a stronger focus, and providers are gradually moving away from traditional fee-for-service structures where every single examination and procedure is reimbursed. Instead, more features of a risk-based model have been introduced to Medicare, Medicaid and also private insurance. It will take a detailed and comprehensive plan to replace many of the ACA features that have been introduced over the last seven years and avoid political fallout. At this point, such a plan, concept, or consensus does not seem to exist.

Tremendous uncertainty will prevail and the only certainty for all players in the health care industry is that changes are coming. And did we mention that it is going to be political and complicated? It is prudent to be prepared for any modifications, including radical changes and a complete demolition of the ACA. Time will tell if the status of our health care system after repeal and replacement of the Patient Protection and Affordable Care Act, the most significant health care reform in half of a century, will improve. ■

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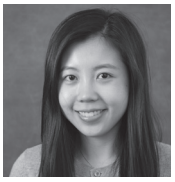

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The Impact of the Low Interest Rate Environment on Life Insurance Companies

By Dirk Nieder

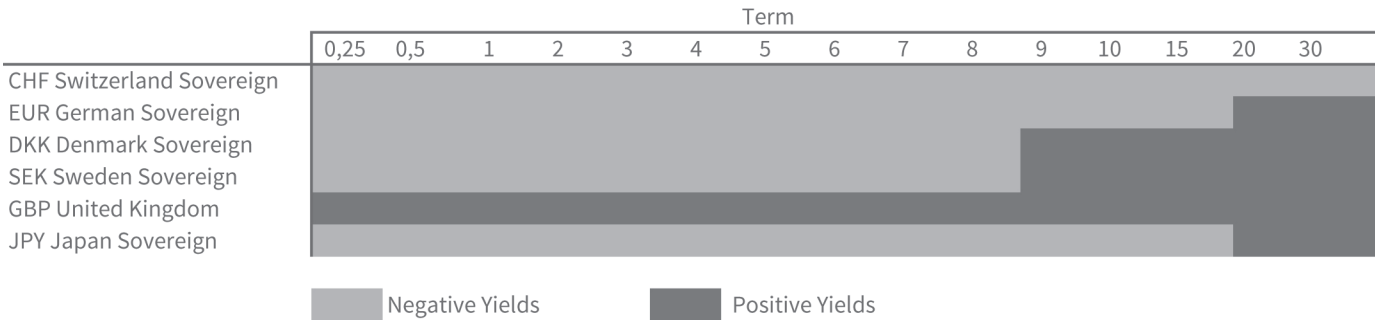
Central banks worldwide reacted to the 2008 financial crisis with a massive increase in liquidity and the reduction of key interest rates to a historically low level, in hopes of stimulating the local economy and jump-starting inflation. This strategy has led to negative interest rates in Japan and a number of European countries, as shown in Figure 1 (below, top).

In most Asian countries interest rates have reached record-low levels but are still positive (Figure 2, below, bottom).

The implications of the strategy of the Federal Reserve in the United States and the European Central Bank after the collapse of Lehman Brothers resembles the consequences of the monetary policy of Japan from the end of the 1990s.

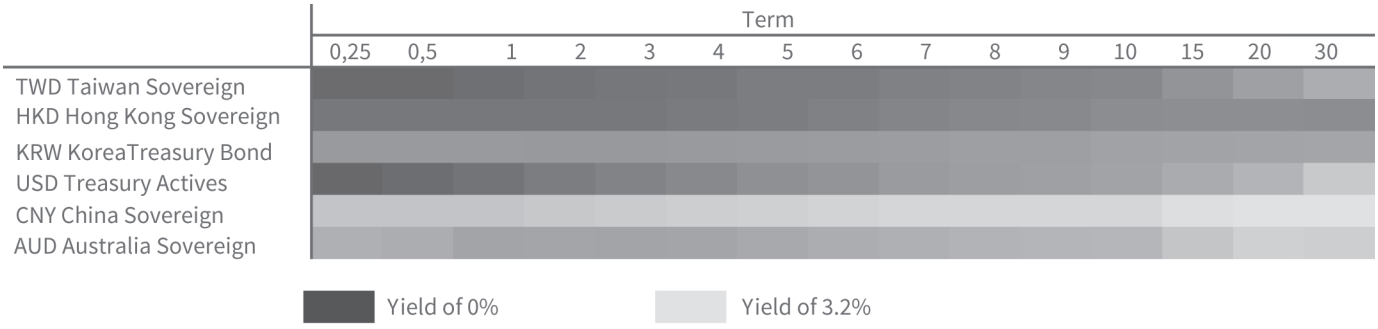
The Japanese example shows that a scenario of long-term low interest rates is not unlikely. A study of such a scenario and the implications for life insurance companies is therefore recommended. The Japanese and German life insurance markets serve as good case studies because in the past, life insurance companies sold policies with guaranteed fixed interest rates that exceeded the interest yield that can be earned today.

Figure 1.
Yield of Government Zero Coupon Bonds (as of June 29, 2016)



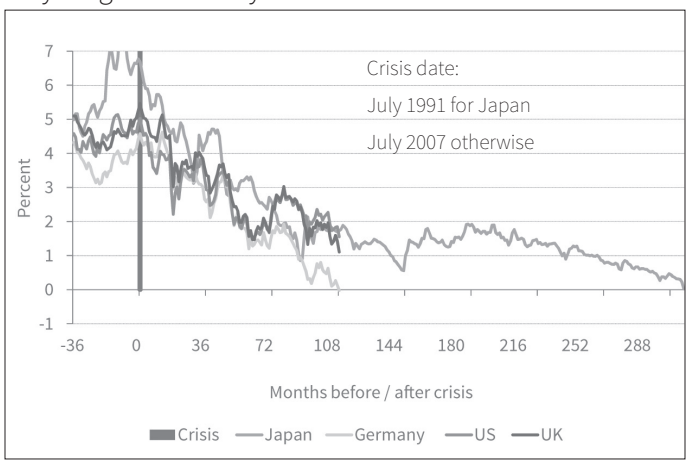
Source: Gen Re based on Bloomberg data.

Figure 2.
Yield of Government Zero Coupon Bonds (as of June 29, 2016)



Source: Gen Re based on Bloomberg data.

Figure 3.
10-year government yield after crisis



Source: Gen Re based on Bloomberg data.

JAPAN

Japan is the largest life insurance market in Asia and the second-largest life insurance market globally, behind only the United States. The total gross premium income resulting from individual life insurance was about EUR 200 billion in 2013.[1]

After World War II, life insurance companies in Japan focused on selling profit-participating, savings-type products through a unique sales channel of "insurance ladies." In the early stage, this channel included widows from World War II who wanted to provide for their families by selling life insurance policies. At a later stage, housewives, who typically had little training and were paid on a commission basis, joined insurance companies. They targeted their relatives and friends who might buy an insurance policy, not because of a need but because of a sense of compassion, which is called *Giri* or *Ninjyo* in Japanese. Other agents focused on developing a close personal connection with potential buyers through frequent home visits with accompanying presents. Such sales activities were called G-N-P (Giri-Ninjyo-Present) solicitations.[2] Typical policies were endowment and whole life products, often supplemented by term riders, and fixed annuity contracts.

The late 1980s in Japan were characterized by an asset price bubble in which real estate and stock prices were greatly inflated. Life insurance companies in Japan at that time issued long-term life insurance and annuity policies with guaranteed fixed interest rates of 4–6 percent to compete with the high interest rates of 10-year insurance policies offered by the state-owned Postal Insurance. Insurance companies supplemented bond investment with investments in equities, loans and real estate, as the Japanese government did not issue many bonds with long maturities.

At the beginning of the 1990s, life insurance companies in Japan were challenged with a number of adverse developments:

- The financial markets collapsed and Japan drifted into a deflationary spiral with plunging stock prices, tumbling real estate values and record-low interest rates.
- In the aftermath of the collapse, Japanese banks were burdened by bad loans and had to be bailed out by the government. This had an impact on the financial service industry as a whole and triggered a loss of confidence in life insurance companies.
- The asset portfolio yields of life insurance companies dropped continuously from about 6.5 percent in 1990 to about 2 percent in 2000.3 A so-called negative spread developed, which was about 2 percent around 2000, resulting from a portfolio interest rate guarantee in the order of 4 percent.
- The deregulation of the Japanese financial markets, which culminated in the so-called Tokyo Big Bang, allowed non-life companies to set up life subsidiaries and made the market entry of foreign insurers easier. Consequently, the number of life insurance companies increased from 30 in 1990 to 47 in 2000.

During the period 1997–2001, the combination of a loss of consumer confidence, the negative spread and increased competition resulted in the first seven insolvencies of life insurance companies since World War II.

JAPANESE LIFE INSURANCE COMPANIES IN A LOW INVESTMENT RETURN ENVIRONMENT

The start of the new millennium in Japan was marked by a continued low interest environment, further declining real estate markets and a volatile stock market that did not recover to historical levels until the present day. The question arises, how did life insurance companies in Japan manage to overcome the challenges of a long-lasting low interest rate period in an increasingly competitive environment? We looked at three key issues.

Shifts in the Investment Portfolio Allocation

Japanese life insurance companies shifted asset allocation toward bonds, increased the duration of their bond portfolios to narrow the duration gap between liabilities and assets, and systematically explored inefficiencies in the financial markets. More recently, an increased investment by Japanese life insurance companies into USD bonds can be observed, reflecting a shift to avoid the negative investment returns of Japanese government bonds.

In particular, the larger Japanese life insurance companies have been looking abroad for investment and growth, for example,

in Australia, Indonesia or the United States, as there is little growth potential seen in Japan due to the aging and shrinking population.

Creation of New Distribution Channels

Japan has seen a tremendous shift in distribution since the start of the low interest environment—away from the traditional channels and toward skilled, professional advisors, bank assurance, Internet sales and, more frequently, sales through so-called insurance shops. Important developments were as follows:

- Banks were gradually allowed to sell insurance products.
- Life insurance companies took advantage of deregulation and sold savings-type products, such as variable annuities, single premium endowment, single premium whole life and annuity policies, over the bank counter.
- Companies focusing on the internet distribution channel have been set up in recent years. These companies have attracted attention in the market and have seen significant growth even though the absolute number of policies sold is still relatively low.
- So-called insurance shops have also been established, addressing both the need to meet an insurance specialist and the need to gather a wide range of information through the internet. The shops carry products from a large number of companies and operate on a commission basis. The advice provided in the shops is free of charge for the customer.

