2019 Fall National Meeting
Austin, Texas

LIFE RISK-BASED CAPITAL (E) WORKING GROUP
Saturday, December 7, 2019
10:00 – 11:00 a.m.
JW Grand Ballroom 3-4 - Level 4
ROLL CALL

Philip Barlow, Chair
District of Columbia
John Robinson
Minnesota

Steve Ostlund
Alabama
William Leung
Missouri

Perry Kupferman
California
Rhonda Ahrens
Nebraska

Deborah Batista
Colorado
Seong-min Eom
New Jersey

Wanchin Chou
Connecticut
Bill Carmello
New York

Gilbert Moreau
Florida
Andy Schallhorn
Oklahoma

Bruce Sartain/Vincent Tsang
Illinois
Mike Boerner
Texas
Tomasz Serbinowski
Utah

NAIC Support Staff: Dave Fleming

AGENDA

1. Consider Adoption of its Oct. 23 and Summer National Meeting Minutes—Philip Barlow (DC)  
   Attachments A & B

2. Consider Adoption of the Longevity Risk (A/E) Subgroup’s Nov. 25, Nov. 4, Oct. 7, Sep. 30  
   and Sep. 18, Conference Call Minutes—Philip Barlow (DC)  
   Attachments C - G

3. Discuss the Longevity Risk (A/E) Subgroup’s Recommendation—Rhonda Ahrens (NE)  
   Subgroup’s Recommendation  
   American Academy of Actuaries (Academy) Longevity Risk Task Force’s Nov. 22  
   Comment Letter  
   American Council of Life Insurers’ (ACLI) Nov. 26 Comment Letter  
   Attachment H  
   Attachment I  
   Attachment J

4. Hear an Update from the Academy’s C2 Work Group—Chris Trost (Academy)  
   Attachment K

5. Hear an Update on Economic Scenario Generators—Pat Allison (NAIC)

6. Discuss Comments Received on Life Growth Risk—Philip Barlow (DC)  
   Attachments L & M

7. Discuss Referral on Changes Made to the Life and Health Guaranty Association  
   Model Act (#520)—Philip Barlow (DC)

8. Discuss Referral on Reinsurance Credit Risk—Philip Barlow (DC)

9. Discuss Any Other Matters Brought Before the Working Group—Philip Barlow (DC)

10. Adjournment

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Life Risk-Based Capital (E) Working Group
Conference Call
October 23, 2019

The Life Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met via conference call Oct. 23, 2019. The following Working Group members participated: Philip Barlow, Chair (DC); Steve Ostlund (AL); Perry Kupferman (CA); Deborah Batista (CO); Wanchun Chou (CT); Gilbert Moreau (FL); Bruce Sartain (IL); John Robinson and Fred Andersen (MN); William Leung (MO); Rhonda Ahrens (NE); Kevin Clarkson (NJ); Bill Carmello (NY); Andrew Schallhorn (OK); and Mike Boerner (TX). Also participating was: Mike Yanacheak (IA).

1. Discussed the Comments Received on a Proposal to Update the RBC Charge for Unaffiliated Common Stock Supporting Long-Horizon Contractual Commitments

Mr. Barlow said the Working Group received several comment letters. He said there was an additional letter from Allstate, which is not included in the materials because it came in after the comment period. However, he said those comments can be raised as part of this discussion. He provided those submitting comment letters the opportunity to speak on their comments.

Mark Prindiville (Allstate) said Allstate submitted the original proposal, documentation of the underlying rationale, a 20-page example, a comment letter (Attachment 1) and a response to the American Academy of Actuaries’ (Academy) comment letter, so Allstate’s views are well documented for the Working Group. He said the six guiding principles that form the foundation of the proposal that are listed on page three of Allstate’s comment letter. He made two points in response to the Academy’s comment letter. The first is whether the proposal should be implemented in the C-3 risk component as opposed to the C-1 component. Mr. Prindiville said this has been a discussion almost from the beginning. He agreed that there are reasons to support C-3 because there is a long horizon and a liability connection, so Allstate understands this position. However, he said by definition of the framework, this is a C-1 issue. C-1 covers the change in equity value, exclusively, while C-3 covers the risk of loss due to changes in interest rate levels and variable products. As a result, there is not any question, according to the current definition, this is a C-1 issue. He asked whether there should be a massive framework overhaul and move equity volatility to C-3 because of the long horizon and liability question. He said this would be complicated with which scenarios to use and how to do covariance. Mr. Prindiville said it would end up with the same issue, and it centers on that low-water mark.

For short-term investing, that low-water mark is very important, but for a long-term product with the type of guardrails Allstate is proposing, he said this is much less relevant.

Mr. Prindiville said the second point is potential disconnect with the accounting because there are differing amounts of volatility modeled in risk-based capital (RBC) versus what may be included in statutory surplus and the capitalization ratio. He said there is not internal consistency currently and that the capitalization ratio amortization concept included in the proposal is an attempt to provide more consistency because the capitalization ratios would both be calibrated to seven-year horizons. He said Allstate does not believe accounting needs to change but that RBC is the modernization of statutory capital as a measurement of strength because statutory capital does not incorporate how risky a portfolio is or the recoverability of assets over longer horizons. What RBC measures is the claims paying ability of assets, which changes over the short run and the long run. Mr. Prindiville said that over the long run, if equities are used demonstrably, the claims paying ability is higher because the returns are much greater than those for bonds and much more able to support a long-term product.

Brian Bayerle (American Council of Life Insurers—ACLI) presented the ACLI’s comment letter (Attachment 2). He said the ACLI’s comments are high-level and that they do not take an explicit position on the proposal. He said the ACLI appreciates the Working Group and other state insurance regulators having these discussions about how to improve retirement security. Obviously, the purpose of the RBC framework is to make sure companies are appropriately capitalized, and he said the ACLI would not be in favor of anything that would weaken that. Conceptually, he said the ACLI believes the Allstate proposal has appropriate guardrails, but in discussing any details, that main objective needs to be maintained. He said the ACLI’s comment letter addresses several technical issues but that the ACLI believes there are more discussions that could be had on this topic with other potential solutions.

Chris Trost (Academy) presented the Academy’s comment letter (Attachment 3). With respect to the point made by Allstate about the inconsistency between the accounting and RBC, he said the Academy is concerned because the capital will be immediately impacted and fully reflected in the capital position on the statutory statement by reductions in the equity market, while RBC would be assuming some amortization. He said the Academy also commented that product-specific features tend
to be reflected in C-3 and not C-1. When looking at the product liabilities being considered here, the long-horizon contracts, he said there really is no aspect of those liability cash flows that would offset the loss. Mr. Barlow asked about the Academy's point that product-specific investment choices are reflected in C-3. In the current RBC framework, Mr. Trost said there are certain specific places where liability characteristics are reflected, and those are with variable annuities and fixed annuities, where interest rates and assets are addressed. To reflect the common stock component in C-3, he said that would require redesign of the RBC framework where it would bring in equity performance for fixed annuities where it currently does not exist.

Mr. Andersen said he believes Allstate did a good job of presenting the history of stock market performance over the long-term but reiterated his concern that there needs to be an equal analysis of theory to prevent an unreasonable result where money can be borrowed at a low rate with a guarantee of a higher rate over time.

Mr. Carmello reiterated New York’s position that this proposal is a bad idea as it is not the time to be reducing RBC for equities. He noted that there was a 66% drop in equities in 2008 and 2009.

Mr. Barlow said this proposal would be a significant change to RBC and something requiring a lot of consideration. He said with other proposals in the past, the Working Group has referred them to the Academy for consideration, conducted field tests or asked NAIC staff to do some work. He asked Working Group members for any additional thoughts on the proposal and any input on how to move forward with the proposal. Ms. Ahrens said her initial thought is to agree with Mr. Andersen and suggested also that the Working Group should study this from more of a macro perspective beyond one company. She said the Working Group needs to keep in mind the concern Mr. Carmello raised about equities losing two-thirds of their value in recent history. She said there are a lot of questions to answer about whether this is a C-1 or C-3 risk. While she believes it is a C-3 risk, she said she does not fully agree that C-3 is not already set up in some ways to address something like this, citing C-3 Phase I cash-flow testing, which could potentially be leveraged to accommodate it. She said she believes there is a lot of discussion that needs to take place before the Working Group moves forward on something like this.

Mr. Sartain said this may be the same type of issue companies have with having reserves at too high a level and affecting pricing in that RBC charges that are too high can affect investment decisions. He said it seems indisputable that if you have a long-term liability, you are going to want to match that with some equities. He said this is probably true on the investment side, but the question is whether it fits into the RBC framework. If RBC is a regulatory tool, he asked how it is so critical for companies to make sure the RBC charges are not too conservative. He said rating agencies have their own capital models and that RBC is generally recognized as a blunt regulatory tool. He said it would be helpful to get the perspective of companies on that.

Mr. Barlow said he has had that same question for a long time. He said he was on a panel last year where there were quotes from analysts specifically referencing the RBC of a company and indicating that if that RBC fell below a certain percentage, it was time to be concerned. He said that certain percentage was not 200% but something significantly higher. He said while RBC is a tool with a single purpose to identify weakly capitalized companies, it seems this dynamic is a fact of life right now for the insurance industry. He said Allstate indicated to him that it is following a strategy of investing in equities for these liabilities currently and has not been dissuaded by the existing RBC charges to invest in a sub-optimal way. He said the life insurance industry seems to be well capitalized without much in the way of solvency issues, which is good but may highlight the issue of the other uses of RBC beyond the regulatory purpose.

Mr. Prindiville confirmed that Allstate has invested its block along the lines of what it believes is an optimal RBC charge because in its own economic capital framework, it has made the change that is being proposed. He said this was not easy and took several years of internal dialogue to get everyone comfortable with the underlying concepts and to ensure that all the right protections were in place so that Allstate will be able to withstand an untoward event in the markets. He said Allstate believes the concepts are more widely applicable and could be useful to the entire industry, which is why it has submitted the proposal. Mr. Robinson asked how long Allstate has been using this investment approach. Mr. Prindiville said about five years. In response to Mr. Andersen’s comment on theory, he said the last two pages in its comment letter are an attempt to provide the kind of theory being requested but that Allstate would be happy to engage further on this topic.

When considering whether equities are appropriate for immediate annuities, Mr. Trost said a portion of equities may be appropriate. However, he said he believes the real issue is that it is necessary to cover what the potential downside of the equities is, which is the short, concentrated event where losses can occur in a hurry. Mr. Sartain said it seems like the proposal covers this, at least in part, by having seven years of liquidity. He said the research would show that the longer the years extend, the more unlikely there would be that negative return on the equities. With equities, Mr. Trost said there is not the luxury of
waiting for that entire seven-year period. He noted the example given of equities dropping rapidly by two-thirds. He said the issue is that this would be reflected in a much lower capital position in the statutory statements if they had a large portion of equities as opposed to if they did not invest in equities. He said it is a mismatch between how an insurance company’s capital is measured relative to its particular investment strategy. If there was a change in statutory accounting, whether or not it makes sense to hold them at something other than market value given their fluctuations, he said there would be a better consistency between the proposal and how statutory solvency would be measured.

Mr. Barlow agreed and said one of his concerns is a scenario where a company is insolvent but has a healthy RBC. He acknowledged that this would take an extraordinary set of circumstances but said it does happen occasionally. Mr. Prindiville said the capitalization ratio amortization part of the proposal is an attempt to mimic what the asset valuation reserve (AVR) does for statutory surplus. Mr. Yanacheak said he shares Mr. Barlow’s concern and said he believes that scenario definitely exists. He said it is a severe scenario, and while it may not be likely, severe scenarios are never regarded as likely. If it is a conditional tail expectation (CTE) type analysis, he said, when looking at tail events, he believes it might flip to likely, and that concerns him about this proposal. Mr. Barlow said there are some guardrails in the proposal that are good for what they do, but he is concerned that companies could use equities in a way that may not be appropriate for the liabilities they are backing and then, at the end of the year, trade to something for the purpose of RBC and then go back afterward. He said he does not yet have a clear view of what the next step is but suggested the Working Group could come up with additional questions. He asked Working Group members for their thoughts. Mr. Carmello suggested rejecting the proposal and moving on to other issues. He said RBC has been reduced for the last 20 years, and that is why the rating agencies’ multiples are up to four or five. Mr. Boerner said he has been struggling with what type of analysis would be useful right now, but he is not comfortable with the proposal at this point and said he would not oppose Mr. Carmello’s suggestion.

Mr. Carmello made a motion, seconded by Mr. Boerner, to reject the proposal. Mr. Andersen said he supports that for now but suggested a more independent and rigorous study as to what happens over a 30-year period would make this a discussion worth having again. The motion passed, with Illinois abstaining.

