LONGEVITY RISK TASK FORCE UPDATE (LRTF)

TRICIA MATSON, MAAA, FSA
CHAIRPERSON, LONGEVITY RISK TASK FORCE

PAUL NAVRATIL, MAAA, FSA
MEMBER, LONGEVITY RISK TASK FORCE

NAIC SPRING MEETING 2018

Agenda

- Status Update
- Field Study Details
- Next Steps

Status Update

- LRTF has a proposed methodology for NAIC consideration in developing longevity risk factors (generally to be applied to reserves) in risk-based capital (RBC)
  - Factors derived by stressing both base mortality and mortality improvement at a 95th %ile level to get a total asset requirement, and deducting the 85th %ile reserve to get capital
  - Risks included are credibility (basis), volatility, and trend
- To date, determination of the factors has been based on a simple Excel model for new issues only
- Next step is to test the approach using actual inforce blocks through a field study

Field Study Overview

- The Academy Research Task Force (ARTF) has approved the study to be conducted by the Academy
- LRTF has developed instructions and a template to be completed to enable the Academy to conduct a field study on individual and group annuities (excluding deferred, indexed, and variable)
- Company data will be kept confidential, and only aggregated results will be shared with the LRTF
- ARTF will solicit participation from a sample of companies with longevity products
- Any company interested in participating is welcome

Field Study Overview

- Currently gathering public data on all companies with material blocks of individual and/or group annuities to identify potential participants
- Will select a random sample from that data, and adjust using judgment to enable inclusion of all material product types (e.g., pension risk transfer)
- Anticipate sending out requests for participation shortly after this NAIC meeting
- Request Dec. 31, 2017 statutory CARVM reserve amounts calculated using "current" and stressed assumptions, under a range of valuation interest rate, issue age, duration since issue, and gender combinations
- Anticipate companies will need 2-3 weeks elapsed time to perform runs and 1-2 hours to complete template

Field Study Details

Run A – 2017 CARVM Valuation Basis (assumed to be 85th percentile)

- 2012 IAM Table (1994 GAR for Group business)
- Projection Scale G2 (Projection Scale AA for Group business)

Run B/C – 95th Percentile Stress – basis and volatility risk

- 2012 IAM Table (1994 GAR for Group business), all rates adjusted for our defined basis risk stress event (99% factor for run B high credibility/large block or 94% factor for run C low credibility/small block)
- Projection Scale G2 (Projection Scale AA for Group business)

Run D – 95th Percentile Stress – trend risk

- 2012 IAM Table (1994 GAR for Group business)
- Projection Scale G2 (Projection Scale AA for Group business), all improvement factors adjusted for our defined trend stress event (0.20%/0.50% stress for under/over age 85)

$$\text{Capital} = [(\text{Run B/C} - \text{Run A})^2 + (\text{Run D} - \text{Run A})^2]^{1/2}$$

Next Steps

- Conduct field study and evaluate results
- Develop a proposed approach for the Longevity Risk Subgroup to consider for longevity RBC factors
- Determine proposed approach to correlation with other risks (most significantly, C2)
- Continue to evaluate approach for a potential RBC charge for lifetime income benefits

Appendix

Prior Updates provided to NAIC Life Risk Based Capital Committee

Other Background Information

American Academy of Actuaries

Objective. Independent. Effective.™

Current Approach

- Focused on a longevity risk charge for payout annuities (including deferred payout)
- Statutory reserves are generally intended to be at the 85th percentile level
  - Formulaic plus any additional reserves from asset adequacy testing (AAT)
- RBC factors generally cover risks in excess of reserves up to a 95th percentile event
  - Capital requirements are established under the assumption that statutory reserves are adequate; RBC is not a balance sheet item and is not intended to make up for shortfalls in reserves. Stresses up to the 85th percentile are assumed to be covered in reserves
  - The longevity risk stress event will include both basis risk (risk that actual company mortality varies from the table) and trend risk (risk that actual mortality improvement varies from assumed)
  - Based on its nature, trend risk stress event looks at a relatively long time horizon
- RBC longevity risk charge will be based on difference between "current" statutory reserve and statutory reserve calculated under a longevity stress, converted to a factor

Risks To Be Included

- LRTF previously determined that focus should be on trend risk only (mortality improvement), and used historical data to develop a stress event for mortality improvement based on the 95th less the 85th percentile result (0.25% up to age 85; 0.50% age 85-104)
- Current reserve basis (2012 IAM) appears to only include a margin for basis risk
- Therefore, LRTF determined that charge should consider both basis risk and trend risk