The number of tied agents dropped by about 50 percent from 1990 to 2013, to about 230,000. It is expected that the number of tied agents will continue to drop in the future, to the benefit mainly of the internet distribution and sales through the post office and banks.[4]

Changes in the Product Mix

The product mix has also seen remarkable changes over recent decades. A major focus has been the transfer of the investment risks to policyholders, as exemplified by the following:

- While interest rate guarantees were still preferred by applicants in general, companies have managed to increase the new business sales of variable life insurance products.
- The introduction of USD-, euro- and, more recently, AUD-denominated policies promised a higher nominal investment return but has left policyholders with the exchange rate risk.
- Variable annuity contracts, predominantly sold as single premium variable annuities (SPVAs) through banks, were introduced in 2000 and gained significant market share within a short period of time. Sales of SPVAs virtually stopped in the aftermath of the global financial crisis when many life insurance companies suffered significant losses under the financial guarantees of these products.

The most important trend, however, was the development of the so-called Third Sector, which includes health insurance policies, cancer insurance products and long-term care (LTC)

products. This sector for a long time had been restricted exclusively to foreign insurers and smaller companies but was liberalized in 2001, when all life and non-life companies were able to sell Third Sector insurance products. Low claims ratios of such policies allowed companies to dilute losses triggered by the negative spread.

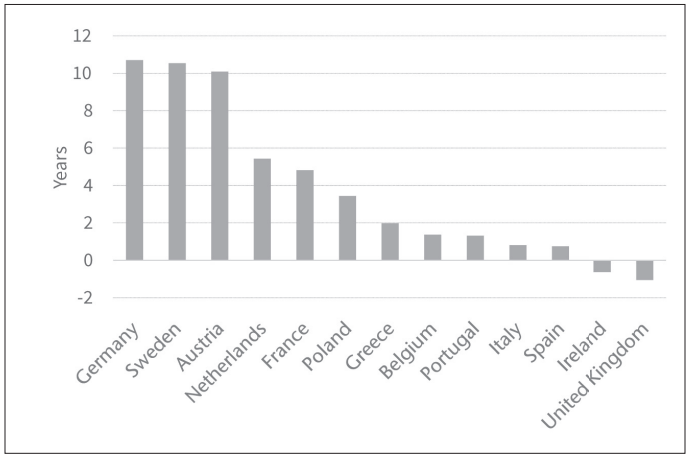
GERMANY

Germany is the third-largest life insurance market in Europe, with a total gross premium income for individual life insurance of about EUR 70 billion in 2014.[5] Traditionally, life insurance companies in Germany focused on selling profit-participating endowment products with a conservative interest rate assumption; a slogan traditionally used to advertise policies in the past was "Sicherheit mit Dividende" (security with profit sharing).

The Federal Ministry of Finance determines a maximum interest rate assumption, which German life insurers are allowed to use for the calculation of their mathematical reserve. Simply put, this interest rate assumption should not exceed 60 percent of the average return of 10-year AAA government bonds. This assumption was typically also applied for the pricing of new life insurance products. This rate has been 1.25 percent from 2015 and will be 0.9 percent from January 2017, but had been as high as 4 percent in the past.

Due to the existing guarantees in the in-force portfolio and the sharply reduced returns of government bonds, companies have experienced a significant interest gap for new investments in the last few years. German life insurers furthermore experienced a significant duration mismatch between liabilities and assets, as shown in Figure 4.

Figure 4.
Duration of Liabilities Minus Duration of Assets (Baseline Scenario)



Source: European Insurance and Occupational Pensions Authority (EIOPA)

German life insurance companies, hence, bear a significant reinvestment risk. This has also been recognized by the German regulator, and a new balance sheet item, the so-called Zinszusatzreserve (ZZR), was introduced to address the risk of future reinvestment at lower interest rates than the interest rates used for pricing. The ZZR amounts to about EUR 32 billion in 2015, which represents about 4.1 percent of the mathematical reserve held by German life insurance companies.[6] It is expected that 3.5–4.0 percent of the mathematical reserve will have to be added each year to the ZZR during 2017–2019.[7] The ZZR is mainly funded by realizing hidden reserves.

> While interest rate guarantees were still preferred by applicants in general, companies have managed to increase the new business sales of variable life insurance products.

The question then arises, how do life insurance companies in Germany react to the challenges of a low interest rate period? We explore two areas.

Shifts in the Allocation of the Investment Portfolio

The investment strategy of German life insurers has traditionally been conservative, with 87.3 percent of assets invested in bonds and 4.3 percent of assets invested in equities as of Dec. 31, 2015.[8] A shift of investments toward more risky asset classes would, under Solvency II, increase capital requirements.

German life insurers have instead focused on increasing investment into less liquid investments and taking advantage of the liquidity premium built into the return. Such investment includes infrastructure projects, such as solar and wind energy, parking garages and gas distribution systems.

New Product Strategy

The dominating products traditionally sold in the German market have been endowment products, priced with conservative interest rates and mortality rates. Sales arguments included annual investment returns in excess of 7 percent (which contrast with about 3 percent for the in-force portfolio today) and exemptions from taxes on interest earned under life insurance policies. Such endowments have been replaced to a large extent by traditional deferred annuity products, especially since tax advantages were removed for endowment products in 2004.

Traditional deferred annuity products sold in Germany provide substantial guarantees not only during the deferment period but also during the payout period (Figure 5).

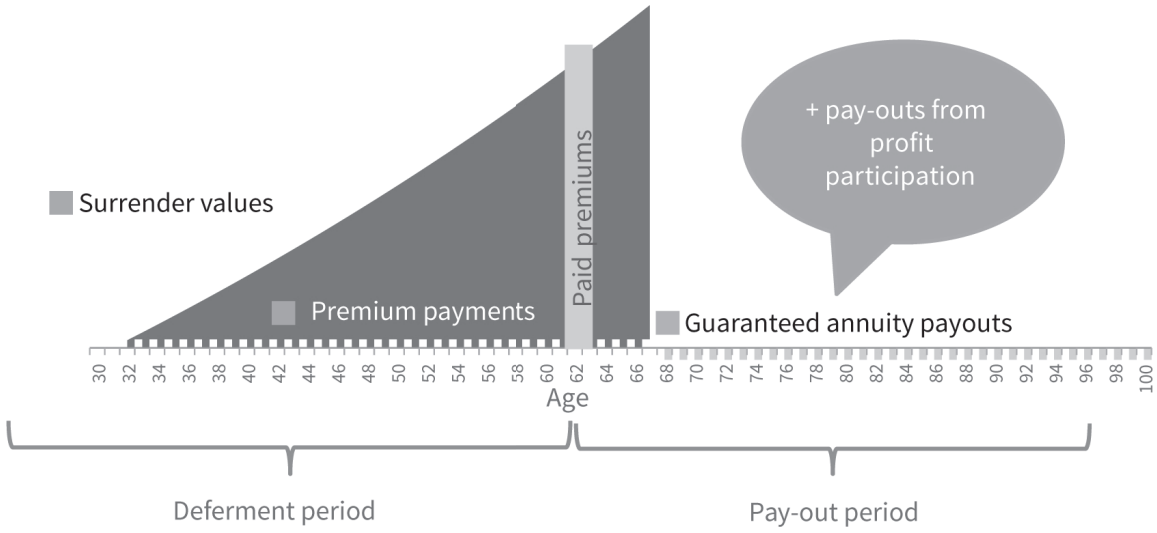
These guarantees trigger large capital requirements under Solvency II.

Life insurance companies in Germany pursue two main strategies today to address the implications of the low interest rate environment and the capital requirements for long-term guarantees mandated under Solvency II:

- Replacing traditional savings-type products (such as deferred annuities) with alternative guarantee concepts, for example, deferred annuities that only guarantee the return of the premium at the end of the deferment period and a minimum annuity payout after the deferment period
- Focusing on protection-type products, such as disability income business and LTC

Disability income business is the most important German protection-type product. New business is about 400,000 policies per annum.

Figure 5.
Guarantees in Traditional Deferred Annuity Products Sold in Germany



Guaranteed	• Interest rate • Surrender values • Accumulated capital at the end of the deferment period • Return of paid premiums at the end of the deferment period	• Interest rate • Mortality rate • Minimum annuity pay-out • Annuitisation factor at the end of the deferment period

Source: Gen Re

There is significant need in Germany for private LTC protection in view of the aging population and gaps in the benefits of the public LTC system. In 2014 there were about 3.4 million policies in force, 95 percent of which were sold by health insurers and the remaining 5 percent by life insurers. Health insurers experienced a growth rate of about 15 percent whereas life insurers saw a growth rate of about 25 percent during 2010–2014.

OUTLOOK FOR COMPANIES WORLDWIDE IN A LONG-TERM LOW INTEREST RATE ENVIRONMENT

The experience of insurance companies in Japan and Germany during the period of low investment returns shows that the companies that focused on sales of protection-type products fared better than the companies that focused on investment guarantees. In addition, new and innovative distribution approaches (e.g., approaches using the internet to attract customers, as experienced in Japan) continue to challenge the traditional sales approaches. ■

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Term Conversions: Pricing and Reserves

By Hezhong (Mark) Ma

Most term products in the U.S. offer policyholders the option of conversion to a permanent policy, typically without additional underwriting. To some extent, convertibility of a term contract is similar to a swaption in that a policyholder has the option to swap premium for the death benefits of permanent life insurance. In a term conversion, the "moneyness" of the conversion option is not tied to any trading asset or index. The conversion decision is generally one of self-selection: based only on information known to the policyholder, of which none is known to the insurer. Insurers do not have a general consensus on how to account for the cost of convertibility.

Table 1
Conversion Philosophy of 21 Companies in SOA Survey

Conversion Philosophy	
Cost of Conversions	Responses
Implicitly built into the term policy	5
Explicitly built into the term policy	7
Implicitly built into the permanent policy	5
Explicitly built into the permanent policy	2
Not built into either term or permanent policy	1
Conversion has no cost	1

Source: SOA "Report on the Survey of Conversion Assumptions dn Product Features for Level Premium Term Plans," 2015.

Per Table 1, more than half of the companies surveyed (12 of 21) indicated they built their conversion costs, either explicitly or implicitly, into their term policies. Seven, meanwhile, built the costs into their permanent products. Different companies are likely to have their own assumptions, histories, and conversion pricing philosophy. Let's first examine two hypothetical situations.

