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The Art & Science of Risk Understanding Risk's Holistic Nature

Last year SCOR introduced its branding campaign "The Art & Science of Risk." The phrase underlies the nature of our business: managing risk through proven mathematical methodologies while recognizing the role of experience and judgment in assessing risk.

In our industry the "science" of risk is front and center: our actuaries, statisticians and medical directors help us quantify the nature of mortality, longevity and morbidity risk in terms of probability and severity, confidence intervals and credibility. In this issue of SCORviews, Mark Swanson examines mortality improvement in the US, compares it with improvement rates in other parts of the world and explains the implications. Beaman Senecal examines the effects that conversion provisions can have on term life terminations and asks whether carriers are factoring these effects into their pricing effectively as they consider the lapse effect of post-level term rate jumps.

As the insurance industry becomes more electronically and data driven, companies are exposed to more operational risk. Clarke Rodgers discusses cybersecurity, what carriers can do to manage data risk, and specifically what we have done to provide SCOR Velogica® clients a state-of-the-art data security environment. We are particularly pleased that Velogica has received its SOC2 report for data security controls.

We have a number of initiatives underway at SCOR to capitalize on the art and science of risk. Last year we welcomed Mary Bahna-Nolan to head SCOR's global Mortality R&D center. Mary's unit is made up of actuarial and underwriting researchers who produce experience studies that support clients' understanding of their risks and ultimately support their business performance. Our R&D unit currently is working with clients on projects including mortality improvement forecasting as it pertains to mortality and longevity risk; older-age mortality and implications for mortality, longevity and long-term care risk; and policyholder behavior at the post-level term. Mary and her team are visiting clients to share our observations about emerging mortality, underwriting and other business trends.

As a thought leader in the life insurance business, we are committed to sharing our knowledge through regular client visits and active involvement with industry associations. This Spring our experts will present at a variety of major industry meetings. For example, Paolo De Martin, who heads SCOR's global life operations, will join a panel of life reinsurer CEOs at the Canadian Reinsurance Conference. At AHOU's Annual Meeting Roger Tafoya will discuss our experiences in automated underwriting, a hot topic among our clients. Matt Daitch will share our expertise in longevity risk management at the Life Insurance Conference. Through these and other opportunities, we look forward to working with you in tailoring solutions to enhance your company's depth in The Art & Science of Risk. ∞

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When the Level Term Ends

Terminations and Conversions Post-Level Term

Executive Summary

Increasing post-level term (PLT) persistency has been a hot topic in the industry. Most discussion has centered on strategies to retain more policyowners in the PLT. The effect of conversions, however, is a fairly new area of examination. Beaman uses SCOR's proprietary experience database to provide us an early look at what has happened with term policies that offer a conversion provision, and the pricing implications for both the term and converted perm policies.



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Since the first group of 10-year level-premium term policies (LT-10) began to enter the post-level term (PLT) period, many articles and presentations have suggested how carriers may optimize PLT performance. Typically these discussions focus on PLT persistency. Only relatively recently has the industry addressed conversions.

The Society of Actuaries has published Phase 1 of a study on term conversions. Phase 2, which examines emerging mortality experience, is more challenging. Preliminary findings were shared at last year's Annual Meeting.

In this article I examine SCOR's experience with term conversions, with a strong caveat that mortality and lapse experience continues to emerge. Thus, as with the SOA report, the findings I share in this article are preliminary but may help uncover trends.

The Nature of PLT Rates

Level premium term life insurance issued 2000 and later fall under Regulation XXX and incorporate premium rates that increase sharply after the level premium period. In many of these policies the rate jump had a guaranteed maximum, though the company could use a lower increase. The typical increased premium is about 200%-300% of the Ultimate 2001 CSO. The average premium is about eight times higher than the level rate. Some policies allow jumps that can be 30 times or higher.

Lapse rates near the PLT for these policies were expected to be much higher than lapse rates of older products that had lower premium jumps. LT-10

products with a high duration-11 rate increase have experienced lapse rates averaging 90% or higher near the PLT. Lapse rates seem to correlate positively with both the size of the rate increase and with the insured's attained age (Figure 1).