Components of Basis Risk

Valuation Table vs. Company Mortality

- Prescribed statutory valuation mortality may not be conservative enough for all business
- AAT Testing already covers this risk

Company Mortality Experience Assumption vs. True Company Mortality Basis

I. **Credibility Risk—**difference between the true underlying mortality basis and company experience due to the limited amount of experience data. Size of this risk declines as the quantity of experience increases

II. **Volatility of True Mortality**—true underlying mortality rates have volatility and change from year to year even with fully credible data

III. **Mortality Trend Adjustment—**mortality experience over a multi-year period must be translated to a base table year using a mortality improvement assumption. Basis risk will result to the extent this assumed improvement differs from actual underlying improvement.

I. Credibility Risk

- Full credibility is often defined as 95% confidence that an assumption is within 5% of the true value
- Some error margin always exists even with long experience from a fully credible block of business
- Figures below use Longley-Cook credibility formula to estimate this error margin
- Adjusted for credibility by amount of insurance in force using data underlying the 2012 IAM table development

	One-sided confidence interval for μ				
# of Deaths	85%	95%	99%		95th - 85th
250	14.0%	22.2%	31.4%		8.2%
500	9.9%	15.7%	22.2%		5.8%
1,082	6.7%	10.7%	15.1%		4.0%
3,000	4.0%	6.4%	9.1%		2.4%
10,000	2.2%	3.5%	5.0%		1.3%
100,000	0.7%	1.1%	1.6%		0.4%
200,000	0.5%	0.8%	1.1%		0.3%

II. Volatility of True Mortality

- This results from year-to-year volatility in true population mortality rates in the experience study period
- Using data and analysis from the LRTF's prior work on trend risk, the annual volatility of population mortality in the U.S. is 2.9% at 1 standard deviation
- This result is scaled to multi-year experience periods using the assumption that each years' volatility is independent
- Longer experience periods will reduce this risk component as the impact of volatility in any single year is diminished

Volatility of Underlying Population Mortalitiy Rate μ								
Annual volatility of mortality rate (improvement rate) from trend risk work:								2.9%
# of Exp Yrs	85%	95%	99%		95th - 85th			
1	3.0%	4.8%	6.7%		1.8%			
3	1.7%	2.8%	3.9%		1.0%			
5	1.3%	2.1%	3.0%		0.8%			
10	1.0%	1.5%	2.1%		0.6%			

III. Trend Adjustment

- Risk results from differences between actual and assumed mortality improvement during the experience period that is used to adjust mortality experience to the base table effective date
- Quantification uses mortality trend stress work previously completed by group (aggregate M/F results across all ages based on the normal model at 85th and 95th percentile relative to mean improvement)
- Trend stress is applied for ½ of the experience period—trending from the mid-point of the experience period to the end point
- Longer experience periods will increase this component as the possibility for error in trending older experience to the valuation date increases

Mortality Trend Adjustment							
Trend Stress:	0.38%	0.60%	(from Trend Stress work, normal model)				
# of Exp Yrs	85%	95%			95th - 85th		
1	0.2%	0.3%			0.1%		
3	0.6%	0.9%			0.3%		
5	1.0%	1.5%			0.6%		
10	1.9%	3.0%			1.1%		

Aggregate Basis Risk

- The three components are independent, so aggregate basis risk measured as $(I^2 + II^2 + III^2)$ ½
- Overall risk is not that sensitive to the length of experience period given the trade-off between Annual Volatility and Trend Adjustment as the experience period lengthens.
- Credibility adjustment declines with experience, but aggregate basis risk quickly becomes dominated by components B and C for large blocks of business.
- Aggregate basis risk is independent of mortality trend risk

# of Exp Yrs:	3	3	3		5	5	5		10	10	10
# of Deaths	500	3,000	100,000		500	3,000	100,000		500	3,000	100,000
I. Credibility	5.8%	2.4%	0.4%		5.8%	2.4%	0.4%		5.8%	2.4%	0.4%
II. Volatility	1.0%	1.0%	1.0%		0.8%	0.8%	0.8%		0.6%	0.6%	0.6%
III. Trend Adjustment	0.3%	0.3%	0.3%		0.6%	0.6%	0.6%		1.1%	1.1%	1.1%
Total Basis	**5.9%**	**2.6%**	**1.1%**		**5.9%**	**2.6%**	**1.0%**		**5.9%**	**2.7%**	**1.3%**