SITUATION 1: THE NET COST OF CONVERSION TO THE INSURER IS ZERO.

If at the time of a conversion, the slope of expected mortality matches that of the gross premium for a permanent policy through conversion, the converted policy is perfectly priced. For example, a reinsurance treaty could be structured so that yearly renewable term rates follow point-in-scale mortality (PISM). Since there is no prefunding for conversions, there would be no need for an insurer to charge extra premium or to set up reserves for a convertibility option for the term product.

Situation 1, if it exists, might be a bit of wishful thinking and not necessarily preferable. To avoid cross-subsidizing, the rate scales for permanent policies from term conversions have to vary by many policy characteristics and it is highly likely they will need to be separated from other permanent products. Direct companies' insurers frequently push back on developing rate scales specifically for converted policies due to administrative concerns. According to the "Report on the Conversion Experience Study for the Level Premium Term Plans" (SOA Conversion Experience Report), the mortality experience of converted permanent policies can vary significantly, depending on when in the term policy's duration it converted. To make the hypothetical situation real, an insurer might have to charge different premium rates for the converted policies that would depend on the timing of the conversions. Once examined carefully this hypothetical situation might be less appealing considering the pricing and administrative challenges it would entail.

SITUATION 2: AN INSURANCE COMPANY HAS SUBSTANTIAL EXPERIENCE WITH TERM-TO-PERMANENT POLICY CONVERSIONS. ITS EXPERIENCE IS MATURE AND NOT EXPECTED TO CHANGE.

For these companies, if the rate of conversion and postconversion mortality and lapse experience is mature and not expected to change, many think that there is no need to institute a separate charge for the conversion option, as the deterioration in mortality of the converted permanent policies would have been accounted for in the experience study of permanent products, assuming conversions have not been separated from the study. In other words, the premium for permanent products would already reflect the additional death experience due to conversions.

It is not entirely fair for the permanent product to include the converted policies' mortality experience. Since converted permanent products generally have higher mortality experience than permanent policies bought outright, blending the experience of the two might make overall mortality for a given product appear artificially high.

In addition, without knowing the motivation of the policyholders who exercise the conversion option, experience could change significantly in the future. For example, for a company new to the 10-year term market, the first nine years of experience would likely see very low conversion rates and therefore minimal impact on mortality experience in their permanent policies. However, Year 10 could see an approximately 10-fold

jump in conversion rates, making the mortality of permanent products suddenly spike.

Neither of those two hypothetical situations is as desirable as it first appears. Convertibility should cost both insurers and as a result, consumers. That being said, how should the charge occur? Should it be attached to the term or the converted permanent product? How much should the charge be, and how should insurers reserve for experience if the option is exercised?

The cost to insurers of exercising the convertibility option stems from the additional mortality experienced after conversion. The optionality of incurring such excess mortality, however, is built in the term policy. To align risk and revenue, it would make economic sense to charge only the term policies. It is the product on which the swaption exists. There should be an internal transfer pricing, from the term product into permanent product, when a policy converts. The amount transferred makes the permanent product indifferent to whether the policy was acquired through term conversions, or bought outright. The overall process is similar to how we price certain health products, such as long-term care insurance, where an insurer charges active lives and builds up active life reserves. Therefore, when a policyholder becomes disabled, the active life reserve is released through incurred claim costs to cover the newly established disabled life reserves.

We propose a two-stage model to price term-to-permanent convertible policies. In the first stage of the calculation, we determine, at the time of conversion, how much the excess mortality due to a conversion might cost. We do this by calculating the present value of future benefits (PVFB) of a converted policy and, for the sake of comparison, the PVFB of an otherwise identical nonconverted permanent policy, again at the time of conversion. The difference between the two PVFBs represents the severity of the excess mortality and will be defined as "claim costs per conversion," by duration at conversion. The second stage looks at the term life side of the conversion. The aforementioned claim costs per conversion is multiplied by the conversion rate, to get a series of claim costs per policy in force by policy years. With those factors, we can price the cost of convertibility and establish reserving schedules.

Let's look at an example: a 10-year convertible term policy held by a male nonsmoker, issue age 55, preferred class and 5percent discount rate. We want to calculate the cost of excess mortality if the policy were to convert to permanent in Duration 10. Table 2 shows how to calculate the single premium of a permanent policy issued at the same time a converted term policy was originally issued. Note that at the time of conversion, the policyholder is age 64.

Table 2
Permanent Life Single Premium

									Continuous		
		Attained		Base	Mortality	Perm			Const. Force	Death Benefit	EOY
Dur_Since_CV	Duration	Age	$q_x^{(lapse)}$	Mortality	Multiple	Mortality	$q_x^{(total)}$	p_x	$a^{bar}_{x1}{}^{bar}$	per $1,000	PVFB
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0								1	0.9760		261.56843
1	10	64	0.049798	0.005260	0.90	0.004734	0.0543	0.9457	0.9495	4.49	285.4250
2	11	65	0.046734	0.006060	0.90	0.005454	0.0519	0.9481	0.9506	5.18	310.3706
3	12	66	0.026846	0.006950	0.90	0.006255	0.0329	0.9671	0.9600	6.00	330.4677
4	13	67	0.015039	0.007940	0.90	0.007146	0.0221	0.9779	0.9653	6.90	347.4184
5	14	68	0.012947	0.009040	0.90	0.008136	0.0210	0.9790	0.9658	7.86	364.1780
6	15	69	0.012947	0.010280	0.90	0.009252	0.0221	0.9779	0.9653	8.93	381.4312
7	16	70	0.012947	0.011700	0.90	0.010530	0.0233	0.9767	0.9647	10.16	399.1534
8	17	71	0.012947	0.013330	0.90	0.011997	0.0248	0.9752	0.9639	11.56	417.3128
9	18	72	0.012947	0.015240	0.90	0.013716	0.0265	0.9735	0.9631	13.21	435.8513
10	19	73	0.010060	0.017470	0.90	0.015723	0.0256	0.9744	0.9635	15.15	453.3535
11	20	74	0.010000	0.020060	0.90	0.018054	0.0279	0.9721	0.9624	17.38	470.9022
12	21	75	0.010000	0.023050	0.90	0.020745	0.0305	0.9695	0.9611	19.94	488.4269
13	22	76	0.010000	0.026500	0.90	0.023850	0.0336	0.9664	0.9596	22.89	505.8179
14	23	77	0.010000	0.030430	0.90	0.027387	0.0371	0.9629	0.9579	26.23	522.9716
15	24	78	0.010000	0.034910	0.90	0.031419	0.0411	0.9589	0.9560	30.04	539.7703
16	25	79	0.010000	0.040010	0.90	0.036009	0.0456	0.9544	0.9537	34.34	556.0835
17	26	80	0.010000	0.045840	0.90	0.041256	0.0508	0.9492	0.9512	39.24	571.7540
18	27	81	0.010000	0.051120	0.90	0.046008	0.0555	0.9445	0.9489	43.65	587.1173
19	28	82	0.010000	0.056920	0.90	0.051228	0.0607	0.9393	0.9463	48.48	602.1312

In the table above, the column (1) lapse assumptions are from the SOA Conversion Experience Report, indexed by duration since conversion. The base mortality rates in the column labeled (2) are from the 2008 Valuation Basic Tables' Select Ultimate Table, gender and smoking status—distinct version. For this exercise, we arbitrarily assigned a 70 percent mortality multiple factor for a superpreferred life, a 90 percent factor for a preferred life and a 110 percent factor for a standard life. Calculations after attained age 82 were omitted for presentation purposes, but continue to age 100. In this example, the single premium of a regular permanent policy that was issued at the same time as an equivalent convertible term policy would be $261.57 in Duration 10.

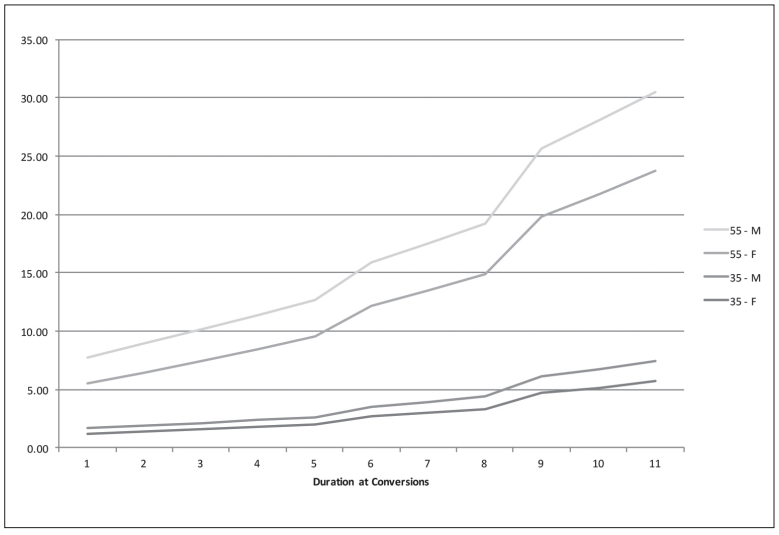
The calculation is largely identical to that performed in Table 2, with the addition of the conversion mortality multiples, the figures in column (1), which is the PISM in the SOA Conversion Experience Report. The conversion mortality, which is column (2), is the product of column (1) and of the permanent mortality numbers in Table 2, column (4). The single premium for a term conversion is $289.63. The difference between the PVFBs of the term conversion and the regular permanent policy issued at the same time is $28.06 (i.e., $289.63 – $261.57). This difference reflects the cost of excess mortality due to conversion if a term policy converts in policy year 10. Let's call it "claim costs per conversion at Duration at Conversion 10." If this amount is transferred from the term policy into the permanent policy, it could cover the excessive mortality expected from the term conversion. In other words, the product manager of the permanent product becomes profit neutral to the term conversion.

For a convertible term policy, we can look at different durations at conversion to generate a series of costs associated with the conversions. Figure 1 (page 25, bottom) graphs four policies, two issued to males and two to females, at issue ages 35 and 55, preferred nonsmokers, and shows claim costs per $1,000 converted face amount by duration at conversion. Unsurprisingly, policies issued to older males who convert at a later stage of the level term period tend to have higher claims costs.