2. Exposed the Memorandum on Potential Further Work on Life Growth Operational Risk

The Working Group agreed to expose the memorandum from the Operational Risk (E) Subgroup for a 25-day public comment period ending Nov. 20. Having no further business, the Life Risk-Based Capital (E) Working Group adjourned.
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The Life Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met in New York, NY, Aug. 3, 2019. The following Working Group members participated: Philip Barlow, Chair (DC); Steve Ostlund (AL); Perry Kupferman and Rachel Hemphill (CA); Manny Hidalgo (CT); John Reilly (FL); Bruce Sartain (IL); John Robinson and Fred Andersen (MN); John Rehagen (MO); Rhonda Ahrens (NE); Seong-min Eom (NJ); Mark McLeod, James Regalbuto and Jim Everett (NY); Mike Boerner (TX); and Tomasz Serbinowski (UT). Also participating were: Mike Yanacheak (IA); and Peter Weber (OH).

1. Adopted its July 22, June 24, June 17, June 6, May 13, April 26, and Spring National Meeting Minutes

Mr. Boerner made a motion, seconded by Ms. Eom, to adopt the Working Group’s July 22 (Attachment Three-A), June 24 (Attachment Three-B), June 17 (Attachment Three-C), June 6 (Attachment Three-D), May 13 (Attachment Three-E), April 26 (Attachment Three-F), and April 7 (see NAIC Proceedings – Spring 2019, Capital Adequacy (E) Task Force, Attachment Five) minutes. The motion passed unanimously.

2. Adopted the Report of the Variable Annuities Capital and Reserve (E/A) Subgroup

Mr. Weber said the Variable Annuities Capital and Reserve (E/A) Subgroup essentially met its charge for 2019. He said the Subgroup is just waiting for the Executive (EX) Committee and Plenary to adopt Valuation Manual changes during their meeting on Aug. 6. The risk-based capital (RBC) instructional changes were adopted by the Capital Adequacy (E) Task Force on June 28. At this point, the Subgroup is waiting for new charges. Mr. Weber said he has thought about charges for next year, and while there may be some clarifying and organizational “clean-up” edits that could be made, he would recommend that the Subgroup wait for now. He understands that there will be a small number of companies early adopting the framework for year-end 2019, and he said the Subgroup can be ready to address any “emergencies” that may arise when those companies get into the details of actually implementing the requirements.

Mr. Boerner made a motion, seconded by Ms. Ahrens, to adopt the report of the Variable Annuities Capital and Reserve (E/A) Subgroup. The motion passed unanimously.

3. Adopted the Longevity Risk (A/E) Subgroup’s July 17 Minutes

Ms. Ahrens made a motion, seconded by Mr. Serbinowski, to adopt the Longevity Risk (A/E) Subgroup’s July 17 minutes (Attachment Three-G), including a friendly amendment to add “not” in item 1a. line 9. The motion passed unanimously.

4. Heard an Update from the Academy Longevity Risk Task Force

Ms. Ahrens said, as part of the Longevity Risk (A/E) Subgroup’s July 17 conference call, the Subgroup asked the American Academy of Actuaries (Academy) Longevity Risk Task Force to provide more information on correlation and reserve assumptions. Paul Navratil (Academy) provided a presentation of the Task Force’s proposed approach to incorporating a charge for longevity risk in the life and fraternal RBC formula (Attachment Three-H). He said the presentation is an update of what was shared at the Spring National Meeting for factors that could be implemented, and part of the recommendation is that correlation between longevity and morality also be considered. He said the Task Force has spent time looking at this issue, and what is included in this presentation is their recommendation on that correlation. He said the Task Force has continued to discuss this since the July 17 call, and it has put together draft materials that it expects to have available toward the end of this month. He presented a summary of the recommendation for correlation, along with background about its direction and strength. He discussed correlation generally in the RBC formula, more specifically as it relates to the two risk components for longevity and mortality, trend risk and non-trend risk, and the risk correlation results in total. Looking at the analysis and then deciding what the Task Forces’ recommendation would be, he said the Task Force then looked at the practical implications of using a fixed correlation assumption. He discussed three different versions of this, as shown on pages 16 through 18 in the presentation and summarized on page 19. Mr. Barlow asked if this correlation would be separate from the overall correlation that is done at the end of the current formula. Mr. Navratil said it would be. Mr. Barlow asked if the analysis included consideration of both
sets of correlation. Mr. Navratil said it was focused solely on the longevity and mortality correlation within the C-2 component. Mr. Barlow asked if this is something that the Subgroup is still looking at. Ms. Ahrens said it is, but the charge of the Subgroup is specific to longevity. While this has been a significant area of discussion, she said how to approach this may be something that the Subgroup needs direction from the Working Group on. Mr. Barlow said he is unsure if it is best to have the theoretical discussion with the Working Group first or have the Subgroup present a proposal to actually review, but he agreed that this is an area the Working Group probably needs to take a significant role in. He suggested that the Subgroup continue its work and, as it gets closer to a more specific proposal to evaluate, the discussion can move up to the Working Group.

5. Received an Update on Pending Items to Be Considered by the Working Group

Mr. Barlow provided an update on other items the Working Group will be looking at. With respect to the elimination of the fraternal annual financial statement blank and the combined life and fraternal RBC formula, he said blank and instruction changes needed were adopted by the Working Group during its May 13 conference call.

With respect to a proposal to update RBC charges for unaffiliated common stock supporting long-horizon contractual commitments, Mr. Barlow said the Working Group received a presentation from Allstate during the Working Group’s July 22 conference call, which was exposed for an initial comment period ending Sept. 20. He said one of the items discussed during that call was to have this proposal included for discussion today to possibly influence what the Working Group receives in the comments. He said there are aspects of the proposal that he would like to see specific comments on and specific consideration of as the Working Group continues its discussions and these include:

a. Is time diversification something that should be reflected in RBC, and if so, is it appropriately considered in the C-1 risk category?

b. Is there an unrecognized solvency risk with payout annuities and structured settlements in this ongoing low interest rate environment, and will a shift to equity investments to back those products alleviate that risk?

c. Should there be a complementary change to the accounting for the equities, or is the proposal to modify the total adjusted capital (TAC) to smooth equity gains and losses sufficient?

d. The proposal assumes a diversified portfolio. How do we require an initial diversified portfolio backing the reserves, and how do we allow reasonable trades in that portfolio while preventing inappropriate activity?

e. How might the use of reinsurance impact this proposal?

f. How do we ensure that this proposal is strictly limited to payout annuities and structured settlements?

g. Are there implications in this proposal for principle-based reserving (PBR) or asset adequacy analysis, and if so, how should those be coordinated?

h. Retirement security is a big issue, and a proposal that has the potential to put more money into the hands of retired people will help, but should that be a criterion that we consider in developing RBC?

i. Should this proposal be forward looking only? Given that there is no opportunity to adjust the payments for existing payout annuities and structured settlements, is there a reason to allow it for existing contracts?

j. Does the proposal work for environments other than the current low-interest environment?

Mr. Andersen reiterated his concern that the analysis received from Allstate was, primarily, based on history in which the stock market has gone up, and he said he believes there needs to be some consideration of theory. Otherwise, he said the basis for this model will be that it will always work out that you can borrow money, buy stock, and be guaranteed to be better off.

With respect to whether any adjustment is needed due to the changes made to the Life and Health Insurance Guaranty Association Model Act (#520), Mr. Barlow said NAIC staff will draft a memorandum for the Working Group to consider. He said the Working Group also needs to consider if any adjustment is needed to the reinsurance credit risk in light of changes related to collateral, and he would like to address this before the Fall National Meeting, in addition to a referral from the Operational Risk (E) Subgroup on whether a growth risk charge is needed in the life RBC formula.

With respect to the work that was done for tax reform, Mr. Barlow said there were some changes that might have been done structurally without the time constraints, and he said the Working Group will need to consider whether those are significant enough to require additional changes.

Having no further business, the Life Risk-Based Capital (E) Working Group adjourned.
The Longevity Risk (A/E) Subgroup of the Life Actuarial (A) Task Force and the Life Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met via conference call Nov. 25, 2019. The following Subgroup members participated: Rhonda Ahrens, Chair (NE); Seong-min Eom (NJ); Bill Carmello (NY); and Peter Weber (OH). Also participating was Philip Barlow (DC).

1. **Adopted its Recommendation to the Life Risk-Based Capital (E) Working Group on Longevity Risk**

Ms. Ahrens said the Subgroup is considering adoption of the recommendation to the Life Risk-Based Capital (E) Working Group on new C-2 factors for longevity risk. She discussed the memorandum, which includes as attachments: 1) the American Academy of Actuaries (Academy) Longevity Risk Task Force’s proposal document, which was presented at the Spring National Meeting; 2) the Academy’s update on correlation, which was presented at the Summer National Meeting; and 3) the actual proposed changes to the risk-based capital (RBC) blank and instructions. She said this memorandum was also discussed during the Subgroup’s Nov. 4 conference call and now includes the edits that have been suggested. With respect to longevity reinsurance transactions (LRT), Ms. Ahrens said the issues that have been discussed by the Subgroup are highlighted in the third paragraph, with the following paragraph indicating that the Subgroup believes these transactions should ultimately be in scope of the proposal but that the Subgroup needs more time and guidance from the Working Group on this aspect. She said the issue of correlation is presented next explaining the discussions the Subgroup has had along with its recommendation that this is an issue to be considered by the Working Group.

Mr. Carmello suggested modifying the memorandum to indicate that a majority of the Subgroup members, as opposed to the Subgroup as a whole, supports scoping out LRT for now since he believes there is a way to have it included and it was not unanimous. He also suggested inclusion of the changes needed for the tax page and the authorized control level (ACL) page, LR030 and LR031, respectively, as part of the recommended RBC blank changes.

Ms. Eom expressed concern with the statement in the Academy’s proposal document concerning longevity reinsurance indicating that premium amounts excluded from statutory reserves should be netted against C-2 capital. She said she wants to make it clear that not everyone supports this. The Subgroup agreed to modify the paragraph on LRT to make clear that the need for further analysis is because the Subgroup did not reach a consensus, along with modifying the premium offset bullet point to reference a portion of future premiums, as opposed to all future premiums.

Mr. Carmello made a motion, seconded by Ms. Eom, to adopt as the recommendation to the Working Group the memorandum with the changes discussed along with the three attachments with pages showing the changes needed to LR030 and LR031 without correlation added. Brian Bayerle (American Council of Life Insurers—ACLI) said the Subgroup indicates in the memorandum that it has not taken a position on correlation and said the ACLI believes it would be better to advance the recommendation with versions of LR030 and LR031 with and without correlation and let the Working Group decide whether it wants to expose one or both of the versions. Mr. Barlow said he appreciates Mr. Bayerle’s comments and that he is not speaking for the Working Group, but it would be his preference that only one version rather than multiple versions be advanced to the Working Group. The motion passed unanimously.

2. **Discussed the Academy’s Offer of Additional Assistance on Correlation**

Ms. Ahrens said the Academy submitted a letter on the implementation of longevity C-2 with correlation that includes the RBCblank changes that would be needed. With the Subgroup not taking a position on correlation, she said she believes this is something the Academy could direct to the Working Group. Paul Navratil (Academy) said the Academy is presenting this to make sure that the operational details are provided to facilitate the Working Group’s discussion of the issue. Mr. Barlow said he understands that the correlation aspect may fall outside of the specific consideration of longevity risk and is something that the Working Group can appropriately address.

Having no further business, the Longevity Risk (A/E) Subgroup adjourned.
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The Longevity Risk (A/E) Subgroup of the Life Actuarial (A) Task Force and the Life Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met via conference call Nov. 4, 2019. The following Subgroup members participated: Rhonda Ahrens, Chair (NE); Mike Yanacheak (IA); John Robinson (MN); Seong-min Eom (NJ); Bill Carmello (NY); and Peter Weber (OH).

1. Continued Discussion of the Academy’s Longevity Risk Task Force Proposal

Ms. Ahrens said a memorandum to the Life Risk-Based Capital (E) Working Group was drafted per the Subgroup’s discussion on Oct. 7 describing the Subgroup’s work on the proposed longevity risk C-2 charges. She said the memorandum outlines the Subgroup’s recommendation, which includes the proposal document along with the actual risk-based capital (RBC) blank and instruction changes, the discussions to date and the presentations from the American Academy of Actuaries (Academy) Longevity Risk Task Force. She said the memorandum also includes the Subgroup’s consideration of correlation explaining that the Subgroup believes that this aspect may not be in the Subgroup’s purview. Ms. Ahrens said the Subgroup has also discussed the scope of products to be included and, specifically, longevity reinsurance. She said state insurance regulators received some education on this during a regulator-to-regulator conference call held on Oct. 21 to discuss the similarities and differences to other longevity exposures in the life and fraternal annual statement that are included in the proposal’s scope. She said she believes it should be in scope but that the Subgroup seems to be divided on how a credit for this would be calculated or whether there should be a credit at all. Because there is more work to be done in this area, she believes that rather than holding up C-2 factors for other products, it should be scoped out for now and the additional work done possibly by a drafting group.