Figure 1 – Lapse Rates by Issue Age

Age	Dur. 10 All Months	Dur. 11 1-3 Months	Total
0-39	79%	6%	85%
40-49	92%	2%	94%
50+	96%	3%	99%
Total	88%	4%	92%

Early experience on a group of LT-10 policies that persist beyond the level-premium term illustrate how quickly the lapse effect can be felt.

This association with attained age may have serious implications for premium income. Total PLT premiums are much lower than the estimate from a simple 88% lapse rate projection across all issue ages: Issue age 35 persists but has 75% lower premium rates than those for issue age 50.

Emerging PLT Strategies

To increase persistency, many insurers set new premium rates for durations 11+ on LT-10. Some companies linearly graded rates for 5-7 years, eventually converging with the guaranteed rate. While lower than the original jump, the increases are still substantial, with the duration-11 rate commonly jumping 2-4 times the level premium. Moreover, these premium jumps continue into durations 12 and 13 (e.g., duration 12 rate 6-10 times that of duration 10).

Persistency under this approach is high enough to provide significant premium revenue in durations 11-12 (Figure 2). However, a much smaller group

Figure 2 – Cumulative Lapses, Graded

Age	Duration 10	Duration 11	Duration 12
0-39	48%	62%	84%
40-49	57%	74%	91%
50-59	68%	82%	94%
Total	54%	69%	87%

Even with a more moderate rate jump structure, cumulative lapse rates have a major effect on the product portfolio by duration 13. By that time, only 6% of policyowners in their 50s persist.

persists into duration 13 as rates continue to climb. Selective lapses occur because, in most cases, renewal premiums exceed premiums for a newly underwritten LT-10 policy.

Conversion Rates

Conversion rates to permanent products historically have been less than ½ of 1% per year, and this rate remains common today through duration 8. Conversion options vary by company: some carriers do not allow conversion within 5 years of the PLT; others may permit conversions until the PLT; a few allow conversions after the level term.

Insurers offering conversion up to the PLT may experience much higher conversion rates in later durations (e.g., 9-10): 11%-15% or more of LT-10 policies inforce after 9 years may convert as the PLT jump approaches. For term products with a graded rate, experience so far indicates a moderately lower conversion rate of 8%-10%.

Converted policy persistency remains quite high, commonly with 85%-90% inforce 13 years or more after issue of the original LT-10 policy. Many examples reviewed for this article had duration 12+ lapse rates of less than 4%, similar to or lower than rates from UL policies in these durations. This appears to be consistent across all issue ages.

Premiums may be a key driver for converted policy persistency. Figure 3 assumes a jump and 7-year grading to 200% of the 2001 CSO as the guaranteed mortality rates. Illustrated conversion premiums are 90% and 120% of 2008 VBT.

Conversion premiums are noticeably less than for PLT rates, even when applying a graded pricing structure: the 90% VBT has a lower premium in duration 14

than the graded premium for duration 11. In fact, the 90% VBT duration 11 conversion premium is close to \$1050 for a LT-10 policy. (Figure 3's 45 y/o Preferred Male is now 55.) The 120% VBT rate represents the pricing similar to conversion-specific UL.

Conversion rates of 8%-15% near duration 10 of LT-10 are significant and the premium required is relatively attractive to the policyholder. Assuming that some adverse selection influences conversion, it is possible that the premiums illustrated in the figure for converted policies may not cover associated mortality and other costs. In such a circumstance the extra cost should be factored in pricing LT-10, the conversion option and in financial projections.

Figure 3 – Comparison of PLT, Conversion Rates

Duration	Term Jump	Term 7-yr Grade	Conv. (90% 08 VBT)	Conv. (120% 08 VBT)
1-10	500	500	500	500
11	5,820	2,117	1,139	1,518
12	6,480	3,734	1,305	1,740
13	7,120	5,351	1,485	1,980
14	7,760	6,969	1,674	2,232

For 45 y/o Male, Pref NT., \$500,000 face Premiums for the conversion option are noticeably less than for PLT, even when applying a graded PLT pricing structure.