Table 3
Conversion Single Premium

								Continuous			
		Attained	Conversion	Conversion				Const Force	Death Benefit	EOY	Reserve
Dur_Since_CV	Duration	Age	Multiple	Mortality	$q_x^{(lapse)}$	$q_x^{(total)}$	p_x	$a^{bar\ bar}_{x1}$	per $1,000	PVFB	per $1K @ CV
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0							1	0.9760		289.62536	28.0569
1	10	64	1.849387	0.008755	0.049798	0.0581	0.9419	0.9476	8.30	313.6227	28.1977
2	11	65	1.956586	0.010671	0.046734	0.0569	0.9431	0.9482	10.12	337.9087	27.5381
3	12	66	1.758423	0.010999	0.026846	0.0375	0.9625	0.9577	10.53	357.1548	26.6872
4	13	67	1.720997	0.012298	0.015039	0.0272	0.9728	0.9628	11.84	372.6994	25.2810
5	14	68	1.512863	0.012309	0.012947	0.0251	0.9749	0.9638	11.86	388.6312	24.4532
6	15	69	1.512863	0.013997	0.012947	0.0268	0.9732	0.9630	13.48	404.7417	23.3105
7	16	70	1.512863	0.015930	0.012947	0.0287	0.9713	0.9621	15.33	420.9557	21.8023
8	17	71	1.512863	0.018150	0.012947	0.0309	0.9691	0.9610	17.44	437.1818	19.8690
9	18	72	1.512863	0.020750	0.012947	0.0334	0.9666	0.9597	19.91	453.2830	17.4317
10	19	73	1.193468	0.018765	0.010060	0.0286	0.9714	0.9621	18.05	470.4634	17.1098
11	20	74	1.200000	0.021665	0.010000	0.0314	0.9686	0.9607	20.81	487.4625	16.5603
12	21	75	1.200000	0.024894	0.010000	0.0346	0.9654	0.9591	23.88	504.2344	15.8076
13	22	76	1.200000	0.028620	0.010000	0.0383	0.9617	0.9573	27.40	520.6357	14.8178
14	23	77	1.200000	0.032864	0.010000	0.0425	0.9575	0.9553	31.39	536.5253	13.5536
15	24	78	1.150000	0.036132	0.010000	0.0458	0.9542	0.9537	34.46	552.4571	12.6868
16	25	79	1.150000	0.041410	0.010000	0.0510	0.9490	0.9511	39.39	567.6748	11.5913
17	26	80	1.150000	0.047444	0.010000	0.0570	0.9430	0.9481	44.98	581.9803	10.2263
18	27	81	1.150000	0.052909	0.010000	0.0624	0.9376	0.9455	50.02	595.7144	8.5971
19	28	82	1.150000	0.058912	0.010000	0.0683	0.9317	0.9425	55.53	608.7916	6.6605

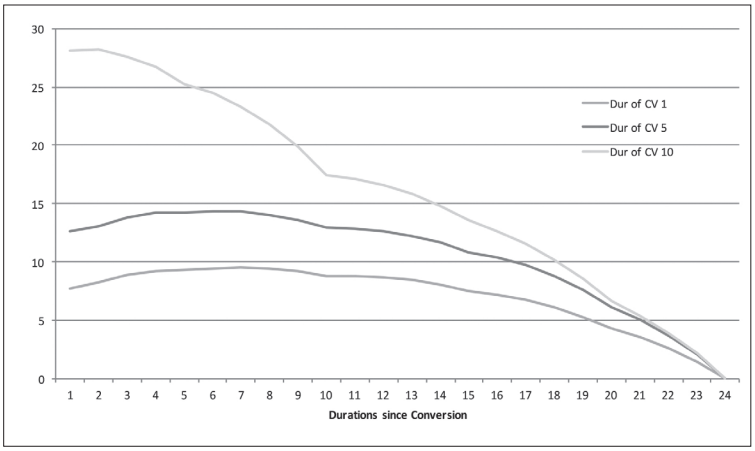
Figure 1
Claim Costs per $1,000 Converted Face Amount



With the projections of PVFBs postconversion, we can not only look at the claim cost at conversion, but also at how the cost of excessive mortality is released. The last column of Table 3 contains the projection of reserves once a term policy converts. It shows the differences between the PVFBs of a converted policy and that of a regular permanent policy issued at the same time as the original term policy. This reserve, as mentioned earlier, is similar to disabled life reserves for some health products, and generally decreases throughout the life of a permanent policy.

Figure 2 (page 26) shows the reserves for the same sample policy, (male nonsmoker, issue age 55, preferred class) converting at Durations 1, 5 and 10. Conversions that occur at later stages of the level term period have higher overall levels of reserves. PISM after duration since conversion 10 is low. As a result, the trajectories of the graphs appear to bend at Year 10. For conversions that occur in the first few years, excess mortality is low. Reserves actually increased slightly due to interest earned.

Figure 2
Permanent Reserves for Conversions



Equipped with the claim costs per conversion from the permanent life model, we next switch our attention to the second stage model, the term life projection. Tables 4 (below) and 5 (page 27) project the sample policy during the term life stage. Most assumptions, including the arbitrary mortality multiple for different classes, are identical to what is being used for permanent life projection. (The mortality select factors, Column (3), term lapse rates, Column (5), and term conversion rates, Column (6), are from the SOA Conversion Experience Report.)

Column (10) in Table 5 shows claim cost per policy converted, which was calculated in Table 3. Note the number $28.06 we got from Table 3 is used in Table 5, in column (10) for Duration 10. Claim costs per $1,000 face amount in force, column (11), are defined as conversion rate multiplied by the figures in Column (10). Column (12) is the present values of claim costs per $1,000 face amount in force. In Column (13), we chose $1 as the gross premium during the level term period and $5 for the premium in Duration 11 and later. The beauty of setting those levels is for mathematical simplicity. The net level premium ratio works out to be the annual net premium for convertibility during the level term period. For the purpose of calculating convertibility costs, we did not use a full-length premium projection, but only the segment of time when conversions would take place. It is conservative to shortened amortization period to avoid negative reserves after Duration 11.

In the example above, the single premium for convertibility is $0.94 per $1,000 face amount (as seen in column (12)), and the

Table 4
Term Life Projection

	Attained	Base	Mortality	Select	Term					Const Force
Duration	Age	Mortality	Multiple	Factor	Mortality	$q_x^{(lapse)}$	$q_x^{(conversion)}$	$q_x^{(total)}$	p_x	$a^{bar}_{x1}{}^{bar}$
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
									1	
1	55	0.000830	0.90	0.907102	0.000678	0.093146	0.005792	0.0990	0.9010	0.9272
2	56	0.001340	0.90	0.860118	0.001037	0.074088	0.010196	0.0845	0.9155	0.9345
3	57	0.001770	0.90	0.850015	0.001354	0.064540	0.009203	0.0744	0.9256	0.9395
4	58	0.002160	0.90	0.842955	0.001639	0.059327	0.009098	0.0694	0.9306	0.9420
5	59	0.002530	0.90	0.824281	0.001877	0.057961	0.013708	0.0726	0.9274	0.9404
6	60	0.002940	0.90	0.823767	0.002180	0.054100	0.007172	0.0629	0.9371	0.9452
7	61	0.003390	0.90	0.805842	0.002459	0.051230	0.006971	0.0602	0.9398	0.9466
8	62	0.003930	0.90	0.862190	0.003050	0.052192	0.006977	0.0617	0.9383	0.9458
9	63	0.004550	0.90	0.804303	0.003294	0.058428	0.007702	0.0688	0.9312	0.9423
10	64	0.005260	0.90	0.863699	0.004089	0.603525	0.045495	0.6231	0.3769	0.6257
11	65	0.006060	0.90	1.700753	0.009276	0.267457	0.036784	0.3009	0.6991	0.8216
12	66	0.006950	0.90	1.700753	0.010638	0.267457	-	0.2753	0.7247	0.8356
13	67	0.007940	0.90	1.700753	0.012154	0.500000	-	0.5061	0.4939	0.7022
14	68	0.009040	0.90	1.700753	0.013837	0.750000	-	0.7535	0.2465	0.5281
15	69	0.010280	0.90	1.700753	0.015735	1.000000	-	1.0000	-	-

annual charge for the conversion option is $0.14 per $1,000 face amount (column (15)).

OBSERVATIONS

With those simplified assumptions, the higher the base mortality, the bigger the difference in PVFB between converted term policies and regular permanent policies; therefore, the higher the cost of convertibility.

Figure 3 summarizes the convertibility net premium for 54 sample policies, by gender, risk classes, smoker status and issue ages. Net premium ranges from $0.02 per $1,000 face amount for a female super-preferred nonsmoker at issue age 35 to $0.30 per $1,000 for a male standard-class smoker at issue age 55.

Note that Figure 3 depicts dollar amount of net premium. If converted to the percentage of gross premium of a term policy, the shape of the chart might look very different.

Figure 4 (page 28) depicts reserve projections for six convertible term policies for preferred nonsmokers. The graph shows the projection for males and females, issue ages 35, 45 and 55. Reserves build slowly during the first nine years due to generally low conversion rates and relatively low PISMs. In Duration 10, however, significant portions of the reserves are released due to both the high likelihood and potential severity of experience for the conversions. The male policyholders in each age group have the highest reserves throughout. Older issue ages, which are associated with higher net premiums for convertibility, also require higher reserves.