The Subgroup discussed edits to the memorandum, including adding detail to explain the issues with respect to longevity reinsurance, along with more clarity on those products that are within the scope of the proposal. Ms. Ahrens suggested: 1) having the suggested edits included; 2) having Subgroup members, the American Council of Life Insurers (ACLI) and the Academy review the updated memorandum; and 3) scheduling another conference call to consider adoption of the recommendation prior to the Fall National Meeting. The Subgroup agreed with this approach.

Having no further business, the Longevity Risk (A/E) Subgroup adjourned.
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The Longevity Risk (A/E) Subgroup of the Life Actuarial (A) Task Force and the Life Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met via conference call Oct. 7, 2019. The following Subgroup members participated: Rhonda Ahrens, Chair (NE); Mike Yanacheak (IA); Seong-min Eom (NJ); Bill Carmello and Amanda Fenwick (NY); and Peter Weber (OH).

1. Continued Discussion of the Academy’s Longevity Risk Task Force Proposal

Ms. Ahrens said two remaining aspects of the American Academy of Actuaries (Academy) Longevity Risk Task Force’s proposal to incorporate a charge for longevity risk in the life and fraternal risk-based capital (RBC) formula are the covariance and the scope. With respect to scope, she said there may be a need to schedule a regulator-to-regulator conference call to provide some education on pension risk transfer (PRT) transactions. With respect to the covariance aspect, she asked whether this was actually part of the Task Force’s recommendation or whether it was an aspect it is highlighting for additional consideration.

Paul Navratil (Academy) said the proposal document, which was presented to the Life Risk-Based Capital (E) Working Group at the Spring National Meeting, presented the work done on the factors for longevity risk, but the recommendation was that in implementing the factors, covariance needed to be considered at the same time. He said the presentation at the Summer National Meeting provided more detail, but the summary was that the recommendation was for a correlation of -33% between longevity and mortality C-2. He said the key premise in the work when the factors for longevity risk were developed was to calibrate them to get to a 95th percentile, which entailed including consideration of both longevity risk and mortality risk.

Ms. Ahrens noted the presentation included other jurisdictions having correlations of -50% and -25%. She asked Subgroup members for their thoughts on what the Subgroup should present to the Life Risk-Based Capital (E) Working Group as part of the recommendation with respect to correlation. Ms. Fenwick reiterated New York’s opposition to including any correlation within C-2. When the Subgroup first started to look at longevity risk, she said it was to introduce a factor for longevity, and it is being watered down and made less conservative with the work looking at different assumptions on reserve levels and covariance. She said it is uncertain what is going to happen with longevity risk because it involves two different groups of people with life insurance versus annuities, and how this ultimately works out is an inexact science. Mr. Weber said that Ohio would probably favor some correlation. He said there may be some appeal in recommending something less than the -33%. He acknowledged that it is not an exact science but that 0% seems extreme so perhaps -25% as another jurisdiction is using may be appropriate. Ms. Ahrens noted concern expressed with the possibility of the overall C-2 component actually going down with the introduction of longevity risk and suggested a possible approach could be to require a floor of one of the two C-2 components on its own after application of any covariance adjustment. Mr. Yanacheak reiterated his belief that this is a Life Risk-Based Capital (E) Working Group-level discussion. He said he thinks the Subgroup has an obligation to point out this issue as it has been presented to the Subgroup that relates to the longevity risk and what the Subgroup is proposing. He said if the Working Group wants the Subgroup to do additional work, it can provide that guidance. Brian Bayerle (American Council of Life Insurers—ACLI) said the ACLI believes covariance is appropriate but would support consideration of this aspect going to the Working Group.

Ms. Ahrens suggested moving forward with recommending the Task Force’s Spring National Meeting proposal to Working Group along with a memorandum documenting: 1) the Subgroup’s considerations of the factors and the assumptions; 2) the actual RBC blank and instruction changes needed to implement the proposal; and 3) the Subgroup’s consideration of covariance with the consensus that the Subgroup believes this is an aspect that merits the Working Group’s consideration but that the Subgroup is willing to continue work on it with further direction. Mr. Yanacheak supported this approach. Mr. Bayerle said the ACLI supports the approach as well.

Having no further business, the Longevity Risk (A/E) Subgroup adjourned.
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The Longevity Risk (A/E) Subgroup of the Life Actuarial (A) Task Force and the Life Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met via conference call Sept. 30, 2019. The following Subgroup members participated: Rhonda Ahrens, Chair (NE); Mike Yanacheak (IA); Seong-min Eom (NJ); Bill Carmello (NY); and Peter Weber (OH). Also participating was: Vincent Tsang (IL).

1. **Continued Discussion of the Academy’s Longevity Risk Task Force Proposal**

The Subgroup continued its discussion of the requested sensitivities the American Academy of Actuaries (Academy) Longevity Risk Task Force provided in its Sept. 10 letter (Attachment 1). Ms. Ahrens reminded the Subgroup that the Task Force’s proposal targets a 95th percentile total asset requirement (TAR) assuming an 85th percentile reserve. She said the Subgroup questioned whether this assumption could actually be made and what the factors would be at different assumed reserve levels that the Task force provided. Mr. Carmello reiterated his preference to go with the factors at the 75th percentile level without a covariance adjustment. Mr. Yanacheak said reserves are to cover moderately adverse events and that he believes the 85th percentile is close to a mean plus one standard deviation, so he is not opposed to going with the 85th percentile factors. Ms. Eom said she is also supportive of the 85th percentile since that is what is assumed for reserves in other product lines and, if there is a problem with the actual reserve level, the reserves can be addressed separately.

Ms. Ahrens noted Mr. Carmello’s concerns with potential reserve inadequacies and asked him if he thought even using the 75th percentile would actually be the appropriate assumption. Mr. Carmello said the only positive about going with the 85th percentile is that state insurance regulators could start holding companies to it in examinations as another reason to increase reserves. For this product especially, he said he does not believe companies are very far from best estimates. He said he would pick the 60th percentile. Brian Bayerle (American Council of Life Insurers—ACLI) said the ACLI is supportive of using the 85th percentile and that the ACLI believes any concern with reserves not being at the appropriate level should be addressed separately.

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Nancy Bennett (Academy) said that when RBC was developed, it was designed to establish minimum capital requirements and was built on the premise that reserves were adequate whether it was formulaic or formulaic plus any additional reserves established through cash flow testing. She said RBC was not intended to rectify any problems with reserves but rather to be built on top of that and that there was nothing specifically quantified about reserves in the development of individual RBC factors. Ms. Ahrens said her preference would be that the Subgroup recommend using the 85th percentile but explain that the Subgroup also looked at other levels and why as part of the recommendation. Mr. Yanacheak, Ms. Eom and Mr. Weber expressed support for this approach.

With respect to the sensitivity to the assumed average reserve per policy, Ms. Ahrens said she does not have an issue with the assumed average although she said she is surprised it was only 50,000 for payout-type products and questioned whether this might go up over time as insurers’ expertise with these products increased. Mr. Yanacheak said he does not have a concern with the 50,000 average assumption. Mr. Tsang noted the reduction in the factors as the size of the total reserve increases and the fact that the reductions get proportionally smaller with the increases. He questioned whether this would penalize smaller companies. Paul Navratil (Academy) said the two main risks considered were: 1) mortality improvement or trend risk, which is a risk that applies evenly to all sizes of business; and 2) estimation of base mortality or mortality level risk, which is much
higher on a small block of business. He said the grading down of the factors reflects the fact that level risk is much higher on a small block of business and then levels off as trend risk becomes the more dominant risk.

With respect to covariance, Ms. Ahrens said she has discussed the potential for the introduction of a covariance factor, which does not currently exist at Life Risk-Based Capital (E) Working Group meetings. She said there is a case to be made that diversification is a positive, and she asked for members’ thoughts. Mr. Carmello reiterated his opposition to this aspect. Mr. Yanacheak suggested this may be an issue for the Working Group to decide and expressed concern with the Subgroup potentially leading them astray if they have not specifically directed the Subgroup to address this aspect. Ms. Ahrens said she understands the theoretical justification for including this aspect but shares that concern. She suggested making the recommendation on factors and highlighting the potential for a correlation component along with alternatives for how it could be implemented, including limitations or guardrails that would address concerns about the introduction of an RBC charge potentially leading to decreased RBC.

Having no further business, the Longevity Risk (A/E) Subgroup adjourned.
The Longevity Risk (A/E) Subgroup of the Life Actuarial (A) Task Force and the Life Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met via conference call Sept. 18, 2019. The following Subgroup members participated: Rhonda Ahrens, Chair (NE); Mike Yanacheak (IA); John Robinson (MN); Seong-min Eom (NJ); Bill Carmello and Amanda Fenwick (NY); and Peter Weber (OH).

1. Continued Discussion of the Academy’s Longevity Risk Task Force Proposal

Ms. Ahrens said the Subgroup discussed the comments received on the questions posed by the Subgroup as part of the exposure of the American Academy of Actuaries (Academy) Longevity Risk Task Force’s proposed approach for incorporating a risk charge into the life and fraternal risk-based capital (RBC) formula during its July 17 conference call. As part of that discussion, she said the Subgroup asked the Academy for some sensitivities around the assumed 85th percentile reserve level and the assumed average reserve per policy. Paul Navratil (Academy) presented the Academy’s responses (Attachment 1).

With respect to what issues remained prior to being able to go forward with its recommendation, Ms. Ahrens said the correlation component is one. She said she has indicated to the Life Risk-Based Capital (E) Working Group that the Subgroup is focused on longevity and that it may be appropriate for the Working Group, where there is a larger audience, to decide whether there should be a correlation component within C-2. She said the Subgroup’s choices include simply adopting the Academy’s proposal and working with the Working Group on the next steps or also providing the Working Group with some alternatives along with the pros and cons of each.

Ms. Ahrens asked Subgroup members for comments on the range of factors in the sensitivities presented with respect to the reserve level. Mr. Carmello acknowledged that the 85th percentile may be ideal, but it is not what the reality is and has been in that it is actually in the 60–65th percentile range for payout annuities; so the 75th percentile would be a compromise. Ms. Ahrens said she believes the Subgroup needs to discuss three things during upcoming calls: 1) whether the Subgroup wants to recommend one of the longevity factor choices presented by the Academy, given the discussions on assumed reserve levels; 2) whether the Subgroup wants to make any adjustment to the assumed average reserve size; and 3) whether the Subgroup recommends a correlation component, which is part of the Academy’s proposal.

Having no further business, the Longevity Risk (A/E) Subgroup adjourned.
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TO: Philip Barlow, Chair, Life Risk-Based Capital (E) Working Group

FROM: Rhonda Ahrens, Chair, Longevity Risk (A/E) Subgroup

DATE: November 25, 2019

RE: Recommendation for incorporating an RBC charge for longevity risk

The NAIC’s Longevity Risk (A/E) Subgroup was formed in 2016 with the charge to provide recommendations for recognizing longevity risk in statutory reserves and/or risk-based capital (RBC), as appropriate. The Subgroup has worked closely with the American Academy of Actuaries’ (Academy) Longevity Risk Task Force (Academy Task Force) over the ensuing three years to focus efforts on addressing RBC for longevity risk after determining that statutory reserves would be addressed through the work of other NAIC groups. After many discussions and considerable input from the Subgroup, the Academy Task Force conducted a field study in 2018. The intent of the field study was to quantify longevity risk coverage at an appropriate confidence level. The results of that field study were presented to the Life Risk-Based Capital (E) Working Group at the 2018 Summer National Meeting. Those results were used to produce a proposal for an RBC charge for longevity risk (the proposal) which was exposed for comment by the Subgroup, along with a list of questions on which the Subgroup requested input, on its March 5, 2019 conference call. The proposal was presented to the Working Group at the 2019 Spring National Meeting (Attachment 1). The comments and the responses to the Subgroup’s questions were discussed on its July 17, 2019 conference call.

The Subgroup wants the Working Group to be aware that special consideration was given to the proposal’s assumption of statutory reserves being at the 85th percentile. While differing views were expressed, the Subgroup’s consensus is that any deviation in reality from this assumption should be addressed as part of consideration of reserves and not as a factor in determining a capital charge. The Academy Task Force did produce potential factors that would address the gap if reserves were actually at the 75th or 80th percentile. Those factors are not included in the proposal being recommended as the Subgroup reached consensus on the after-tax factors as presented on page three of the proposal. These factors are then included on a pre-tax basis in the RBC instructions.