Conclusion

PLT pricing can affect term life persistency. The combined effect of all terminations, including lapse rates and conversion rates, should be incorporated into projection models. If conversions are ignored, modeled PLT persistency and premium cash flows may be too optimistic.

The industry has only a few years of XXX-related PLT experience to analyze, and only with LT-10 products. SCOR's Mortality R&D staff will continue to monitor business that transitions out of the level period and share our findings with clients. ∞

Observations on Mortality Improvement

A Comparison of Nations

Executive Summary

Over the last half of the 20th Century, populations – both general and insured – experienced significant improvement in mortality rates. As we entered the 2000's, improvement rates began to taper off in some major economies. In this article, Mark Swanson takes a look at mortality improvement rates for the US, compares them to similar data from four European markets, and concludes that 2011 may have marked a slow-down in annualized mortality improvement.



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Mortality improvement is a topic of interest to many in the life insurance industry, and it will surprise none of our readers that we at SCOR are no exception! Assumptions for future mortality improvement can be derived in many different ways but one thing all methods have in common is that they rely to some extent on *historical* mortality improvement rates – the actual, measurable mortality improvement rates in past periods. (For more information, see “US Mortality Improvement Analysis Methodology” in the December 2015 issue of *SCORviews*.)

At SCOR we recently compared historical mortality improvement rates among several different countries, including the US. Before discussing these comparisons, let us state some definitions.

Definition of annual mortality improvement:

$$1 - \frac{\text{Mortality rate year } X}{\text{Mortality rate year } X-1}$$

So if the mortality rate does not change, annual mortality improvement is zero. If the mortality rate changes, for example, from 10 per 1000 to 9.9 per 1000, the annual mortality improvement rate is a positive number, 1.0%. Likewise, if the mortality rate increases year over year then the annual mortality improvement rate is a negative number.

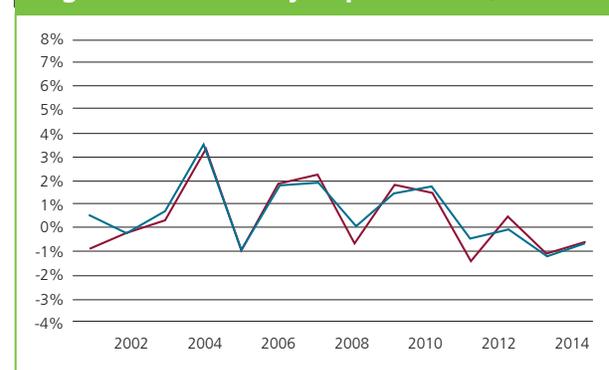
For purposes of this article, we begin with sex and attained age specific mortality rates by calendar year. We consider males and females separately but instead of considering individual attained ages we look at a weighted average mortality rate across the

population. For this purpose we used a set of weights more representative of the insured population than of the general population. We also used the same set of weights regardless of country, removing the weight vector as a possible source of variation.

Finally, our source data come from the Human Mortality Database (HMD) as of January 2016. We used the CDC multiple causes of death file to compute the mortality rates in the population for 2014 – one year beyond the current range of the HMD. This method has been back-tested and closely approximates the HMD data for years where they overlap.

With these preliminaries out of the way, let's look at some results.

Figure 1 – Mortality Improvement, USA



Annual mortality improvement rates for males (blue) and females (red) are closely correlated in the US. The graph stands out. One is the close correlation of the female and male results. Another is the negative auto-correlation with frequent up and down movements. But the most overriding feature is the trendline which is apparent: each succeeding 'good' year is less good and the last few years have had small improvement rates, or even negative ones (females 2011 and males 2013). Improvement seems to have slowed, perhaps even to have reversed.

Although our research was driven originally by interest in US mortality improvement trends, we decided to

broaden our research to compare trends in the US with those in other developed economies. For comparative purposes we limited our review to markets with sufficient population and up-to-date HMD records. All figures are reported using the same scale (-4%+8%) and the same time frame where possible (2001-2014).