Figure 3
Convertibility Net Premium

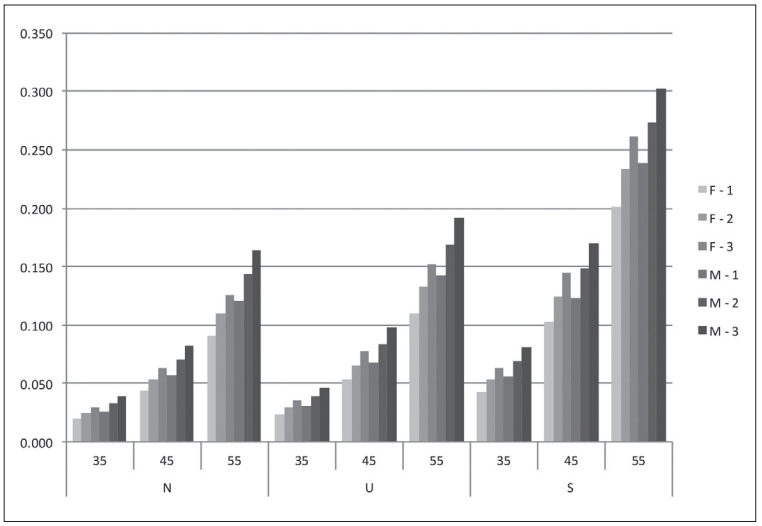
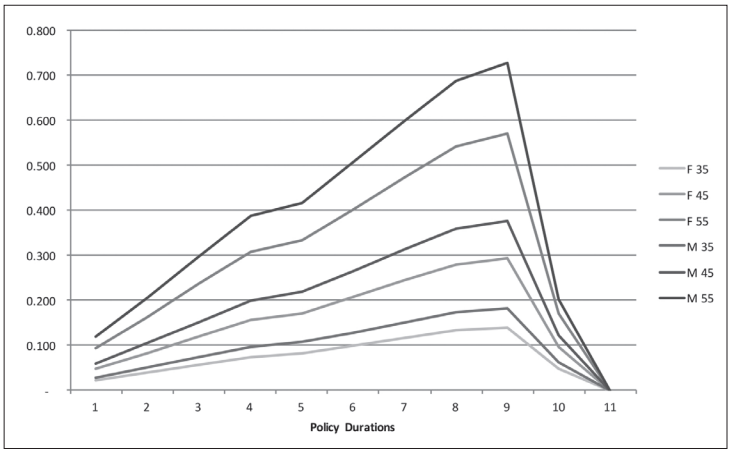


Table 5
Term Life Projection, continued

			per $1,000 Converted		Gross Prem			
Duration	Attained	Single Prem	undecrmted	EOY	to Amort CV	EOY	Net Lvl Prm	Terminal
	Age	Due to Conv.	Claim Costs	PVFB	BOY	PVFP($1)	Factor	Reserve
		(10)	(11)	(12)	(13)	(14)	(15)	(16)
				0.9389		6.5218	14.40%	
1	55	7.7271	0.0448	1.0459	1.0000	6.4350	0.1440	0.1194
2	56	8.9215	0.0910	1.1020	1.0000	6.2333	0.1440	0.2046
3	57	10.1174	0.0931	1.1509	1.0000	5.9367	0.1440	0.2962
4	58	11.3556	0.1033	1.1887	1.0000	5.5702	0.1440	0.3868
5	59	12.6605	0.1735	1.1611	1.0000	5.1745	0.1440	0.4162
6	60	15.9503	0.1144	1.1799	1.0000	4.6776	0.1440	0.5065
7	61	17.5463	0.1223	1.1888	1.0000	4.1086	0.1440	0.5973
8	62	19.2347	0.1342	1.1883	1.0000	3.4786	0.1440	0.6875
9	63	25.7107	0.1980	1.1294	1.0000	2.7947	0.1440	0.7271
10	64	28.0569	1.2764	0.9216	1.0000	5.0000	0.1440	0.2018
11	65	30.4962	1.1218	-	5.0000	-	0.1440	-
12	66	-	-	-	-	-	0.1440	-
13	67	-	-	-	-	-	0.1440	-
14	68	-	-	-	-	-	0.1440	-
15	69	-	-	-	-	-	0.1440	-
		-	-	-	-	-	0.1440	-

Figure 4
Term Reserves for Conversions



Clearly, the cost of convertibility for these policies is rear-heaped. This reserving pattern for convertible term products makes it difficult to manage the profit in the term products. When we realize our base assumptions of conversion rates and PISM are inadequate, there is not much time to take action. When that happens, it makes economic sense for the term product to absorb the shock and to transfer assets to what the revised assumptions suggest, instead of what is available from the built-in release of reserves. However, the actual accounting could still be tricky.

Shortening the conversion privileges for the term policies might provide some relief. We used the same method described in this article to test different lengths of conversion privileges. To be fair and to avoid negative reserves, the premium payment period was set to match the duration of the conversion privileges for the term policy.

Figure 5
Annual Premiums by Conversion Privileges

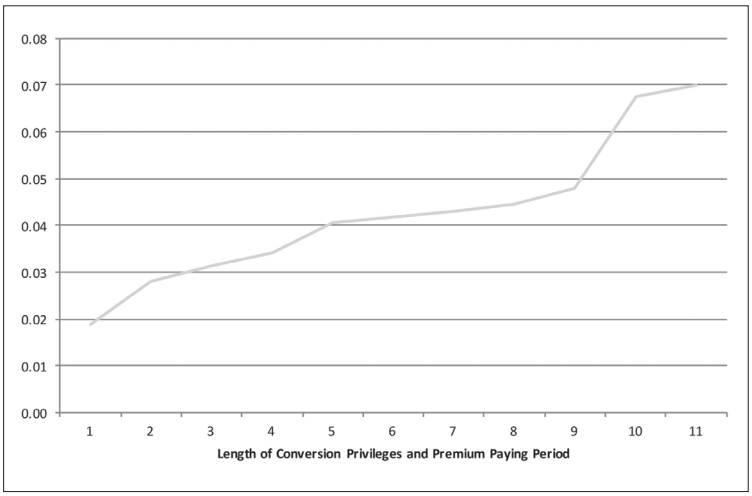


Figure 5 shows the annual premium for a convertible term policy held by a male, standard class and issue age 45, by the length of conversion privileges and premium paying period. If there is no restriction on conversions, the annual premium for the convertibility will be $0.07, payable for the life of the term contract. If, however, conversion privileges are restricted to the first seven policy years, the additional premium cost for the convertibility decreases to $0.04 a year, payable for seven years.

Generally speaking, we noticed that if conversions are disallowed in year 10 and beyond, annual premium for the convertible term product can be reduced by roughly 30 percent. The calculation is based on the assumption that policyholders do not alter their behavior to adapt to the new policy feature. In reality, when conversion privileges are shortened, it would be reasonable to expect policyholders to accelerate their conversion decisions while they still have the option.

In the calculations above, it is assumed that conversions would occur throughout all policy years. Year 10, however, is clearly unique, as claim costs due to conversion as well as shock lapse levels are both high. Uniform distribution might not be prudent, especially during year 10, when conversions are likely to occur around the end of the policy year. To quantify the impact of this timing assumption, we changed the timing of the conversions and lapses to the end of each policy year. Conversions were calculated after continuous death but before lapsation. The resulting net premium for convertibility rose by about 25 percent.

To sum up, revenue should match risks. An insurer should charge and establish reserves specifically for conversions at the issuance of a convertible term policy. With each term conversion, the company would calculate a claim cost to cover future excess mortality. That reserve becomes the asset that transfers from the term product to the permanent product.

This article is not intended to offer a valuation guideline. There are many questions companies still need evaluate. For example: should insurers follow FAS 60 to lock in assumptions related to conversions? Or, should SOP 03-1 be followed for the release of deferred acquisition costs? How are conversions not explicitly charged for incorporated into the term reserve under principal based reserve framework? For policies already converted, when we update our PISM assumptions, should we unlock the reserves due to conversions? These, and other questions, would need careful analysis and discussions with valuation actuaries and auditors. ■

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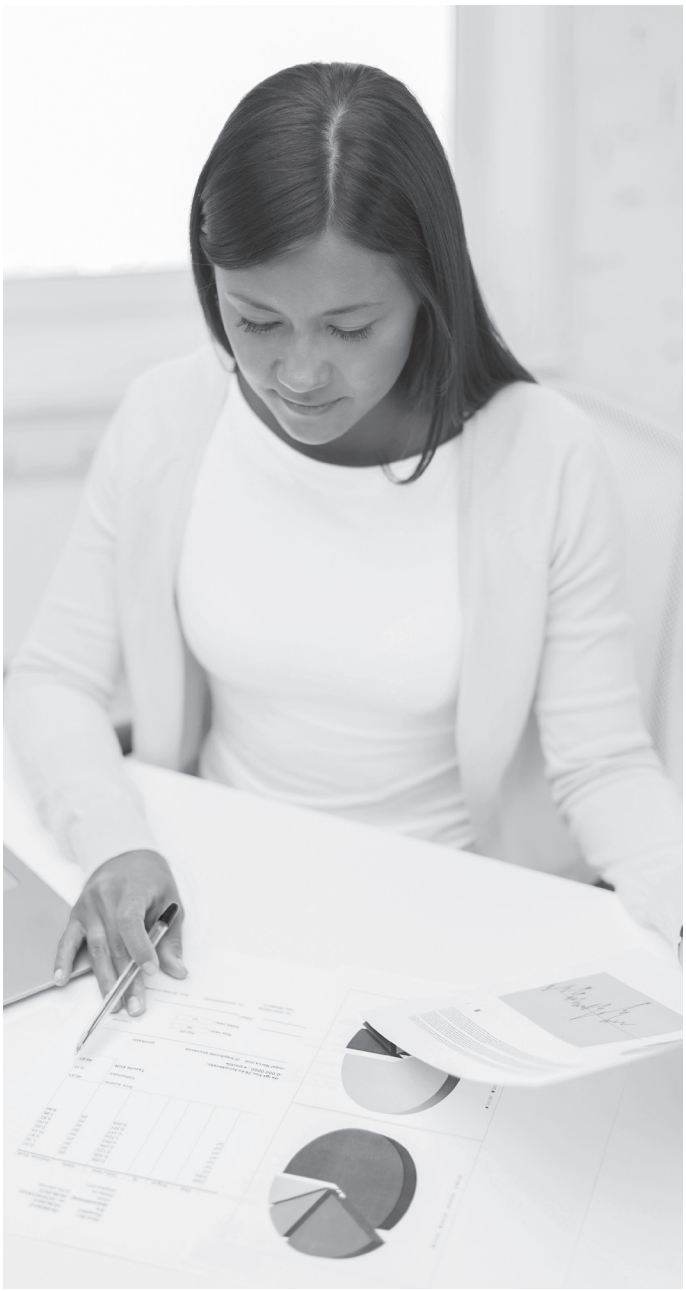
The Birth of an Actuarial Learning Company

By Stephen Camilli



Editor's note: This article is not an endorsement of the company. This article is highlighting non-traditional roles of actuaries.

Like many great companies, the birth of ACTEX happened through a combination of planning, hard work and chance. In 1964, Geoffrey Crofts, FSA, began a graduate program in actuarial science at Northeastern University in Boston. Richard (Dick) London was a student in the second year of that program, graduating in 1967. In 1968, London joined Crofts on the faculty of the Northeastern program, teaching courses designed to directly prepare students for the actuarial exams. In the academic year of 1969–70, the Northeastern program was expanded to include exam preparation courses for all SOA exams beyond the preliminary level.