The Subgroup has also evaluated longevity reinsurance transactions (LRT), a reinsurance arrangement initially in scope for longevity C-2. LRT is a relatively new type of arrangement which involves the transfer of longevity risk associated with group annuities to a reinsurer and is discussed on slide nine of the proposal. While the Subgroup has held several discussions on LRT, because the Subgroup did not reach a consensus, we believe further analysis of the arrangement addressing key considerations is necessary for the Subgroup to issue a recommendation. These key considerations include:

- The basis for the factors – Statutory reserves may not be the appropriate basis to which the factor applies since reserves are generally zero at inception. The present value of future payout benefits using VM 22 criteria was discussed as a potential basis, however this would not be a statutory reporting item that could be pulled from the financial statement. The basis needs to be determined and the process for including it in the RBC pages needs to be established.
- Premium offset – Whether and how to allow a portion of future premiums due to the reinsurer under a reinsurance arrangement to offset the capital requirement resulting from applying the factor to the present value of benefits.
- Treatment for primary insurer – How capital would be reflected for a primary insurer that has reinsured longevity risk to a reinsurer.

The Subgroup recommends LRT arrangements should ultimately be included in scope for longevity C-2, however, additional time is needed in order to further review and consider these key issues. Therefore, for purposes of our current recommendations to the Working Group, a majority of the Subgroup supports scoping out LRT and seeks support on forming a drafting group to continue evaluation and development of a recommendation.
Another aspect the Subgroup discussed at length with differing viewpoints expressed was possible correlation between longevity and mortality risk. Correlation is an aspect that the Subgroup feels extends beyond our charges and is an issue for the Working Group to decide. The proposal includes the Academy Task Force’s recommendation that updated C-2 mortality factors and new C-2 longevity factors be implemented concurrently along with a covariance adjustment within C-2. Various correlation factors of 0%, -25%, and -50% were included to demonstrate hypothetical company impacts related to implementation with or without correlation noting that additional work on coordinating and consideration of the proper level of covariance was needed. An update on this by the Academy Task Force was included in a presentation to the Working Group at the 2019 Summer National Meeting (Attachment 2). The Subgroup believes the factors presented by the Academy Task Force may be reasonable but believes the Working Group is in a better position to consider this as it involves more than just the longevity component. As such, the Subgroup is only providing a recommendation for the factors as presented in slide three of the proposal, and is raising the topic of correlation for the entire Working Group to address.

The proposal, as produced and presented by the Academy Task Force, is included as Attachment 1 and includes the Academy Task Force’s objectives and analysis approach along with the results of the field study and the calibration of the longevity factor. Attachment 3 presents the RBC blank and instruction changes necessary to implement the proposal.
Longevity Risk Task Force (LRTF) Update

Paul Navratil, MAAA, FSA
Chairperson, Longevity Risk Task Force
American Academy of Actuaries
Discussion Topics

- Preliminary Factor Proposal
- Objectives & Analysis Approach
- Field Study Results & Longevity Factor Calibration
- Next Steps
Preliminary Proposal Summary

- Recommend capital structure with longevity C-2 factors applied to base Statutory Reserves
  - Factor applied to present value of benefits for longevity reinsurance

- Propose that updated C-2 mortality factors (e.g., C-2a) and new C-2 longevity factors (e.g., C-2b) be implemented concurrently along with a covariance adjustment within C-2.

- Anticipated factors (working version below) vary with the total size of company reserves for in scope products, where reserves are a proxy for the credibility and volatility of company-specific longevity

<table>
<thead>
<tr>
<th>Total Reserves (in scope products)</th>
<th>C-2 Longevity After-Tax Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to $250M</td>
<td>1.35%</td>
</tr>
<tr>
<td>next $250M</td>
<td>0.85%</td>
</tr>
<tr>
<td>next $500M</td>
<td>0.75%</td>
</tr>
<tr>
<td>over $1B</td>
<td>0.70%</td>
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</tbody>
</table>

Attachment 1
Objective & Philosophy

- The objective of our work is to develop a recommended method to incorporate longevity risk into the NAIC’s Life Risk-Based Capital (LRBC) formula.
- The scope of our work is LRBC. Statutory Reserves reflect longevity risk through prescribed mortality assumptions and asset adequacy testing requirements.
- Our proposal was developed in line with the overall objective of LRBC as being a tool for regulators to identify potentially weakly capitalized companies.
  - We took a practical approach in developing an initial longevity risk factor for LRBC that is not intended to precisely reflect all drivers nor align to an internal view of economic capital for all companies.
- We balanced several competing objectives in developing a longevity risk factor within LRBC:
  - Clear linkage of the calculation to statutory financial statements & regulatory ability to audit calculation
  - Accuracy and reasonability of the charge as a measure of longevity risk at the company level
  - Simplicity of the calculation
  - Consistency with the existing RBC framework
Overall Approach

- Scope to include longevity risk to payout annuity products and pension risk transfers. Other products such as variable annuities (VA), long-term care (LTC), and traditional deferred accumulation annuities are out of scope at this time. (Additional scope detail in Appendix)

- Based on discussions with the National Association of Insurance Commissioners (NAIC) Longevity Risk Subgroup, our analysis begins with the premise that LRBC is intended to cover tail risk in excess of the risk covered by Statutory Reserves.
  - Our work assumes Statutory Reserves adequately fund moderately adverse risk measured at the 85th percentile and that LRBC covers longevity risk from the 85th percentile to the 95th percentile level
  - Our work assumes LRBC covers longevity risk over the lifetime of the policy

- RBC is intended to cover losses from increased longevity over the policy lifetime, summarized into two components for analysis:
  - Mortality Trend Risk—risk that future mortality improvements are greater than anticipated
  - Mortality Level Risk—error in initial mortality assumptions, including credibility of starting mortality rate assumption and volatility of individual company longevity outcomes

- Losses due to longevity risk are measured as the impact on reserves from stressed longevity assumptions.

- Loss amounts are expressed as a capital factor to be applied to the Statutory Reserves.
Field Study Results (Summary)

- Academy Field Study asked participating companies to run the impact of level and trend stresses to actual company reserves to confirm the calibration of the longevity risk charge. (Additional detail in Appendix)

- Results reflected the combined impact of the requested trend and level stresses, assuming independence.

- Results confirmed many expectations from our cell testing and resolved some outstanding questions with a combined impact that was comparable across products and ages (detail not included below).

- Field study indicated low prevalence of contingent deferred annuities where no benefits are payable if annuitant does not survive to benefit commencement. Our cell testing indicated greater risk as a percentage of reserves for this structure, and is a potential future enhancement.

- Red lines show recommended pre-tax LRBC factors.

Note: Error bars show result from 25th and 75th percentile responses.

“Cell Model” reflects expected study result derived from a simple reserve cell testing model constructed by the LRTF and shown for comparison. Cell model error bars are based on sensitivity tests of different assumed age distributions.

Field study requested mortality level shocks of 1% and 6% to represent companies with high and low credibility of mortality experience data.
Factors to be applied to Statutory Reserves for products in scope to determine C-2b longevity risk amount

Factors and breakpoints were chosen to closely match total risk derived from the Field Study calibration

- Simple approach with four factors shown provides results which closely match calibration from Field Study
- Each factor applies at the margin to reserves in excess of the breakpoint, avoiding discontinuities in total C-2b for companies with reserves just above vs. below a breakpoint

<table>
<thead>
<tr>
<th>Reserve Level ($,M)</th>
<th>Calibrated Field Study Results</th>
<th>Marginal C-2b Factor</th>
<th>Total C-2b</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>1.35%</td>
<td>1.35%</td>
<td>1.35%</td>
</tr>
<tr>
<td>500</td>
<td>1.09%</td>
<td>0.85%</td>
<td>1.10%</td>
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<td>1,000</td>
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<td>2,500</td>
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<tr>
<td>50,000</td>
<td>0.69%</td>
<td>0.70%</td>
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</table>
Sample Company Impacts

- Introduction of “C-2b” charge is effective in identifying companies with concentrated exposure to longevity risk, and has appropriately smaller impact on companies with balanced risk exposures.
- Illustration shown using distribution of RBC amounts from aggregate 2017 Life RBC (additional calculation details provided in Appendix)
- Sample impacts shown for companies with Concentrated Longevity exposure (C-2b 3x greater than C-2a), Balanced Longevity exposure (C-2b equal to C-2a), and Low Longevity exposure (C-2a 5x greater than C-2b)
- Sample impacts also shown under a range of covariance assumptions between longevity and mortality

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Concentrated Longevity</th>
<th>Balanced Longevity</th>
<th>Low Longevity Exposure</th>
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</thead>
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<tr>
<td>C2a Mortality/Other Insurance Risk</td>
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<td>25.1</td>
<td>25.1</td>
<td>25.1</td>
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<td>C2b Longevity Insurance Risk</td>
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<td>75.4</td>
<td>25.1</td>
</tr>
<tr>
<td>Longevity - Mortality Correlation</td>
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<td>0%</td>
<td>-25%</td>
<td>0%</td>
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<tr>
<td>C-2 Insurance Risk</td>
<td>25.1</td>
<td>79.5</td>
<td>73.3</td>
<td>35.6</td>
</tr>
<tr>
<td>Calculated CAL RBC Ratio</td>
<td>517%</td>
<td>393%</td>
<td>407%</td>
<td>423%</td>
</tr>
</tbody>
</table>

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<td>Longevity - Mortality Correlation</td>
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<td>-25%</td>
<td>-50%</td>
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<tr>
<td>C-2 Insurance Risk</td>
<td>25.1</td>
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<tr>
<td>Calculated CAL RBC Ratio</td>
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<td>393%</td>
<td>407%</td>
<td>423%</td>
</tr>
</tbody>
</table>
Longevity Reinsurance

- This is a recurring premium product where a reinsurer is responsible for annuity payments based on actual longevity of covered lives in exchange for a premium stream (generally representing expected payments plus a fee).

- There were not enough Field Study responses from companies with Longevity Reinsurance for the LRTF to receive results.

- Although the product structure might not be common, we recommend it remaining in scope for longevity C-2 because the longevity risk is the same as a traditional single premium annuity product.

- There are two important adjustments needed to capture the longevity C-2 consistently with single premium annuities:
  1. **Capital Factor must be applied to the Present Value of annuity benefits under Statutory assumptions**
     - Under a net premium reserve methodology which reflect future premiums, reserves are zero at inception and remain much lower over time than reserves for a comparable Single Premium Immediate Annuity (SPIA)
     - The Statutory Reserve for a SPIA equals the full present value (PV) of benefits, so this is the comparable basis applicable for this product
  2. **Premium amounts excluded from Statutory Reserves should be netted against C-2 capital**
     - A net premium reserve methodology typically excludes a portion of future premiums to prevent a negative initial reserve
     - These excluded premiums are a source of funding for adverse longevity outcomes more severe than provided for in reserves
     - This allows for consistency with funded products where assets from the initial premium are available to fund capital
     - It is appropriate for future fees to fund reserves and capital because claims are only due if premiums are paid
Covariance

- The LRTF together with the Academy C-2 Mortality Work Group plan to develop an approach to reflect the correlation between mortality and longevity risk within C-2.

- The LRTF plans to limit the scope of this effort to mortality and longevity risk.
  - The correlation between longevity and mortality is significant and we believe should be considered concurrent with the implementation of a longevity risk charge.

- The covariance proposal will take into consideration the specific risks (i.e., basis/credibility, volatility, trend) considered in both the development of the longevity risk factors as well as by the Academy C-2 Mortality Work Group.
LRTF Next Steps

- Complete recommendation of covariance between C-2 mortality and C-2 longevity
- Complete more detailed documentation of analysis and recommendations
- Address questions & feedback from regulators and interested parties
Key Assumptions

- **Statutory Reserves** are adequate and cover risks at the 85\textsuperscript{th} percentile.

- **Discount rate** of 5\% (pre-tax) is used to calculate the present value loss amount from increased longevity. 5\% rate was chosen to be consistent with the discount rate applied elsewhere in RBC (C-1 Bond Factors). Sensitivity analysis has been provided to illustrate the impact of a 4\% discount rate.

- **Tax rate** of 21\% used to calculate after-tax capital factors from pre-tax loss amounts. Tax adjustment applied to both the loss amount as well as the discount rate.

- **Mortality distribution** for future insured annuitants can be represented by the distribution of historical population mortality.
  - No differences in the volatility and probability distribution shape for insured mortality compared to the general population.
  - Volatility and distribution of possible future improvements is consistent with the volatility of post-WWII historical improvements.
  - Mortality improvements are normally distributed; this normal distribution was used to determine the 85\textsuperscript{th} and 95\textsuperscript{th} percentiles.
  - 20 years is an appropriate period of time to calibrate an improvement stress that is applied for the entire lifetime of policies.
  - Overlapping 20-year historical periods were assumed independent in developing the distribution of 20-year mortality improvements.
Key Assumptions (Continued)

- **Independence** between Trend Risk and Level Risk, and among Level Risk components (Credibility, Population Volatility and Historical Trend). Each component was separately quantified then combined assuming the components were independent.