UK data illustrate a significant slow-down in mortality improvement after 2011. Annualized improvement from 2000-2011 was about 2.0%, but fell to 0.5% over 2011-2013. Males exhibited a similar drop in annual improvement. The Continuous Mortality Investigation (CMI) released a report in October 2015 indicating that this trend continued in 2014 and 2015.

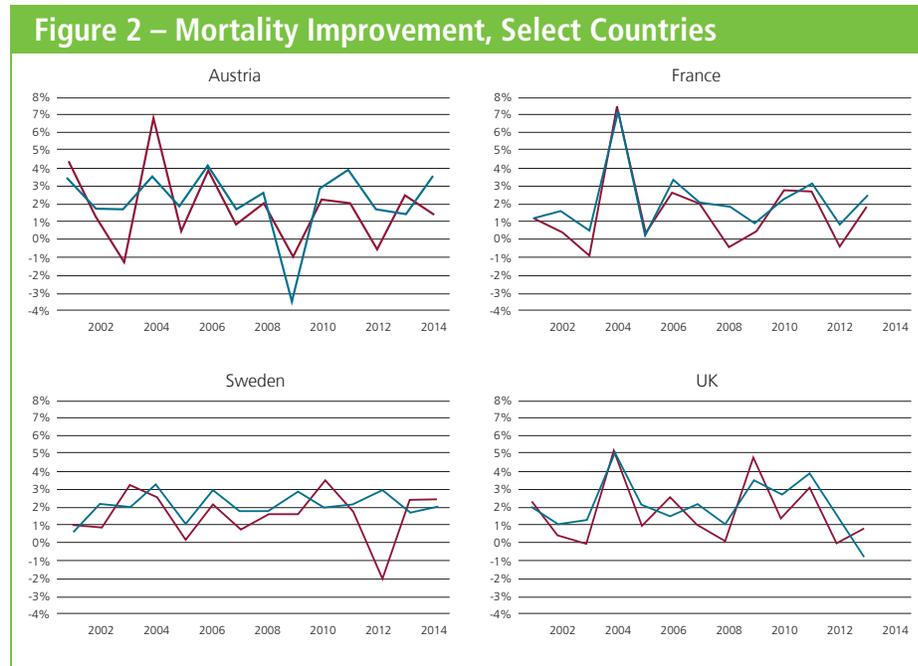
Austria

Mortality improvement for females in Austria slowed down following 2011. The relative mortality improvement from year to year appears to be the most

Conclusion

Of the five nations we observed during this study, females in each country experienced a slowdown in mortality improvement following 2011 when compared to the decade before. Males in three of the countries exhibited similar trends.

Changes in annual mortality improvement can have many different causes and interactions. Examining the causes of these changes was beyond the scope of the original study. However, given the nature of the findings, more research may be warranted for specific countries and/or periods of time.



volatile of this sample. We believe that this volatility is partly attributable to the small population: it is the smallest nation among our five nations studied.

To the extent that historical mortality improvement rates are used to project future mortality improvement rates, it will be interesting to see if post-2011 trends persist as the “new normal.” ∞

France

Results for France show slowdowns for both males and females after 2011. This decline is more pronounced among females.

Sweden

Similar to the data from Austria, mortality improvement for females in Sweden was consistent over the observed period with the exception of 2012. Male mortality improvement similarly was fairly stable over the period, and in fact increased slightly after 2011.

United Kingdom

Data Protection and the Cloud

Meeting Growing Security Needs

Executive Summary

The risk of data breaches, either accidental or through malicious hacking, is an unfortunate consequence of electronic commerce. To ensure the highest standard of data protection, SCOR Velogica has invested in a state-of-the-art data security environment.

Clarke Rodgers discusses SCOR's decision to move Velogica® to the cloud, and explains how SCOR, and other insurers, can take advantage of the expertise that cloud vendors provide while ensuring that cybersecurity remains paramount – allowing each partner to focus on their core strengths.