As the reputation of these courses grew, former students not actually enrolled in a particular course at Northeastern would ask to receive the notes and practice exams used in the course to help them prepare for their SOA exams. The number of such requests grew to include persons who had never been at the school but had simply heard that such material was available, and it soon became clear that a change was needed, and the informal packets should be transformed into a more formal and complete package of study material.

Thus was born the actuarial exam study manual. Initially run by London, starting in 1972 as the Northeastern Study Manual Series, the project was operated as a cooperative venture by the participating authors. That is to say that after deducting expenses and a modest administrative charge by the proprietor, all remaining revenue was distributed among the authors in relation to the sales level of their particular work.

As demand grew, so did the product line, and by the summer of 1978, the Northeastern Study Manual Series had grown to include titles for all of the exams except the first two in the series (then known as Courses 100 and 110). During the next four years, while London was building a log cabin in Maine, traveling around the country and enjoying a two-year visiting appointment at University of Waterloo, a joint hike led to the authorship and publication of manuals for the first two exams by Sam Broverman, ASA (then at University of Texas and now at University of Toronto), bringing the series to completion with regard to the SOA exam program.

At this time, the Northeastern University Bookstore also separated itself from the project, and the company was renamed ACTEX, an acronym for "actuarial texts." Initially run out of London's home, the early operating structure of ACTEX was quite loose. London, living in Winsted, Connecticut, where he settled out of a love for the land and ties to the area,

oversaw the development of manuscripts with the author group and sent them out for printing and distribution.

In 1985, through London's desire to offer better resources for the actuarial community, ACTEX published its first textbook, *Graduation: The Revision of Estimates*. This was to be the first of dozens of ACTEX textbooks and books dedicated to the actuarial science community.

In 1986, as the company grew, ACTEX became a corporation to give it greater flexibility and the ability to issue stock to raise capital. The growth of staff (and other factors) has led on three occasions to the need for increased office space. In 1995, ACTEX expanded its operations to include the retailing of titles of other publishers, naming the expanded retail service Mad River Books, after the stream that flows behind the Willow Street facility. This addition was born out of ACTEX's desire to be a "one-stop shop" for actuaries and actuarial students looking for resources.

Through the years, ACTEX became involved with actuarial recruiting, live seminars and the publishing of nonactuarial books, all of which had some measure of success but were ultimately determined not to be the best focus of the company. Live seminars were eventually replaced by recorded seminars on DVD, which had a time of great success and have now been replaced by ACTEX's series of online exam prep seminars.

In 2005, Gail Hall, FSA, took over as president of ACTEX after having been a vice president at Mass Mutual, serving on the SOA Board of Governors and being the general chairperson of the SOA Employment and Examination Committee structure. Her combination of actuarial knowledge, SOA contacts and general management skills made her a perfect fit for the ACTEX position.

During the eight years of Hall's presidency, several significant changes occurred in the ACTEX product line. Reflecting the evolution of technology, ACTEX made an investment in the development of an online education platform in 2008. This investment made possible a series of recorded exam-preparation seminars and a number of interactive online courses, including highly successful SOA-approved courses in applied statistics, time series, economics and corporate finance, to serve the students' Validation by Educational Experience requirements. Technological advances have also resulted in the development of a number of other electronic products, including online practice exams, ebooks and interactive e-flashcards. ACTEX published its first ebook in 2012.

Also in 2012 ACTEX established a new focus on the continuing education and training needs of actuaries (beyond mere exam preparation), and another opportunity for offering additional, more specialized titles and products was created. ACTEX's mission statement highlighted a product development focus exclusively on aspiring and practicing actuaries. Moving beyond textbooks, in 2015 ACTEX began offering webinars and e-courses focused on continuing professional development (CPD) and training needs. To date, ACTEX has launched two e-courses on ethics and deferred acquisitions costs (DAC) and has offered more than 20 webinars on topics including best practices in Excel, generally accepted accounting practice (GAAP) for beginners, enterprise risk management (ERM) and microinsurance.

> ... the birth of Actex happened through a combination of planning, hard work and chance.

In 2016, the company changed its name from ACTEX Publications to ACTEX Learning to reflect its product line and its mission to serve all actuaries' learning needs. ACTEX also refreshed its logo, keeping the mountains motif showing the challenges each person scales along the path to actuarial excellence. Future areas of development include increasing customization of materials to the specific needs of certain practices, companies and countries; better support materials for professors; and increased CPD and training offerings.

Many things remain unchanged, however, such as the importance of actuarial talent both in ACTEX's staff and its author base, understanding the needs of actuarial students, professional actuaries and companies, and responding appropriately.

With 12 experienced and passionate employees and more than 70 authors and instructors, ACTEX looks forward to continued growth and excitement as the company works through these upcoming exam changes and the new challenges the actuarial profession is facing. ■

Stephen Camilli, FSA, is the president of ACTEX Learning and is passionate about actuarial education and innovation. He can be reached at *Stephen@actexmadriver.com*.

The Social Impact of the Actuarial Profession

By Anthony Asher

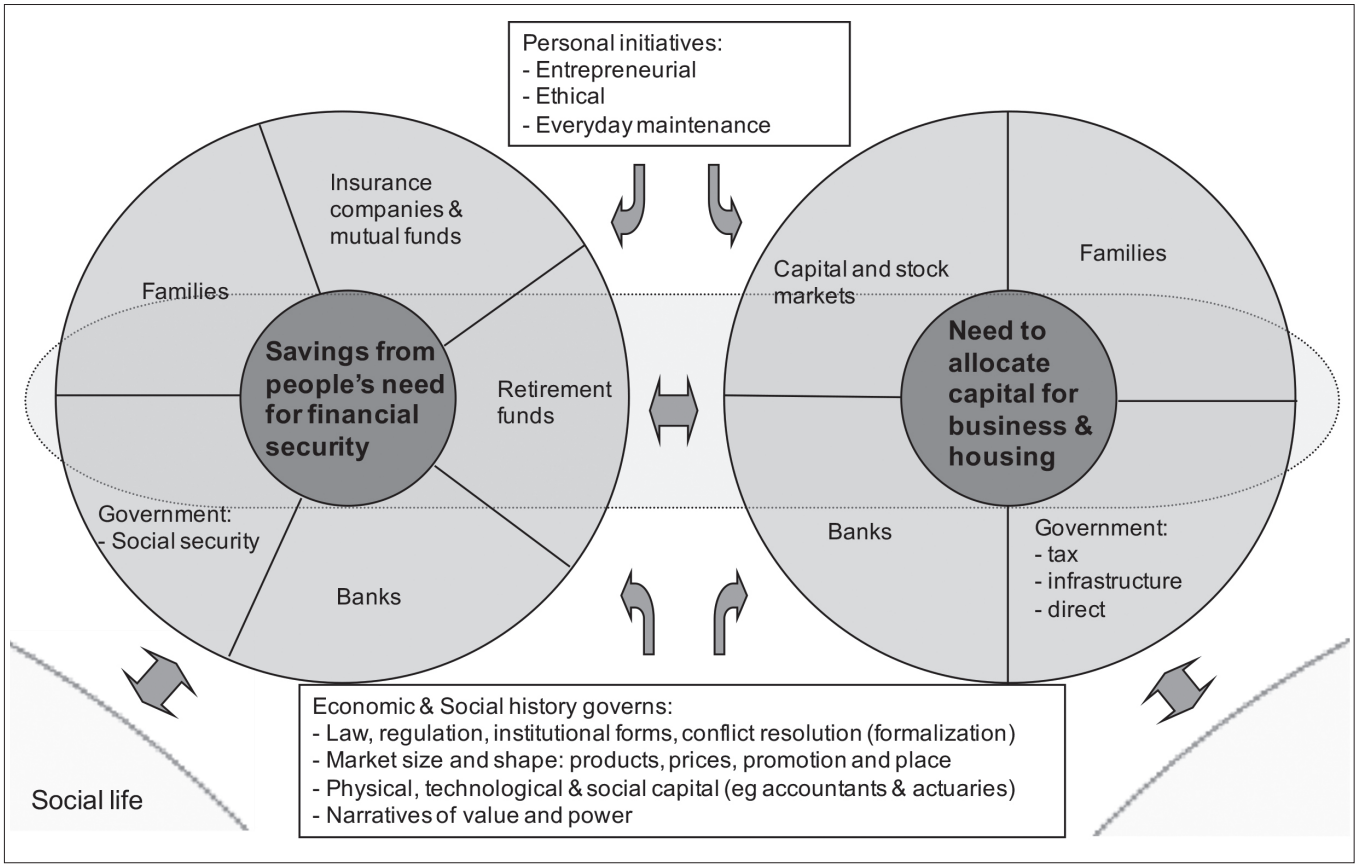
SOA currently describes actuaries as experts in "measuring and managing risk to improve financial outcomes." To that I would add a specific focus on the financial sector. This is where we work as actuaries, where we are recognized as experts and where there are evidently huge needs.[1]

Consider the size and scope of the sector, as illustrated in Figure 1. Taking the helicopter view, the two parts of the sector can be seen as two rotors. The first consists of the institutions and structures that raise money and create financial security. The other consists of the structures that invest the money. While actuaries mainly work on the first, the success and efficiency of the second is critical to the success of our work, and we cannot ignore it.

The boxes emphasize that the institutions (some of which are listed in the bottom box) do not spontaneously evolve. The influence of single individuals is obviously small, but we all have a role that can be enhanced when we act together. The theme of this article is that we make our social impact by building or modifying structures: in private, public and non-profit sectors.

We can remind ourselves that a flourishing financial sector offers significant benefits. I like to quote the biblical references "helping widows and orphans in their distress" (James 1:27) and "a widow should be enrolled if she is at least 60" (I

Figure 1.
The Structure of the Financial Sector



Source: Taken from Anthony Asher, *Working Ethically in Finance: Clarifying Our Vocation* (Business Expert Press, 2015).

Timothy 5:9). Helping the distressed is an ethical as well as a structural issue.

But the sector also contributes to a higher standard of living. This depends on productivity, which in turn requires specialization. A flourishing financial sector supports specialization by

- facilitating payments and providing short-term finance where necessary to allow people to trade;
- creating capital markets for large and long-term projects, diversifying risk; and
- protecting against risks by providing insurance.