- **Old Age Calibration** showed similar absolute level of improvement rate volatility as younger ages. Mortality improvement stress was assumed to be a multiplicative factor of the baseline mortality improvement, resulting in a larger multiple (1.40x vs 1.16x) for older ages because the baseline mortality improvement is lower.

- **Policy Size Distribution** based on a 2009–2013 Individual Payout Annuity Mortality study by the Society of Actuaries (SOA) was used to adjust the volatility of deaths on a count basis to volatility on a dollar reserve basis.

- **Average reserve per policy** of $50,000 and **average block mortality rate** of 2% were assumed in scaling factors derived from the number of company experience period deaths to a total company reserve basis. This does not impact the overall quantification of longevity risk on a life count exposure basis, just the approach to scaling the factor from a life count to a Statutory Reserves basis.
Trend Stress Calibration

- Based on 20-year historical population improvement data.
  - Field study calibration originally based on data 1900–2013; subsequently adjusted to reflect recent population volatility post-WWII 1946–2013 (to exclude war impacts and reflect that total population mortality volatility has declined as population size has increased).
  - Data fit to a normal distribution to determine stresses for 85th and 95th percentiles (Based on regulator input and preference for normal distribution considering the limited number of non-overlapping 20-year historical periods. Use of CTE70 vs CTE90 levels would result in very similar stresses.)

- Multiplicative stress applied to valuation mortality improvement scale.
  - Greater stress used for older (>85) ages to reflect similar absolute trend volatility on a smaller average level of trend
  - Recommendation reflects 80% of Field Study requested trend stress after adjusting to 1946+ calibration
    - 16% stress to mortality improvement for ages <85 (resulting in a 1.16x multiple to improvement rates)
    - 40% stress to mortality improvement for ages 85+ (resulting in a 1.40x multiple to improvement rates)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Avg AA/G2</th>
<th>1900-2013 Calibration (95th - 85th)</th>
<th>1946 - 2013 Calibration (95th - 85th)</th>
<th>Field Study Stress</th>
<th>Final Stress Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ages 35+</td>
<td>1.17%</td>
<td>1.27% 1.49% 19%</td>
<td>1.31% 1.47% 13%</td>
<td>20%</td>
<td>16%</td>
</tr>
<tr>
<td>Ages 35 - 84</td>
<td>1.19%</td>
<td>1.41% 1.63% 19%</td>
<td>1.45% 1.60% 13%</td>
<td>50%</td>
<td>40%</td>
</tr>
<tr>
<td>Ages 85+</td>
<td>0.59%</td>
<td>1.00% 1.28% 47%</td>
<td>1.09% 1.34% 43%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Starting Mortality Level Stress Calibration

- Total Mortality Level Stress varies with the size and credibility of company mortality experience.
  - Larger companies with more insured lives will have less variability in company-specific outcomes
  - There remains fundamental population volatility that does not diversify away with size
- Overall mortality level stress varies between 0.7% and 6.0% of initial mortality rates.
- Mortality Level Stress was quantified using three largely independent components:
  1. Credibility Risk – captures credibility and volatility of insurer population specific mortality
  2. Volatility of Population Mortality – underlying volatility that is not diversified with larger blocks
  3. Trend Adjustment – impact of error in trend applied from experience period to valuation date

<table>
<thead>
<tr>
<th># Exp Yrs:</th>
<th>5</th>
<th>5</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td># Deaths</td>
<td>500</td>
<td>2,100</td>
<td>100,000</td>
</tr>
<tr>
<td>A. Credibility</td>
<td>5.8%</td>
<td>2.8%</td>
<td>0.4%</td>
</tr>
<tr>
<td>B. Pop Volatility</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>C. Trend Shift</td>
<td>0.4%</td>
<td>0.4%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Total Level Stress</td>
<td>5.8%</td>
<td>2.9%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>
We’ve estimated life expectancy impacts of the capital stresses to provide further insight into the calibration results.

For Age 70 annuitants, the capital provides for an additional 0.3–0.4 years of life expectancy beyond reserve mortality.

This is in addition to 0.7–0.8 additional years of life expectancy beyond reserve mortality relative to 2012 Individual Annuity Mortality (IAM) Basic Table.

Reserve life expectancy comparison estimated under the assumption that IAM Basic table is an appropriate best estimate; actual best estimates will vary by block of business.
Two adjustments were made to convert from pre-tax to after-tax factors:

1. Loss amount was multiplied by 0.79 (1-21% tax rate)
2. Discount rate was also multiplied by 0.79 factor (5% pre-tax rate adjusted down to 3.95%)

The baseline recommendation reflects a 5% pre-tax discount rate to be consistent with the discount rate applied elsewhere in LRBC (e.g., recommended C-1 Bond factors).

Because the impact of longevity risk is increased in a low-interest-rate environment, it may be appropriate to consider a lower discount rate (such as 4%) for longevity risk capital. Note: stochastic modeling of interest rates was considered but not used as the basis for a recommendation due to the model complexity it would have required.

<table>
<thead>
<tr>
<th>Capital Factor</th>
<th>5% Discount Rate</th>
<th>4% Discount Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Tax</td>
<td>After-Tax</td>
</tr>
<tr>
<td>High Credibility</td>
<td>0.80%</td>
<td>0.71%</td>
</tr>
<tr>
<td>Low Credibility</td>
<td>1.55%</td>
<td>1.37%</td>
</tr>
</tbody>
</table>
Factor Scaling

- Recommend factor that varies by total Statutory Reserves for in-scope products
  - Size of in-scope product reserves used as a proxy for credibility and volatility of company mortality experience; a better measure would be total annual deaths, however this is not available in statutory statements
  - A key assumption in scaling risk based on total annual deaths to a reserve basis is the average reserve per policy which will vary considerably across blocks of business; $50,000 amount used below is used to illustrate a scaling approach and is not necessarily an average
  - Chart below shows the total capital calibrated from the Field Study stresses (first and last columns) mapped to corresponding total Statutory Reserve levels. Additional calibration points were added based on the relative total risk calculated from the cell testing model to calibrate at other reserve levels

<table>
<thead>
<tr>
<th># Exp Yrs:</th>
<th>5</th>
<th>5</th>
<th>5</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td># Deaths</td>
<td>475</td>
<td>1,000</td>
<td>10,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Total Level Stress</td>
<td>6.00%</td>
<td>4.15%</td>
<td>1.43%</td>
<td>1.01%</td>
</tr>
<tr>
<td>Calibrated Total After Tax Capital</td>
<td>1.37%</td>
<td>1.09%</td>
<td>0.75%</td>
<td>0.71%</td>
</tr>
<tr>
<td>Avg Qx</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td># Life Exposures</td>
<td>4,750</td>
<td>10,000</td>
<td>100,000</td>
<td>250,000</td>
</tr>
<tr>
<td>Avg Reserve/policy</td>
<td>$ 50,000</td>
<td>$ 50,000</td>
<td>$ 50,000</td>
<td>$ 50,000</td>
</tr>
<tr>
<td>Total Reserve Level ($,M)</td>
<td>$ 238</td>
<td>$ 500</td>
<td>$ 5,000</td>
<td>$ 12,500</td>
</tr>
</tbody>
</table>
Products In and Out of Scope

Scope includes annuity products with life contingent payments where benefits are expected to be distributed in the form of an annuity.

- It does not include annuity products for which payments are certain only (non-life contingent).
- It does not include deferred annuities that have an annuitization option, but are not required to annuitize.
- It does not include variable annuities or contingent deferred annuities which are captured in C3 Phase 2 testing.

Product in scope include:

- **Single Premium Immediate Annuities (SPIAs) and Other Payout Annuities:** Annuities issued to individuals (not groups) in which a single premium is paid and a benefit payment is paid periodically during the time the person is alive, including deferred annuities that have moved to a payout stage.

- **Structured Settlements:** Annuities issued to individuals as part of a legal settlement in which a single premium is paid and benefit payments are paid periodically during the time the person is alive. Many structured settlement contracts involve substandard mortality.

- **Longevity Reinsurance:** A product offered to pension plan sponsors (or direct writers) in which the insurer (or reinsurer) makes payments to the pension plan sponsor (or direct writer) in the event that actual mortality experience of the pensioners is better (i.e., they live longer) than a defined level of experience per the contract (or, for a longevity swap, the payments are also made in the opposite direction in the event that actual mortality experience of the pensioners is worse, and may be based on a defined index). In exchange for these payments, the insurer or reinsurer may receive a periodic fee.

- **Group Immediate Annuities:** Annuities issued to groups in which a single premium is paid (in cash or in-kind assets) and benefit payments are paid to specified members of the group periodically during the time they are individually alive.

- **Deferred Payout Annuities (DPAs):** Annuities issued to individuals in which premiums or deposits are made over a specified deferral period. At the end of the deferral period, benefit payments are paid to the individual periodically during the time the person is alive.

- **Group Deferred Payout Annuities:** This product is defined as annuities issued to groups in which premiums or deposits are made over a specified deferral period. At the end of the deferral period, benefit payments are paid to members of the group periodically during the time the person is alive.
Field Study Overview

- Conducted by the Academy Research Task Force (ARTF) (now Research Committee).
- LRTF developed instructions and a template completed by participating companies.
- Tested the impact to Statutory Reserves of stresses in base mortality rates and mortality improvement rates for policies inforce on December 31, 2017.
- Field Study template was at a granular level to understand how drivers such as product type, valuation discount rate, policy duration, age, and gender impact risk.
- Results were submitted to ARTF from 19 companies.
- Company data kept confidential, only aggregated results with average, 25th, and 75th percentile responses for each requested cell shared with the LRTF.
Field Study Details

Run A – 2017 CARVM Valuation Basis (assumed to be 85th percentile)
- 2012 IAM Table (1994 Group Annuity Reserving (GAR) Table)
- 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)

Capital = \([ (\text{Run B/C} - \text{Run A})^2 + (\text{Run D} - \text{Run A})^2 ]^{1/2}\)
Illustrated distribution of RBC risk based on aggregate 2017 Life RBC

Existing Formula: \( \text{CAL RBC} = C_0 + [(C_{1o}+C_{3a})^2 + (C_{1cs}+C_{3c})^2 + (C_2)^2 + (C_{3b})^2 + (C_{4b})^2]^{1/2} + C_{4a} \)

Illustrated Formula Update: \( C_2 = [C_{2a}^2 + C_{2b}^2 + 2*C_{2a}*C_{2b}*\text{Corr}_{a,b}]^{1/2} \)

<table>
<thead>
<tr>
<th>2017 Aggregated Life RBC($,B)</th>
<th>Concentrated Longevity Exposure Company Example</th>
<th>Balanced Longevity Exposure Company Example</th>
<th>Low Longevity Exposure Company Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-0 Asset Risk Affiliates</td>
<td>21.5</td>
<td>21.5</td>
<td>21.5</td>
</tr>
<tr>
<td>C-1cs Asset Risk - Common Stock</td>
<td>29.9</td>
<td>29.9</td>
<td>29.9</td>
</tr>
<tr>
<td>C-1o Asset Risk - All Other</td>
<td>43.7</td>
<td>43.7</td>
<td>43.7</td>
</tr>
<tr>
<td>C-2a Mortality/Other Insurance Risk</td>
<td>25.1</td>
<td>25.1</td>
<td>25.1</td>
</tr>
<tr>
<td>C-2b Longevity Insurance Risk</td>
<td>75.4</td>
<td>75.4</td>
<td>75.4</td>
</tr>
<tr>
<td>Longevity - Mortality Correlation</td>
<td>0%</td>
<td>-25%</td>
<td>-50%</td>
</tr>
<tr>
<td>C-2 Insurance Risk</td>
<td>25.1</td>
<td>79.5</td>
<td>73.3</td>
</tr>
<tr>
<td>C-3a Interest Rate Risk</td>
<td>16.3</td>
<td>16.3</td>
<td>16.3</td>
</tr>
<tr>
<td>C-3b Health Credit Risk</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>C-3c Market Risk</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>C-4a Business Risk</td>
<td>7.7</td>
<td>7.7</td>
<td>7.7</td>
</tr>
<tr>
<td>C-4b Business Risk Admin Expenses</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Calculated CAL RBC</td>
<td>101.8</td>
<td>133.9</td>
<td>129.3</td>
</tr>
<tr>
<td>Reported Aggregate CAL RBC</td>
<td>112.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Adjusted Capital</td>
<td>526.6</td>
<td>526.6</td>
<td>526.6</td>
</tr>
<tr>
<td>Calculated CAL RBC Ratio</td>
<td>517%</td>
<td>393%</td>
<td>407%</td>
</tr>
</tbody>
</table>

Concentrated Longevity Exposure Company Example

Balanced Longevity Exposure Company Example

Low Longevity Exposure Company Example

Attachment 1
Questions?