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At SCOR Velogica, we are constantly pushing the boundaries of innovation in automated underwriting – working with data providers, fine tuning our algorithm and developing insights to ensure that our platform remains at the forefront of the industry.

Investments in technology, processes and people help us deliver a best-of-breed offering to our clients. However, in today's hyper-connected world, none of this matters if we can't deliver security that meets (and exceeds) our client's data protection requirements. We handle some of the most sensitive data available on our clients' insureds – and we treat and protect it as if we collected it ourselves.

Protecting Sensitive Data

Implementing a strict data protection protocol while allowing business users to do their jobs is an expensive endeavor with many moving parts and detailed technical configurations. Any misstep in this multilayered approach to security could potentially expose sensitive data to malicious actors. Finding and hiring skilled security analysts, purchasing expensive hardware/software solutions and implementing strict security policies make information protection a complex part of doing business.

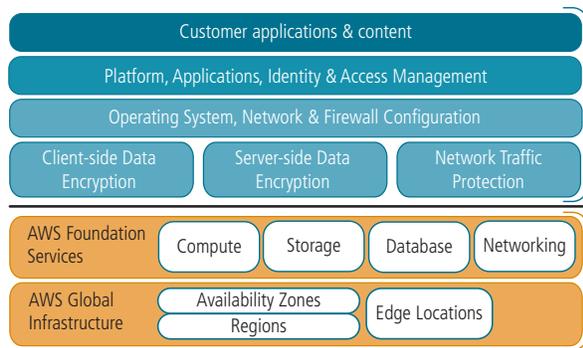
While the above outlines what most organizations *should* be doing to protect sensitive data, it is not what all organizations *are* doing, primarily because of the complexity and maintenance of required configurations. In the "on premise" world of a

company's own data center, staffing is charged with not only protecting assets from compromise, but also matters such as ensuring the data center has enough capacity, redundant power feeds, appropriate cooling, etc. None of these efforts are core to a company's business; instead, they add overhead that prevents 100% focus on the delivery of business solutions – like automated underwriting.

Sharing Responsibility

To achieve gold standard data protection while keeping resources and energy focused on automated underwriting, SCOR moved Velogica to the cloud in 2015, and we have not looked back. In addition to high availability and operational agility, we have significantly increased our security posture while reducing operational overhead. How is this possible? Cloud benefits from its sheer scale, propensity towards automation, explicit logging and commitment to security. The major cloud vendors know that if there is ever a data breach on their platforms (where they are at fault, not due to a customer misconfiguration), there will be a significant impact to their business. They invest heavily in security, the auditability of their platforms and compliance offerings – more so than most organizations can afford to do.

The customer-cloud relationship is one of shared responsibility for security. As one moves up the cloud stack, the responsibility for security transitions from 100% provider to 100% customer, which allows organizations to focus on protecting what they know very well (e.g., the Velogica offering and underlying data) and allows the cloud provider to do what they do best: protecting the underlying infrastructure and providing tools and services for the customer to use (if they choose) to further protect their data.



Security/Compliance *IN* the Cloud

The insurer knows the required security/compliance needs, the cloud provider does not. The carrier can leverage tools from the cloud provider, purchase/bring its own third-party tools or create its own to achieve specific security & compliance needs.

Security/Compliance *OF* the Cloud

Unless the insurer has expertise in datacenter management, it can leave this to experts who are not concerned with running an insurance business. The company can leverage their third-party assurance reports to address any risks and require regular audits and reviews.

We found the following tools/services especially valuable features of the cloud that others in the insurance industry could find helpful:

Ubiquitous Encryption. Data is fully encrypted over the network, at the disk level and within the database, and the cloud customer controls the encryption keys. While encryption can be done in an on-premises environment, it often takes a team to maintain and tune the hardware and software required (PKI isn't easy) to do this. In the cloud, it is all handled via a single console or API call.