Conversely, there is evidence[2] that a dysfunctional financial sector can impose considerable costs on society:

- If it overservices and overcharges its customers, it creates easy money for the unscrupulous. This diverts energy and resources from productive activity and concentrates wealth in the hands of an undeserving few, who become excessively influential.
- If it proliferates products that are unnecessarily complex, it can create financial uncertainty. Examples are unsustainable promises in some insurance and bank guarantees.
- If it fails to develop useful innovations and equitable structures, it increases financial insecurity and fails society.

We obviously have an ethical obligation to address dysfunctionality and injustice where we see it. This article, however, looks at some of the opportunities to develop new products and services that will enhance the private financial sector.

FINANCIAL SECURITY

For the left-hand rotor depicted in Figure 1, one can consider the following possibilities.

Enhancing Income Security

We can start with the traditional insurance needs for death and disability insurance. In a modern knowledge economy, there is less need for some products.

- Housework no longer has to be full time, and widows can find jobs relatively easily. There is, therefore, less need for life insurance.
- Physical impairments seldom prevent people from earning. Cover for physical injuries, particularly dismemberment cover, is archaic. Lump-sum disability contracts are perverse in that they disincentivize what should be the focus of claims management, which is rehabilitation.
- Accident covers should not be sold, as they mislead people into thinking that they are adequately covered.

There is a need for product redesign to provide the wherewithal for rehabilitation. Insurance coverage should as far as possible be MECE (cover all risks in a mutually exclusive and comprehensively exhaustive way; i.e., no gaps and overlaps). The innovative linking of premiums to healthy behavior is a spectacular way of adding new value.

Perhaps the main challenge is insurance against unemployment. To offer more cover, we need to increase our knowledge of labor market dynamics. The more we know, the more we can insure and the more advice we can give. I feel particularly for students who build up large debts with limited anecdotal information as to demand and supply about their future careers.

I also like the idea of developing income-contingent and human capital contracts that can hedge part of people's future income risks. Human capital contracts exchange a fixed proportion of future income for cash. They are available to a limited extent for tertiary education. I believe that they have potential for housing finance and would make great investments for pensioners.[3]

Funding Retirement

Retirement is another traditional actuarial field where we could be more active. For defined benefit funds, we need to press harder to ensure that they are sustainable and that cuts in benefits or increases in contributions are fairly distributed. For defined contribution funds and private saving, we need to find ways of providing better advice that helps people to spread income over their lifetimes and respond appropriately to investment market volatility. Here it is important to acknowledge liquidity constraints in earlier years. I welcome comments on our attempts to do so at *www.draftfinplancalc.com*.

I also believe that there is merit in encouraging annuitization for many people:

- It provides longevity insurance not only for retirees but also for the family fortunes, which are depleted if the grandparents live longer than expected. The bequest motive is normally illogical; I suspect it is normally a rationalization for precautionary savings.
- Annuities protect against fraud and spending errors, which are increased by risks of dementia—one study indicates that more than 40 percent of us are likely to die with dementia.[4]

The benefits of annuitization increase with reducing life expectancy, so they would be more valuable to those with some disability—if we offered enhanced rates for impaired lives.

There are also opportunities in the design and sale of reverse mortgages to access housing wealth, particularly if they can include some equity participation to reduce risks.

Idiosyncratic Costs

Property, casualty and health insurance also need to be MECE, with deductibles that increase as people accumulate assets. There are also challenges here to increase coverage for such events as flood and termite damage in domestic insurance.

The financial and health sectors intersect, and there are obvious challenges not just to increase coverage but also to enhance effectiveness and reduce costs. There is apparently much to do to build systems, and enhance culture, in order to identify the best procedures and learn from errors, thereby reducing tort claims.

Those planning for old age need more information about, and probably better ways of, managing health and long-term care costs.

Dividing the Pie

The financial sector not only takes a large share of the national income; it also plays a significant role in allocating profits. Rewards do not necessarily go to the deserving. People can be lucky if there is significant demand for their particular skills, or get wealthy by extracting rents by lobbying, conspiracy or exploiting the ignorant. To the extent that we are involved in pricing decisions, actuaries have power to recommend fairer prices. We can also provide the more difficult analyses to show overservicing.

FINANCIAL MARKETS

Actuaries could play a greater role in investment markets, as servants of institutional investors.

More Appropriate Investments

One area is the design of investments more appropriate for retirement funding, of which the human capital instruments, mentioned above, could prove a template. Long-term investors do not want interest rate risks but do want low-risk inflation hedges.

Long-term investors also have minimal liquidity needs, which should provide opportunity for investments that capture the liquidity premium.

A pressing current problem is the need to ensure that companies use realistic discount rates to evaluate long-term projects. Evidence shows that organizations are focusing increasingly on the short-term metrics, and have not yet adapted to the low interest rates now prevailing.[5]

Better Monitoring

Institutional investors often get a poor deal from investment managers, but that could be improved with better reporting and actuarial analyses.

- The costs of investment include stock brokerage, margins on cash deposits, and foreign exchange dealing that are often not reported. Insufficient consideration is given to the costs of raising capital, which also reduce investment returns.
- The extent of high-frequency trading suggests that it is exploiting predictable dealing by major market players. The market impact of trading, and comparisons of achieved process with daily volume weighted average price should also be monitored.

Creating Stability

Long-term investors face less pressure to panic in investment bubbles and crashes. They should avoid creating situations in which they are forced sellers, which is often inherent in dynamic hedging. They can also create internal algorithms that allow for smoothing—although we need to ensure that contracts are fair to all parties.

Actuaries may have other ways to contribute to a greater understanding of the randomness of investment markets and create a better match between assets and liabilities.

Capital Governance

As major shareholders, institutional investors play a major, if often reluctant, role in corporate governance.

One can envisage institutions that create a virtuous circle of accountability: members elect trustees, who vote for directors, who appoint staff, who become members. On its own, this would not be adequate to address agency risks, but it could provide a better environment, where energetic and courageous individuals ensured that companies were managed for the benefit of all stakeholders.

On another front, there is no need to gear companies highly where both debt and equity come from the same source. Australia's dividend imputation system is worth emulating in this respect, as it removes the tax advantages.

MAKING AN IMPACT

Professional Preparation

We are fortunate as actuaries to be part of a profession that has high technical standards and inducts us into a community with strong ethical values. Of the four cardinal virtues, we can agree that our professional development is strong in self-control and wisdom.

Making an impact requires more. It requires a passion to right a particular wrong or create a particular value. It also requires the other cardinal virtues of courage to overcome setbacks and justice to ensure we do not harm others in the process. I think most actuaries do aspire to these; it would be good if we could share more about them.

Table 1.
Insights from Actuaries with Social Impact

Questions	Adrian Gore, Founder, Discovery Group	Hugh Miller, Taylor Fry Government Analytics
Was the social impact of your work a prominent reason, or was it rather all part and parcel of a broader objective?	Discovery's Core Purpose is to "make people healthier and enhance and protect their lives" and is the foundation of the Vitality Shared-Value Insurance model, the mechanism through which we incentivize healthier behavior funded through the actuarial surplus created by it.	The rationale is two-pronged. The fiscal conservatives see the approach as a way of managing down long-term costs by early intervention. Others see it as a genuine way of improving the lives of needy, with a side benefit of being able to justify it economically.
Were there particular skills or approaches that you had as an actuary that you think were particularly valuable in making a social impact?	In 1994, the health insurance landscape was inefficient, unsustainable and on track to becoming unaffordable—and an actuarial foundation, and a nontraditional approach focusing on wellness and prevention, was crucial to finding an alternative.	Our models tend to be more individual and event focused. We first model how a person transitions in and out of welfare, and then add the cost. This is a bit different from some aggregate approaches that gloss over the underlying events.
Is there anything you would say to a group of actuaries considering how to increase their social impact?	I am a strong advocate of shared value, where the business model and social need are integrated and aligned; what is good for the business is good for society and the benefit is shared between all stakeholders.	There seems to be genuinely high interest in measuring the effect of social programs and ensuring practices are evidence-based. Actuaries are well placed to help.

As a contribution to this sharing, Table 1 gives the views of two actuaries who have made a significant social impact.

THE ULTIMATE PERSONAL CHALLENGE

Finally, what do you want to be remembered for? Peter Drucker quotes St. Augustine as saying that asking this question is the beginning of adulthood. Drucker goes on to say that you have not understood the question if you have an answer before age 25. On the other hand, if you cannot answer it by the time you are 50, you have wasted your life!

One answer to this question can be found by applying our strengths and passions to real needs in society. It is a privilege to be a member of a profession where many others are setting such great examples. Let us continue to encourage each other to do so. ■

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ENDNOTES

1 This article is based on a presentation given to the Caribbean Actuarial Association in December 2016. An expansion of some of the ideas can be found in Anthony Asher, Working Ethically in Finance: Clarifying Our Vocation.

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Framework Construct for a Basic Reinsurance Optimization Model

By Syed Danish Ali

The basic purpose of modeling should be to help develop an appropriate cession strategy that will maximize achievement of the reinsurance goals. This involves modeling a variety of mixes of reinsurance coverage at various limits and retentions and with various loss-sensitive features in order to achieve an optimal program.

The model can be developed to use the loss data to evaluate recoveries by mapping treaty/facultative cession arrangements on the claim distribution data. The model has to take into account the various layers of reinsurance cover as well as the premium paid for each layer.

The "what if" reinsurance arrangements modeled include quota share, surplus and excess of loss. For each alternative arrangement, the results of the model can be produced in terms of underwriting profit and loss gross and net of reinsurance with appropriate ratios.

For each class of business, the approach should be to analyze complete five years' data, in order to achieve the following:

- Develop an understanding of the pattern of risks underwritten in terms of a distribution of the claims and insured values (for those policies on which there had been a claim along with the associate premium).
- Develop an understanding of the pattern of losses in terms of a distribution of claims by size of individual loss.

Based on the above analysis, we sought to develop an appropriate cession strategy that will maximize the changes of achievement of reinsurance goals.

The key steps for the basic optimization of reinsurance arrangement is as follows:

- Selecting appropriate retention levels and validating the current retention
- Adjusting the existing layers and limits
- Estimating the net claim cost in each layer
- Testing the underwriting results with a coparticipation feature and an aggregate layering arrangement

In the case of catastrophe excess of loss programs, these should be analyzed at a minimum by developing loss scenarios based

Figure 1.
Parameters and Characteristics to Consider When Optimizing Reinsurance

on historical loss simulations. This is intended to give a baseline for developing possible future occurrences and should elaborate on the details of frequency and severity characteristics of subjects insured, as it requires detailed understanding of the underlying risk attached to the subject insured.