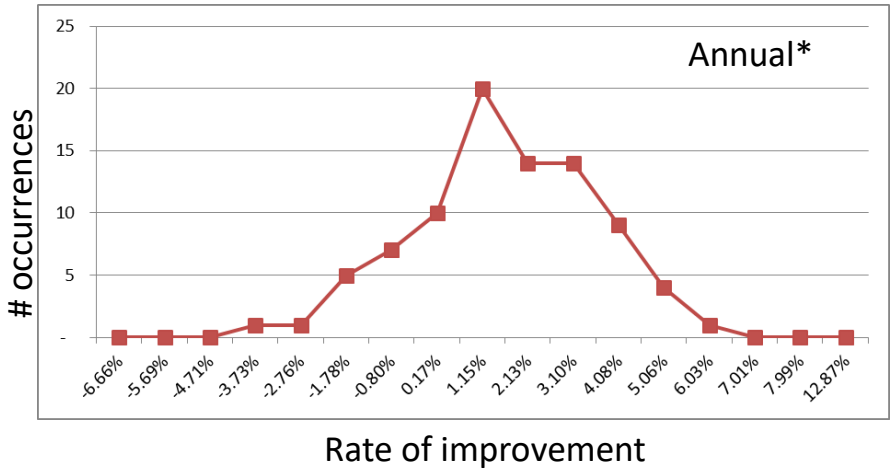
Result is a qx aggregate basis risk stress event ranging from approximately 1% to 6% depending on block size

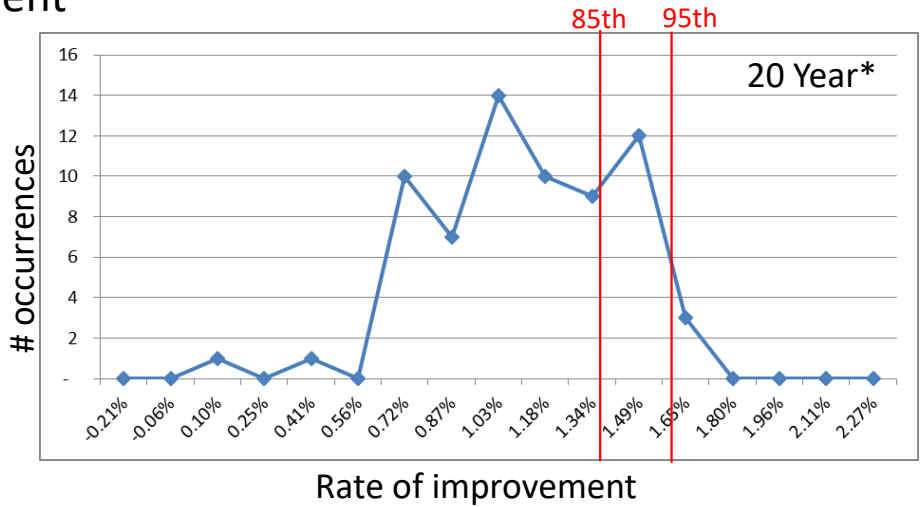
Determining Trend Risk Tail Event

- LRTF analyzed historical population data over the period 1900-2013 using Social Security population data
- Calculated 1-, 5-, 10-, 20-, and 40-year rates of improvement by age bucket and gender
- Fit historical improvement data to a normal distribution to evaluate use of a normal model
- Developed a 95th percentile improvement event, focused on the 20-year historical period
- Evaluated difference between 95th percentile and 85th percentile for use in RBC

Distribution of Mortality Improvement Data

Below is the distribution of annual and 20-year mortality improvement data from 1940-2013 used to develop the shock event





*Annual is improvement over historical one-year periods

*20 year is improvement over historical 20-year periods, converted to an annual rate

Items for Future Consideration

- Due to the stated need to establish a charge within a reasonable timeframe, and the additional uncertainty associated with certain aspects of longevity risk, the following items are being deferred for future consideration:
  - Health products with longevity risk
  - Lifetime income products attached to variable annuities
  - Consideration of the impact of significant medical advancements to the extent they do not already manifest in the historical data used to determine the stress events

For more information

Tricia Matson, MAAA, FSA
Chairperson, Longevity Risk Task Force (LRTF)
tricia.matson@riskreg.com

Ian Trepanier
Life Policy Analyst
American Academy of Actuaries
trepanier@actuary.org