Additional Questions, contact:

Paul Navratil, MAAA, FSA  
Chairperson, Longevity Risk Task Force  
(LRTF)

Ian Trepanier  
Life Policy Analyst  
American Academy of Actuaries  
trepanier@actuary.org
Longevity Risk Task Force Update (LRTF) – Correlation Recommendation
August 2019

Paul Navratil, MAAA, FSA
Chairperson, Longevity Risk Task Force
Introduction

- The objective of the Longevity Risk Task Force (LRTF) work is to develop a proposed method to incorporate longevity risk into the NAIC’s Life Risk-Based Capital formula (LRBC).
- Earlier this year, the LRTF shared its preliminary proposal for Longevity C-2 factors applied to base statutory reserves.
- That proposal included the recommendation that new C-2 longevity factors be implemented concurrently with a correlation adjustment within C-2.
- This document discusses the recommendation and rationale for the correlation between C-2 mortality and C-2 longevity.
Summary

- We recommend a correlation of -33% between longevity and mortality C-2.
  - This is consistent with the overall 95th percentile objective across a wide range of company sizes while being simple to implement within the existing Life RBC framework.

- A key premise in the development of Longevity Risk factors was to target a 95th percentile outcome for longevity risk. The key premise of our work on correlation was the extension of this to now achieve a 95th percentile outcome for the combined C-2 risk from longevity and mortality.

- This recommendation considers the differences in age and other population characteristics between life insurance and annuity policyholders and their resulting impact on correlations.

- It also considers the differing correlations among the components of longevity & mortality risk.
  - Mortality trend risk has historically shown high negative correlation between mortality and longevity
  - Non-trend risk components (volatility, level risk) are less related and assumed to be independent (0% correlation)

- Other regulatory capital frameworks include negative correlation between longevity and mortality risk, including Bermuda BSCR (-50%), Canada LICAT (-25%) and European Solvency II (-25%). (See Appendix page 25)

- From our standpoint, the practical implications of this approach are consistent with the objectives of the Life RBC framework.
Background

Correlation describes the strength and direction of the linear statistical relationship between two random variables (e.g. gain/loss on longevity and mortality), measured from +100% to -100%

Direction

- Positive correlation indicates that high outcomes of 1 variable are more likely to occur together with high outcomes of the 2\textsuperscript{nd} variable
- Negative correlation indicates the opposite—that high outcomes of 1 variable are more likely to occur together with low outcomes of the 2\textsuperscript{nd} variable
Background

Correlation describes the strength and direction of the linear statistical relationship between two random variables (e.g. gain/loss on longevity and mortality), measured from +100% to -100%

Strength

- Correlation values of 100% or -100% indicate perfect certainty of the relationship – a high outcome for 1 variable will always occur with an equally high (+100%) or low (-100%) outcome for the 2nd variable
- Correlations closer to zero indicate greater statistical variability around the relationship
- Correlation of zero (i.e., independence) indicates that there is no relationship between the variables
Background

Correlation describes the strength and direction of the linear statistical relationship between two random variables (e.g. gain/loss on longevity and mortality), measured from +100% to -100%.
Correlation in Life RBC

All components of the existing LRBC formula include some level of assumed correlation.

- Some components have correlation of 100% and are added together in the existing LRBC formula
  - For example, C-1 and C-3
- Some components have correlation of 0% (independent) where total risk equals the square root of the sum of squares of the individual risk components
  - For example C-2 with the total of C-1 and C-3
- In general, the total risk under any correlation between risk components $C_X$ and $C_Y$ with correlation $\rho_{XY}$ follows the formula: $\sqrt{C_X^2 + C_Y^2 + 2\rho_{XY} C_X C_Y}$

When added to LRBC, Longevity risk will also implicitly or explicitly reflect some assumption for correlation with other risk components.

- We recommend a correlation factor of -33% within C-2 to reflect the relationship between mortality and longevity risk:
  - $C-2 = \sqrt{C-2a^2 + C-2b^2 + 2*(-0.33) * C-2a * C-2b}$
    - Where C-2a is mortality and morbidity risk and C-2b is longevity risk
Key Assumptions

1. The calibration target for RBC C-2 remains at 95th percentile for the combined impact of longevity and mortality risk.
   - This was the statistical level targeted for longevity risk on a stand-alone basis, and the analysis on covariance targets the same level for the combination of longevity and mortality risk.

2. Normal Distribution of loss amounts resulting from longevity and mortality risk.
   - The liability side of a typical insurance company tends to have many more policies than the asset side has issuers, and the cyclical volatility of equity returns and asset defaults is not as generally evident on the liability side. The Law of Large Numbers helps to make mortality risk more normally distributed than asset-side risks.

3. Process Correlation between mortality and longevity is constant over time.
   - Process Correlation is the underlying correlation between risks while Observed Correlation is the resulting correlation from a limited sample of historical observations.
   - The distribution of observed correlations over different time periods using Social Security Administration historical data is consistent with this assumption of constant process correlation.

4. Trend Risk is independent (0% correlation) of Non-Trend Risk (Level, Volatility, and Catastrophe risks), and Non-Trend Risks are independent (0% correlation) of each other.
   - Catastrophe risk for mortality is likely negatively correlated with longevity risk; the independence assumption greatly simplifies the analysis without significantly impacting results.
5. -65% Correlation of Trend Risk Component between Longevity and Mortality:
   - Correlation would start at -100% correlation if insuring the same individuals against both risks
   - Observed correlation of -80% between age distributions of life and annuity policies using historical SSA data (most complete available source of relevant data, detail on Appendix page 23)
   - Additional 15% haircut assumption to reflect population basis risk beyond age difference between life insurance and annuity populations. We believe this haircut should be smaller than the (20%) haircut from age distribution because insured populations are more socioeconomically similar to each other than to the general population.
   - -65% resulting trend correlation assumption.
   - Sensitivity tests also included under -55% and -75%; as a benchmark SSA analysis using non-overlapping over/under age 65 populations showed historical correlation of -64%. (Appendix page 24)
Correlation of Risk Components

- Correlation differs between the trend and non-trend components of longevity/mortality risk.
- Our approach considered the different correlation of these components and their relative contribution to overall longevity/mortality risk in determining the appropriate overall risk correlation.

<table>
<thead>
<tr>
<th>Mortality Risk Component</th>
<th>Longevity Risk Component</th>
<th>Risk Component Correlation Assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trend Risk</td>
<td>Trend Risk</td>
<td>-65%</td>
</tr>
<tr>
<td>Trend Risk</td>
<td>Non-Trend Risk (Level/Basis, Volatility)</td>
<td>0%</td>
</tr>
<tr>
<td>Non-Trend Risk (Level/Basis, Volatility, Catastrophe)</td>
<td>Trend Risk</td>
<td>0%</td>
</tr>
<tr>
<td>Non-Trend Risk (Level/Basis, Volatility, Catastrophe)</td>
<td>Non-Trend Risk (Level/Basis, Volatility)</td>
<td>0%</td>
</tr>
</tbody>
</table>
Composition of Trend vs. Non-Trend Risk

We separated the mortality and longevity C-2 risk into Trend and Non-Trend components to understand the impact on aggregate risk correlation.

- Trend risk is a constant percentage of exposure at all exposure levels, while non-trend risk decreases on a percentage basis as exposure increases.
- This effect is the reason for the decreasing C-2 factor at higher exposure levels for both mortality and longevity.
- C-2 for mortality and longevity at each exposure indicated by the factors was decomposed into a Trend and Non-Trend component such that: \((C-2)^2 = (\text{Trend})^2 + (\text{Non-Trend})^2\)
- For example at $1B of exposure, C-2b of $9.25m separated into $6.9m of Trend and $6.16m of Non-Trend risk.

- We used a constant Longevity Trend risk factor of 0.69% in determining the composition of Longevity risk between Trend and Non-Trend components.
  - This composition aligns to Longevity Field Study results which showed that trend risk was 79% of total risk under the 1% level stress ($12.5B exposure), and 38% of total risk under the 6% level stress ($250m exposure).
  - This amount is just below the lowest proposed C-2 factor of 0.70%, indicating that at the highest exposure levels most of the incremental risk is from Trend.

- We assumed a constant Mortality Trend risk factor of 0.59% for Individual Mortality risk.
  - As for Longevity, this is 0.01% lower than the marginal C-2 for the largest exposure band (0.60%) for Individual Mortality C-2.
Longevity Trend vs Non-Trend Risk

- Since volatility risk declines with size for both mortality and longevity, trend risk is the smaller component at low exposure levels but dominates at larger exposure levels.
- The mortality trend risk assumption indicates that trend risk is a slightly smaller percentage for mortality than for longevity.
- These results overall seem reasonable based on preliminary analysis by the C-2 Mortality Working Group, but should be reviewed once their work is complete.

![Graphs showing Longevity Trend Risk Percentage and Mortality Trend Risk Percentage]
Total Risk Correlation Calculation

Total correlation of longevity and mortality risk was calculated as:

\[ \rho = \rho_T \lambda_L \lambda_M \]

- Where \( \rho_T \) is the trend risk correlation assumption -65%, and
- Trend weight parameters \( \lambda_L \) & \( \lambda_M \) are calculated as Trend / C-2 for Longevity and Mortality respectively
- These formulas were developed analytically and validated through simulation
Total Risk Correlation Results

The chart below shows the resulting correlations for different combinations of Mortality NAR (x-axis) and Longevity Reserve (data series).

Total risk correlations vary by size, and range from -15% for the smallest exposures to less than -50% for the largest exposures.

Sensitivities using -55% and -75% Trend Risk Correlation included in the appendix Pg24

A sample range of exposure sizes was tested above, however we do not have the benefit of information on the distribution of actual company exposures.
Correlation Impact on 95th Percentile

Sensitivities on the following slides address the practical implications of using a simple fixed correlation assumption even though the analysis indicates aggregate correlation varies with exposure size

- Total C-2 (mortality C-2a and longevity C-2b) is calculated using a fixed correlation and compared to the 95th percentile outcome calculated using the exposure specific correlations
- Overall a fixed -33% correlation provides the most balanced fit across all exposure sizes tested
Correlation Impact on 95\textsuperscript{th} Percentile: -25\%

With a fixed -25\% correlation:

C-2 for low exposure amounts are close to the 95\textsuperscript{th} percentile, but C-2 for large exposure amounts are up to 20\% too high.
Correlation Impact on 95th Percentile: -33%

With a fixed -33% correlation:
C-2 for the largest exposure amounts are up to 14% too high while C-2 for the smallest exposures are up to 12% too low.
This provides the closest overall fit to the targeted correlation.
Correlation Impact on 95\textsuperscript{th} Percentile: -50%

With a fixed -50% correlation:
C-2 for high exposure amounts are close to the 95\textsuperscript{th} percentile, but C-2 for small exposure amounts are up to 25\% too low.
# Implementation Alternatives

We considered a number of implementation alternatives and the proposed -33% correlation is a simple approach that achieves reasonable accuracy across the spectrum of company sizes.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Advantages</th>
<th>Drawbacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Correlation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-25%</td>
<td>Aligns to 95\textsuperscript{th} % for smaller companies</td>
<td>Overstates C-2 by almost 20% for largest companies</td>
</tr>
<tr>
<td><strong>Proposed</strong> -33%</td>
<td>Achieves total C-2 within +/- 14% of 95\textsuperscript{th} percentile for all sizes tested</td>
<td>Overstates C-2 for largest companies; understates for smallest companies</td>
</tr>
<tr>
<td>-50%</td>
<td>Aligns to 95\textsuperscript{th} % for largest companies</td>
<td>Understates C-2 by up to 25% for smallest companies</td>
</tr>
<tr>
<td>Variable Correlation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cliff factor, e.g.: -25% if C-2 &lt; X -50% if C-2 &gt;= X</td>
<td>Achieves total C-2 within +/- 8% of 95\textsuperscript{th} percentile for all size companies</td>
<td>More complicated Discontinuity in RBC for companies near threshold</td>
</tr>
<tr>
<td>Continuous Function of C-2</td>
<td>Closest alignment to calculated 95\textsuperscript{th} %</td>
<td>Most complicated to implement, but could be done</td>
</tr>
</tbody>
</table>
Hypothetical Company RBC Impacts

- Introduction of “C-2b” longevity risk factor is effective in identifying companies with concentrated exposure to longevity risk, and has appropriately smaller impact on companies with balanced risk exposures.

- RBC impacts to companies with concentrated longevity risk exposure can be material (examples on next slide) and achieve the RBC purpose as a tool to identify potentially weakly capitalized insurers.