Figure 1 depicts the parameters and characteristics that should be analyzed and modeled for the purpose of reinsurance optimization.

The simulation exercise for an insurance company can be thought of as a pure loss simulation or a simulation for mapping reinsurance arrangement.

PURE LOSS SIMULATION: MAJOR SIMULATION APPROACHES

The pure loss simulation can be divided into two categories:

- Historical simulation, which involves random projection of historical losses
- Monte Carlo (based on assumed loss distribution) simulation, which involves random projection of historical losses based on assumed patterns of loss. Assumptions could be based on loss ratio, certain pattern and statistically known distributions.

Simulation for mapping reinsurance arrangement: Based on projected loss (either on historical or Monte Carlo), reinsurance arrangements are mapped to test the underwriting results. The simulation also involves the projection of volumes.

As a practical matter, having a very slow development pattern (long tailed) will often produce results showing either zero or very high projected ultimate layer losses by year. The actuary will often need to use smoothing techniques, such as the Bornhuetter-Ferguson approach or the Cape Cod (aka Stanard-Buhlmann) method, to produce a final experience rate.[1]

A very useful methodology for reinsurance optimization is described as follows:[2]

Phase 1 Set goals and constraints of the optimization.
Phase 2 Create gross of reinsurance model and validate results.
Phase 3 Create net of reinsurance model, validate results and verify limit and retentions are adequate.
Phase 4 Evaluate current contracts.
Phase 5 Set initial analysis as current structure and determine capital savings.
Phase 6 Determine efficacy of each contract and adjust as needed.
Phase 7 Determine efficacy of the revised structure and adjust as needed.

In phase 1, the goals and constraints of the optimization will be based around the risk appetite, or the risk that the company has the capacity to undertake. This can be, for instance, value at risk of no more than 20 percent capital erosion in one year; value at risk of surplus over regulatory capital must be maintained at 2.5 times at all times; maximize return on revenue and capital; minimize the required capital and so on. As multiple goals frequently will be used, a weighted ranking of these goals will have to be made.

Once phases 2, 3 and 4 have been completed, phases 5 and 6 require evaluating the net capital savings due to reinsurance. This can be done through simple equations like the following:

Net return = net underwriting profit – expected return on capital (%) * risk-adjusted capital on net basis

Expected return on capital is the return that shareholders in insurance and reinsurance companies expect. The risk-adjusted capital is usually derived from capital models like UAE's Insurance Authority's Eforms or A.M Best's BCAR model. If the net return is positive, then it means reinsurance is beneficial and is acting as a capital relief. Another way to evaluate reinsurance is to see that costs of reinsurance should be lower than costs of capital saved with reinsurance.

Effectiveness of each contract is measured by looking at cost of capital for that contract. Cost is the difference in the mean underwriting profit with and without the contract. Capital savings can also be seen as the difference in net required capital with and without the reinsurance contract.

Gross loss ratios should also be compared to net loss ratios by lines of business. This will usually present a trade-off to the insurance company, as when loss ratios are reasonable, net

loss ratios will tend to be higher than gross loss ratios. This is because most of the proportion of profitable business will be shifted to reinsurers. But when loss ratios are very high, net loss ratios will be lower than gross loss ratios, as reinsurers will bear a significant portion of those losses.

To elaborate on the impact of reinsurance treaties, particularly nonproportional arrangements, see the proportion of claims greater than some reasonably large claim amount like AED 1 million as proportion of total gross and net claims paid. The proportion of claims greater than AED 1 million on net claims should be far lower than that of gross claims in order to show that the insurance company is significantly protected from large losses by nonproportional reinsurance arrangements.

Another way to see the impact of reinsurance arrangements is to compare (a) expense ratio as proportion of gross premium for the line of business to (b) its reinsurance commission received as a proportion of gross premium. If (a) is greater than (b), it usually indicates suboptimal reinsurance. However, this consideration should be seen holistically with other metrics before arriving at any decision.

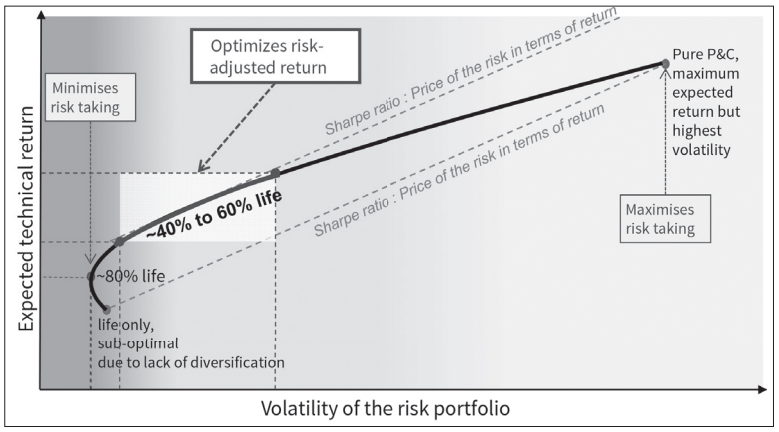
Phase 7 is then to compare the benefit of the new structure to the current structure based on cost and capital savings. If the new structure has lower costs and more capital relief than the current one, then the current structure should be replaced. If not, changes must be made to the new structure until reinsurance optimization has been achieved.

It is also vital to test a number of structural changes for the new structure, not just a few. For instance, different proportions for quota limits should be tested. Is the claim basis in the reinsurance arrangements based on loss occurring or claims made or risk attaching basis? Further, different attachment points should be evaluated for excess of loss. Top and drop, number and size of reinstatements, terms, benefits and conditions of the reinsurance contracts can be expanded or contracted to see their impact. Insurance issues around counterparties and other reinsurers should be assessed as well.

The advantage of this methodology is that it is broken down into many steps and hence is transparent for management to evaluate. It also allows us to see the effects from multiple angles and goals simultaneously. It is basic enough to be widely understood and be computable and is not complex enough to require too many sophisticated tools and models that bypass the capacity of management in emerging markets completely.[3] It is, however, time-consuming, and the number of different structures and variations chosen still require deep understanding of constraints, risk appetite and market pricing of treaty terms and conditions.

SCOR Re shows how it balances and optimizes diversification and expected returns with volatility when focusing on the portfolio composition between life and general/property and casualty (P&C) insurance.[4]

Figure 2.



Source: Denis Kessler, The Reinsurance Industry in 2020, SCOR Re, *https://www.scor.com/images/stories/pdf/Inverstors/financial-reporting/presentation/scor_thereinsuranceindustryin2020_v2.pdf.*

SCOR optimizes returns in the 40–60 percent range between P&C and life. This makes sense, as having only life means lack of diversification and lower expected return but lower volatility as well. P&C reinsurance is far more volatile, erratic and heterogeneous than life and has higher returns.

The balanced composition ensures good returns and controllable volatility.[5]

For reinsurance pricing, we believe that Patrik's 13-point program is comprehensive but not so complicated that reinsurers in emerging markets would decide not to use it.[6] Briefly, these 13 points are:

1. Gather and reconcile primary exposure, expense and rate information segregated by major rating class groups.
2. Calculate an exposure expected loss cost and, if desirable, a loss cost rate.
3. Gather and reconcile primary claims data segregated by major rating class groups.
4. Filter the major catastrophe claims out of the claims data.
5. Trend the claims data to the rating period.
6. Develop the claims data to settlement values.
7. Estimate the catastrophe loss potential.
8. Adjust the historical exposures to the rating period.

9. Estimate an experience expected loss cost and, if desirable, a loss cost rate.

10. Estimate a "credibility" loss cost or loss cost rate from the exposure and experience loss costs or loss cost rates.

11. Estimate the probability distribution of the aggregate reinsurance loss, if desirable, and perhaps other distributions, such as for claims payment timing.

12. Specify commission, internal expense and profit loads.

13. Negotiate, reconcile opinions and estimates, alter terms and conditions.

Data interpretation is crucial when making a basic reinsurance optimization model. Are we using the right time period for our analysis? For long-tail casualty lines, it is important to observe and measure trends over short as well as a longer period of time. Short-term measurements could be "noise" and long-term measurements could be "signal." Also, do we fully understand actual reported activity? Is the actual reported activity overly influenced by large loss activity? Conversely, has there been a slowdown in claims reporting?[7]

Moreover, is there a systematic and observable trend over a period of accident years? This is a strong signal of changes in the market dynamics. Is the observed trend consistent over a period of time? If it is consistent it might mean that change in the reinsurance cycle is about to happen.[8]

A range of outputs should be produced to communicate the results of the reinsurance optimization model to the business. These include:[9]

- Trade-off between risk and return of various reinsurance options
- Break-even return periods between reinsurance premium and reinsurance recoveries
- Breakdown of claims and recoveries by return period and claim type
- Penetration by claims layer and by number of reinstatements
- Impact on company's risk appetite/risk profile
- Impact on economic profit/risk-adjusted profit
- Key performance indicators like retention ratios, loss ratios .125

Ceded reinsurance leverage is defined as "the ratio of ceded insurance balances to policyholders' surplus. Ceded reinsurance leverage represents the extent to which an insurance company relies on ceding risk to reinsurers. Ceded insurance balances include ceded premiums, net balances for unpaid losses and unearned premiums."[10]

Ceded reinsurance leverage is used as a barometer for how much an insurance relies on shifting policy risks to others. A high ratio indicates that the company relies heavily on others to help defray risk, a situation that carries with it its own risks. If reinsurance companies demand more money for assuming risks, the insurance company may find itself exposed to a larger risk than usual.

Another threat to the future health of an insurance company relates to how many reinsurers a company uses when transferring risk. A heavy concentration of ceded insurance in a small group of insurers can lead to a situation in which companies may be unable to collect from reinsurance companies, either because those companies are unwilling to fulfill their obligations or because they are unable to. If the insurance company only offers policies in a single state and in a single line, it could face serious risks.

Having a high ceded reinsurance leverage does not mean that an insurance company is headed to impairment. While there is a risk that the reinsurance companies used could find themselves unable to fulfill their obligations, using reinsurance companies that either have good credit ratings or can provide letters of credit may keep underwriting risks low. ■

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ENDNOTES

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