Logging & Auditing. All calls related to infrastructure (e.g., create a server, add a user, grant/deny permissions, add storage, start a database) and applications (file transfers, services starting/stopping) are logged. While this in itself is nothing special, the cloud platform allows analysis and alerting of these activities in real time, with the ability to set thresholds and alert mechanisms not only to monitor infrastructure performance, but also to add visibility to the age old question of "Who did what, when?"

Segregation/Localization of Data. To be compliant with data protection laws, it is important to know where regulated data resides, and ensure that it does not move unless the transfer is initiated by the

authorized entity. Cloud providers are very sensitive to data localization issues and put controls in place so that data stays in the local region (with no automated transfers to other regions) until purposefully moved.

Authentication and Authorization. Defining who has access to what resources, as with other aspects of cloud administration, is a matter of clicks and/or API calls. Choosing to enforce multifactor authentication, ssh key-based logins and getting detailed, real-time access reports typically do not cost anything more than the per-use charges.

Moving to the cloud is not an easy endeavor. However, when planned correctly and using trusted partners, validated migration techniques and best-of-breed architectures, most organizations should find that they can be more secure in the cloud than in their own data centers. The business, information technology and security benefits are clear to support such a move, freeing company resources to concentrate on improving the core competencies of the carrier's business initiatives.

If you would like more information on Velogica and its data protection environment, please contact either Dave Dorans (ddorans@scor.com) or myself. ∞

Velogica® Achieves SOC2 – Recognizes Security, Confidentiality, Availability

Earlier this year, SCOR announced the receipt of its SOC2 Type 1 report regarding the effectiveness of its controls over the Velogica life underwriting system. The report, based on the AICPA's Trust Services Principles and Criteria for Security, Confidentiality and Availability, is an independent third-party examination that demonstrates how SCOR achieves key compliance controls and objectives as they relate to the Velogica system.

"We have increased our focus on our security and compliance protocols over the past few years," said Dave Dorans, Senior Vice President of SCOR Velogica. "This report gives confidence to current and prospective Velogica clients that the Velogica platform incorporates stringent security, confidentiality and availability practices to protect client data from compromise."

Velogica has processed nearly 2.5 million life insurance applications and continues to build on 10-plus years of experience. "We have been at the forefront of innovation in automated life underwriting for more than a decade," said J.C. Brueckner, CEO of SCOR Global Life in the Americas. "SOC2 demonstrates that we are equally committed to being at the forefront of security and confidentiality issues that automated life underwriting solutions demand."

Industry Meeting Calendar

SCOR Employee Presentations

As a leader in the US life reinsurance industry, SCOR is committed to sharing its knowledge and experience with the industry overall. In addition to volunteering time, service and expertise to industry associations, a key mission is to share our perspective at industry meetings, through presentations and one-on-one meetings. J.C. Brueckner was pleased to participate in the CEO Roundtable at Refocus in March. Below is a list of upcoming industry events and SCOR employees scheduled to present.

We look forward to seeing you at the upcoming meetings. ∞

Upcoming Industry Meetings

Meeting (Location, Date)	Session	SCOR Presenter
 Life Insurance Conference (Las Vegas, Apr. 4-6)	Longevity Risk Management	Matt Daitch, FSA, MAAA, CFA
 Canadian Reinsurance Conference (Toronto, Apr. 13)	CEO Panel	Paolo De Martin
	Specialty Drugs - Increased Risk Exposures to Insurers and Plan Sponsors?	Stéphane Levert, FSA, FCIA
	Individual Life: Simplified Underwriting	Vera Ljucovic FSA, FCIA
 AHOU Annual Meeting (Orlando, May 1-4)	Selling the Value of Underwriting to the Company	Roger Tafoya
	Underwriting Decision Engines, Best Practices for Rules, New Data Sources	Roger Tafoya
	Cause of Death Trends in Mortality Improvement	Travis Short, FSA
	Genetics, Personalized Medicine and Consumer Testing	Bill Rooney, MD
	ALU Survey Results	Kristin Ringland, FALU
 CIU Annual General Meeting (Toronto, June 2-3)	Drivers of Future Mortality – An Underwriter’s Perspective	Philippe Aussel



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