- The impact on companies with balanced risk exposures is much lower and recognizing the offsets between longevity and mortality in an economic way within RBC encourages sound risk management practices.
  - An overly conservative approach to correlation would have little impact on companies with concentrated risk exposures and would result in a statistical safety level that is not targeted at 95% in a consistent way across companies.

- A negative correlation does result in a lower total C-2 for companies with low longevity exposure, however the magnitude of these reductions is quite small and is consistent with the 95th percentile target.
## Hypothetical Company RBC Impacts

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Concentrated Longevity</th>
<th>Balanced Longevity</th>
<th>Low Longevity Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C2a Mortality/Other Insurance Risk</strong></td>
<td>25.1</td>
<td>25.1</td>
<td>25.1</td>
<td>25.1</td>
</tr>
<tr>
<td><strong>C2b Longevity Insurance Risk</strong></td>
<td>n/a</td>
<td>75.4</td>
<td>75.4</td>
<td>75.4</td>
</tr>
<tr>
<td><strong>Longevity - Mortality Correlation</strong></td>
<td>n/a</td>
<td>-25%</td>
<td>-33%</td>
<td>-50%</td>
</tr>
<tr>
<td><strong>Calculated CAL RBC</strong></td>
<td>101.8</td>
<td>129.3</td>
<td>127.8</td>
<td>124.4</td>
</tr>
<tr>
<td><strong>Total Adjusted Capital</strong></td>
<td>526.6</td>
<td>526.6</td>
<td>526.6</td>
<td>526.6</td>
</tr>
<tr>
<td><strong>Calculated CAL RBC Ratio</strong></td>
<td>517%</td>
<td>407%</td>
<td>412%</td>
<td>423%</td>
</tr>
<tr>
<td><strong>Change in RBC Ratio vs Baseline</strong></td>
<td>-</td>
<td>-110%</td>
<td>-105%</td>
<td>-94%</td>
</tr>
</tbody>
</table>

**Illustration shown using distribution of non-Longevity RBC amounts from aggregate 2017 Life RBC**

**We do not have access to actual impacts for any particular company which may differ from examples shown**

**Sample impacts shown for companies with Concentrated Longevity exposure (C-2b 3x greater than C-2a), Balanced Longevity exposure (C-2b equal to C-2a), and Low Longevity exposure (C-2a 5x greater than C-2b)**

**Expanded sensitivities shown in the appendix page 28**
We have used SSA historical data (1946 – 2013) to estimate the correlation in mortality trend risk among cohorts of different ages representative of life insurance vs annuity populations.

- Population data was the best available source of data to compare mortality improvement rates over long time periods.
- We have applied an additional adjustment to our mortality trend correlation assumption to reflect potential impacts from life vs annuity population differences beyond age distribution.

Baseline results reflect the age distribution for life and annuity business based on SOA mortality studies. A sensitivity is also included showing completely non-overlapping age distributions (over/under age 65).

Historical correlations shown using annual mortality improvement as well as correlation of 2-year improvements.

- Longer time periods were not considered because the limited quantity of historical data would result in high standard error in correlation estimates, though the assumption that correlations are stable over time also indicates that annual correlations are consistent with correlation measured over longer time periods.

Analysis suggests that the correlation of trend risk reflecting the age differences between annuity and life policyholders is in the range of -80%.

<table>
<thead>
<tr>
<th>SOA Study Age Distribution</th>
<th>Non-overlapping Ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historical Correlation</td>
<td>Historical Correlation</td>
</tr>
<tr>
<td>Standard Error</td>
<td>Standard Error</td>
</tr>
<tr>
<td>Annual</td>
<td>-81%</td>
</tr>
<tr>
<td></td>
<td>7%</td>
</tr>
<tr>
<td>Biennial</td>
<td>-76%</td>
</tr>
<tr>
<td></td>
<td>11%</td>
</tr>
</tbody>
</table>
Total Risk Correlation - Sensitivities

- There was judgment in selecting -65% as the trend correlation assumption.
- A range of -55% to -75% was considered reasonable for this assumption.
- This assumption impacts correlation at large exposures more than small exposures.
Other Jurisdictions

- Bermuda BSCR applies a -50% correlation between longevity and mortality risks.
- Canada’s LICAT and Europe’s Solvency II apply a correlation factor of -25% and acknowledge significant judgment was applied.
- BSCR
  - BMA “believe that an appropriate selection of tail correlations matrixes strikes an adequate balance between tractability, robustness and risk sensitivity.”
- LICAT
  - “Analysis” indicated a negative correlation between risks; a description of the analysis is not provided.
  - Notes that longevity risk is primarily associated with older ages than life mortality risks.
  - Framework also includes -75% correlation between mortality risk for “life supported” and “death supported” products.
- Solvency II
  - Mortality/Longevity insured differences, including likely age differences, could limit the potential for risk offsets.
  - Systemic changes in mortality would likely impact risks evenly, providing offsets.
Importance of Correlation

- In our view it is necessary to consider correlation between longevity and mortality concurrent with the implementation of a C-2 Longevity factor and that it would not be appropriate to adopt a proposed Longevity C-2 factor without also reflecting correlation with mortality risk.

- In order to achieve a 95th percentile level across multiple risks it is necessary to consider the likelihood that risks occur together.

- If the longevity factor were adopted and applied additively to existing mortality C-2 this would represent an implicit 100% correlation between longevity and mortality risks.

- A 100% correlation would express the view that a stress 95th percentile longevity outcome where annuitants are living longer than expected would with 100% certainty occur concurrent with a stress 95th percentile mortality outcome where insureds are dying sooner than expected.

- We do not find this to be a plausible view of how longevity and mortality risk are related, and this would result in a total RBC C-2 amount materially in excess of a 95th percentile outcome.
Impact of Excluding Correlation

- From a practical perspective, using an implicit 100% correlation would result in a total C-2 amount that does not represent a consistent level of statistical safety across companies.
  - C-2 for companies with concentrated exposure to longevity or mortality would be close to 95\textsuperscript{th} percentile
  - C-2 for companies with balanced exposure to longevity and mortality would be materially in excess of 95\textsuperscript{th} percentile
- This inconsistency may reduce the value of RBC as a tool to identify potentially weakly capitalized companies.
- Examples on the next slide illustrate the RBC ratio impact of introducing the C-2b longevity risk factors under a range of longevity-mortality correlation assumptions:
  - 100%; (high longevity always occurs together with high mortality)
  - 0%; (independence between longevity and mortality)
  - Negative correlations of -25%, -33%, -50% and -75%
## Hypothetical Company RBC Impacts – Impact of Excluding Correlation

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Concentrated Longevity Exposure Company Example</th>
<th>Balanced Longevity Exposure Company Example</th>
<th>Low Longevity Exposure Company Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C2b Longevity Insurance Risk</strong></td>
<td>n/a 75.4 75.4 75.4 75.4 75.4</td>
<td>n/a 75.4 75.4 75.4 75.4 75.4</td>
<td>n/a 75.4 75.4 75.4 75.4 75.4</td>
<td>n/a 75.4 75.4 75.4 75.4 75.4</td>
</tr>
<tr>
<td><strong>Longevity - Mortality Correlation</strong></td>
<td>n/a 100% 0% -25% -33% -50% -75%</td>
<td>n/a 100% 0% -25% -33% -50% -75%</td>
<td>n/a 100% 0% -25% -33% -50% -75%</td>
<td>n/a 100% 0% -25% -33% -50% -75%</td>
</tr>
<tr>
<td><strong>Calculated CAL RBC</strong></td>
<td>101.8 150.7 133.9 129.3 127.8 124.4</td>
<td>124.4 119.3 108.0 104.0 103.3</td>
<td>101.8 99.6</td>
<td>101.8 99.6</td>
</tr>
<tr>
<td><strong>Total Adjusted Capital</strong></td>
<td>526.6 526.6 526.6 526.6 526.6 526.6</td>
<td>526.6 526.6 526.6 526.6 526.6 526.6</td>
<td>526.6 526.6 526.6 526.6 526.6 526.6</td>
<td>526.6 526.6 526.6 526.6 526.6 526.6</td>
</tr>
<tr>
<td><strong>Calculated CAL RBC Ratio</strong></td>
<td>517% 349% 393% 407% 412% 423%</td>
<td>412% 423% 434% 446%</td>
<td>423% 441% 462% 483%</td>
<td>441% 462% 483% 504%</td>
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<tr>
<td><strong>Change in RBC Ratio vs Baseline</strong></td>
<td>- -168% -124% -110% -105% -94%</td>
<td>- -170% -135% -122% -118% -112%</td>
<td>- -168% -124% -110% -105% -94%</td>
<td>- -168% -124% -110% -105% -94%</td>
</tr>
<tr>
<td><strong>Balanced Longevity Exposure Company Example</strong></td>
<td><em>Shown on page 14</em></td>
<td><em>Shown on page 14</em></td>
<td><em>Shown on page 14</em></td>
<td><em>Shown on page 14</em></td>
</tr>
<tr>
<td><strong>C2b Longevity Insurance Risk</strong></td>
<td>n/a 25.1 25.1 25.1 25.1 25.1</td>
<td>n/a 25.1 25.1 25.1 25.1 25.1</td>
<td>n/a 25.1 25.1 25.1 25.1 25.1</td>
<td>n/a 25.1 25.1 25.1 25.1 25.1</td>
</tr>
<tr>
<td><strong>Longevity - Mortality Correlation</strong></td>
<td>n/a 100% 0% -25% -33% -50% -75%</td>
<td>n/a 100% 0% -25% -33% -50% -75%</td>
<td>n/a 100% 0% -25% -33% -50% -75%</td>
<td>n/a 100% 0% -25% -33% -50% -75%</td>
</tr>
<tr>
<td><strong>Calculated CAL RBC</strong></td>
<td>101.8 113.9 106.1 104.0 103.3</td>
<td>101.8 99.6</td>
<td>101.8 99.6</td>
<td>101.8 99.6</td>
</tr>
<tr>
<td><strong>Total Adjusted Capital</strong></td>
<td>526.6 526.6 526.6 526.6 526.6</td>
<td>526.6 526.6 526.6 526.6 526.6</td>
<td>526.6 526.6 526.6 526.6 526.6</td>
<td>526.6 526.6 526.6 526.6 526.6</td>
</tr>
<tr>
<td><strong>Calculated CAL RBC Ratio</strong></td>
<td>517% 462% 496%</td>
<td>506% 510%</td>
<td>517% 529%</td>
<td>517% 529% 540%</td>
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<tr>
<td><strong>Change in RBC Ratio vs Baseline</strong></td>
<td>- -55% -21% -11% -7% 0%</td>
<td>- -56% -22% -12% -8%</td>
<td>- -55% -21% -11% -7% 0%</td>
<td>- -55% -21% -11% -7% 0%</td>
</tr>
<tr>
<td><strong>Low Longevity Exposure Company Example</strong></td>
<td><em>Shown on page 14</em></td>
<td><em>Shown on page 14</em></td>
<td><em>Shown on page 14</em></td>
<td><em>Shown on page 14</em></td>
</tr>
</tbody>
</table>
Questions

- Paul Navratil, MAAA, FSA
  Chairperson, Longevity Risk Task Force

- Ian Trepanier
  Life Policy Analyst
  American Academy of Actuaries
  Trepanier@actuary.org
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This proposal creates a new schedule in the life and fraternal RBC formula along with the necessary instructions to incorporate a charge for longevity risk.

**REASON OR JUSTIFICATION FOR CHANGE**

The Longevity Risk (A/E) Subgroup was charged with providing recommendations for recognizing longevity risk in statutory reserves and/or RBC, as appropriate. This represents the Subgroup’s recommendation as it applies to RBC.
Basis of Factors

The factors chosen represent surplus needed to provide for claims in excess of reserves resulting from increased policyholder longevity calibrated to a 95th percentile level. For the purpose of this calibration aggregate reserves were assumed to provide for an 85th percentile outcome.

Longevity risk was considered over the entire lifetime of the policies since these annuity policies are generally not subject to repricing. Calibration of longevity risk considered both trend risk based on uncertainty in future population mortality improvements, as well as level or volatility risk which derives from misestimation of current population mortality rates or random fluctuations. Trend risk applies equally to all populations whereas level and volatility risk factors decrease with larger portfolios consistent with the law of large numbers.

Statutory reserve was chosen as the exposure base as a consistent measure of the economic exposure to increased longevity. Factors were also scaled by reserve level since number of insured policyholders is a less accessible measure of company specific volatility risk. Factors provided are pre-tax and were developed assuming a 21% tax adjustment would be subsequently applied.

Specific Instructions for Application of the Formula

Annual statement reference is for the total life contingent reserve for the products in scope. The scope includes annuity products with life contingent payments where benefits are to be distributed in the form of an annuity. It does not include annuity products that are not life contingent, or deferred annuity products where the policyholder has a right but not an obligation to annuitize. Line (3) for General Account Life Contingent Miscellaneous reserves is included in the event there are any reserves for products in scope reported on Exhibit 5 line 0799999; it is not meant to include cash flow testing reserves reported on this line. Included in scope are:

- Single Premium Immediate Annuities (SPIA) and other payout annuities in pay status
- Deferred Payout Annuities which will enter annuity pay status in the future upon annuitization
- Structured Settlements for annuitants with any life contingent benefits
- Group Annuities, such as those associated with pension liabilities with both immediate and deferred benefits

The total reserve exposure is then further broken down by size as in a tax table. This breakdown will not appear on the RBC filing software or on the printed copy, as the application of factors to reserves is completed automatically. The calculation is as follows:

<table>
<thead>
<tr>
<th>Line (5)</th>
<th>Life Contingent Annuity Reserves</th>
<th>Statement Value</th>
<th>Factor</th>
<th>RBC Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 250 Million</td>
<td></td>
<td></td>
<td>0.0171</td>
<td></td>
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<tr>
<td>Next 250 Million</td>
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<td>0.0108</td>
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<tr>
<td>Next 500 Million</td>
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<td>Over 1,000 Million</td>
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<td>0.0089</td>
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<tr>
<td>Total Life Contingent Annuity Reserves</td>
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<td></td>
<td></td>
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</tbody>
</table>
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### Longevity Risk

<table>
<thead>
<tr>
<th>Life Contingent Annuity Reserves</th>
<th>Statement Value</th>
<th>Factor</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) General Account Life Contingent Annuity Reserves</td>
<td>Blue Book Exhibit 5 column 2 row 0299999, in part ‡</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) General Account Life Contingent Supplemental Contract Reserves</td>
<td>Blue Book Exhibit 5 column 2 row 0399999, in part ‡</td>
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<td></td>
</tr>
<tr>
<td>(3) General Account Life Contingent Miscellaneous Reserves</td>
<td>Blue Book Exhibit 5 column 2 row 0799999, in part ‡</td>
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<td></td>
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<tr>
<td>(4) Separate Account Life Contingent Annuity Reserves</td>
<td>Green Book Exhibit 3 column 2 row 0299999, in part ‡</td>
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<td></td>
</tr>
<tr>
<td>(5) Total Life Contingent Annuity Reserves</td>
<td>Lines (1) + (2) + (3) + (4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† The tiered calculation is illustrated in the Longevity Risk section of the risk-based capital instructions.
‡ Include only the portion of reserves for products in scope per the instructions

Denotes items that must be manually entered on the filing software.
## CALCULATION OF TAX EFFECT FOR LIFE AND FRATERNAL RISK-BASED CAPITAL (CONTINUED)

<table>
<thead>
<tr>
<th>Source</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>### (134) Long-Term Care</td>
<td>LR019 Health Premiums Column (2) Line (28) + LR023 Long-Term Care Column (4) Line (7)</td>
<td>X 0.2100 =</td>
</tr>
<tr>
<td>### (135) Life Insurance C-2 Risk</td>
<td>LR025 Life Insurance Column (2) Line (8)</td>
<td>X 0.2100 =</td>
</tr>
<tr>
<td>### (136) Group Insurance C-2 Risk</td>
<td>LR025 Life Insurance Column (2) Lines (20) and (21)</td>
<td>X 0.2100 =</td>
</tr>
<tr>
<td>### (136b) Longevity C-2 Risk</td>
<td>LR025 Longevity Risk Column (2) Line (15)</td>
<td>X 0.2100 =</td>
</tr>
<tr>
<td>### (137) Disability and Long-Term Care Health Claim Reserves</td>
<td>LR024 Health Claim Reserves Column (4) Line (9) + Line (15)</td>
<td>X 0.2100 =</td>
</tr>
<tr>
<td>### (138) Premium Stabilization Credit</td>
<td>LR026 Premium Stabilization Reserves Column (2) Line (10)</td>
<td>X 0.0000 =</td>
</tr>
<tr>
<td>### (139) Total C-2 Risk</td>
<td>Lines (133) + (134) + (135) + (136) + (136b) + (137) + (138)</td>
<td>X 0.0000 =</td>
</tr>
<tr>
<td>### (140) Interest Rate Risk</td>
<td>LR027 Interest Rate Risk Column (3) Line (36)</td>
<td>X 0.2100 =</td>
</tr>
<tr>
<td>### (141) Health Credit Risk</td>
<td>LR028 Health Credit Risk Column (2) Line (7)</td>
<td>X 0.0000 =</td>
</tr>
<tr>
<td>### (142) Market Risk</td>
<td>LR027 Interest Rate Risk Column (3) Line (37)</td>
<td>X 0.2100 =</td>
</tr>
<tr>
<td>### (143) Business Risk</td>
<td>LR029 Business Risk Column (2) Line (40)</td>
<td>X 0.2100 =</td>
</tr>
<tr>
<td>### (144) Health Administrative Expenses</td>
<td>LR029 Business Risk Column (2) Line (57)</td>
<td>X 0.0000 =</td>
</tr>
<tr>
<td>### (145) Total Tax Effect</td>
<td>Lines (109) + (120) + (132) + (139) + (140) + (141) + (142) + (143) + (144)</td>
<td>X 0.0000 =</td>
</tr>
</tbody>
</table>

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**CALCULATION OF AUTHORIZED CONTROL LEVEL RISK-BASED CAPITAL (CONTINUED)**

<table>
<thead>
<tr>
<th><strong>Insurance Risk (C-2)</strong></th>
<th><strong>Source</strong></th>
<th><strong>Requirement</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>(43) Individual and Industrial Life Insurance</td>
<td>LR025 Life Insurance Column (2) Line (8)</td>
<td></td>
</tr>
<tr>
<td>(44) Group and Credit Life Insurance and FEGI/SGLI</td>
<td>LR025 Life Insurance Column (2) Lines (20) and (21)</td>
<td></td>
</tr>
<tr>
<td>(44b) Longevity Risk</td>
<td>LRtbd Longevity Risk Column (2) Line (5)</td>
<td></td>
</tr>
<tr>
<td>(45) Total Health Insurance</td>
<td>LR024 Health Claim Reserves Column (4) Line (18)</td>
<td></td>
</tr>
<tr>
<td>(46) Premium Stabilization Reserve Credit</td>
<td>LR026 Premium Stabilization Reserves Column (2) Line (10)</td>
<td></td>
</tr>
<tr>
<td>(47) Total (C-2) - Pre-Tax</td>
<td>Sum of Lines (43) through (46)</td>
<td></td>
</tr>
<tr>
<td>(48) (C-2) Tax Effect</td>
<td>LR030 Calculation of Tax Effect for Life and Fraternal Risk-Based Capital Column (2) Line (139)</td>
<td></td>
</tr>
<tr>
<td>(49) Net (C-2) - Post-Tax</td>
<td>Line (47) - Line (48)</td>
<td></td>
</tr>
</tbody>
</table>
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November 22, 2019

Ms. Rhonda Ahrens  
Chair, Longevity Risk (A/E) Subgroup  
National Association of Insurance Commissioners

Via email: Dave Fleming (dfleming@naic.org)

Re: RBC Blank Implementation of Longevity C-2

Dear Rhonda,

On behalf of the Longevity Risk Task Force of the American Academy of Actuaries,¹ I am providing sample changes to risk-based capital (RBC) blanks to implement longevity C-2 factors to assist the Longevity Risk Subgroup.

Changes from the existing blanks are highlighted in yellow in the attached excel file.

- The LRtbd tab was previously provided to calculate the pre-tax longevity C-2 amount based on the factors proposed by the LRTF.
- Changes to LR030 include longevity risk in the calculation of tax effect for C-2.
- Changes to LR031 include longevity risk in the calculation of Net C-2 Post-Tax.

It was necessary to add new lines to LR030 and LR031 for longevity risk. This was done in this sample by adding lines numbered with “b.” It may be preferable in a final version to renumber the entire calculation so that longevity risk uses a uniquely numbered line.

Correlation between longevity and mortality is included in the formulas suggested for implementation. The formula includes a TBD Correlation Factor which can be inserted into the formula pending a decision by Life RBC on correlation.

At your request we have also included an alternative formula (provided to the right in the exhibit) that includes a Guardrail Factor that could be used to limit the reduction from correlation. We do not believe this Guardrail Factor is needed as part of the implementation of longevity C-2. If correlation is implemented with the Guardrail Factor, we recommend that it be

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¹ The American Academy of Actuaries is a 19,500-member professional association whose mission is to serve the public and the U.S. actuarial profession. For more than 50 years, the Academy has assisted public policymakers on all levels by providing leadership, objective expertise, and actuarial advice on risk and financial security issues. The Academy also sets qualification, practice, and professionalism standards for actuaries in the United States.
reviewed and phased out over time rather than become a permanent factor increasing the complexity of the RBC calculation.

*****

Should you have any questions or comments regarding this letter, please contact Ian Trepanier, life policy analyst at the Academy (trepanier@actuary.org).

Sincerely,

Paul Navratil, MAAA, FSA
Chairperson, Longevity Risk Task Force
American Academy of Actuaries
<table>
<thead>
<tr>
<th>Source</th>
<th>RBC Amount</th>
<th>Tax Factor</th>
<th>RBC Tax Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>(134) Long-Term Care</td>
<td>LR019 Health Premiums Column (2) Line (20) + LR023 Long-Term Care Column (4) Line (7)</td>
<td>X 0.2100</td>
<td>=</td>
</tr>
<tr>
<td>(135) Life Insurance C-2 Risk</td>
<td>LR025 Life Insurance Column (2) Line (8)</td>
<td>X 0.2100</td>
<td>=</td>
</tr>
<tr>
<td>(136) Group Insurance C-2 Risk</td>
<td>LR025 Life Insurance Column (2) Lines (20) and (21)</td>
<td>X 0.2100</td>
<td>=</td>
</tr>
<tr>
<td>(137) Longevity C-2 Risk</td>
<td>LR034 Longevity Risk Column (2) Line (5)</td>
<td>X 0.2100</td>
<td>=</td>
</tr>
<tr>
<td>(138) Disability and Long-Term Care Health Claims Reserves</td>
<td>LR024 Health Claim Reserves Column (4) Line (9) + Line (15)</td>
<td>X 0.2100</td>
<td>=</td>
</tr>
<tr>
<td>(139) Total C-2 Risk</td>
<td>LR025 Premium Stabilization Reserves Column (2) Line (10)</td>
<td>X 0.0000</td>
<td>=</td>
</tr>
</tbody>
</table>

Alternative with Guardrail Factor:

\[
\text{L}(133) + \text{L}(134) + \text{L}(137) + \text{L}(138) + \text{Square Root of} \left( \left( \text{L}(135) + \text{L}(136) \right)^2 + \text{L}(136b)^2 + 2 \times (\text{TBD Correlation Factor}) \times (\text{L}(135) + \text{L}(136)) \times \text{L}(136b) \right)
\]

\[
\text{L}(133) + \text{L}(134) + \text{L}(137) + \text{L}(138) + \text{Greatest of} \left( \text{Guardrail Factor} \times \left( \text{L}(135) + \text{L}(136) \right), \text{Guardrail Factor} \times \text{L}(136b) \right)
\]

\[
\text{Square Root of} \left( \left( \text{L}(133) + \text{L}(134) \right)^2 + \text{L}(136b)^2 + 2 \times (\text{TBD Correlation Factor}) \times (\text{L}(133) + \text{L}(134)) \times \text{L}(136b) \right)
\]
### Calculation of Authorized Control Level Risk-Based Capital (Continued)

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Source</th>
<th>Confidential when Completed</th>
<th>(1) RBC Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insurance Risk (C-2)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(43) Individual and Industrial Life Insurance</td>
<td>LR025 Life Insurance Column (2) Line (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(44) Group and Credit Life Insurance and FEGI/SGLI</td>
<td>LR025 Life Insurance Column (2) Lines (20) and (21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(44b) Longevity Risk</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(45) Total Health Insurance</td>
<td>LR024 Health Claim Reserves Column (4) Line (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(46) Premium Stabilization Reserve Credit</td>
<td>LR026 Premium Stabilization Reserve Column (2) Line (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(47) Total (C-2) - Pre-Tax</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(48) (C-2) Tax Effect</td>
<td>LR030 Calculation of Tax Effect for Life and Fraternal Risk-Based Capital Column (2) Line (139)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(49) Net (C-2) - Post-Tax</td>
<td>Line (47) - Line (48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interest Rate Risk (C-3a)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(50) Total Interest Rate Risk - Pre-Tax</td>
<td>LR027 Interest Rate Risk Column (3) Line (36)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(51) (C-3a) Tax Effect</td>
<td>LR030 Calculation of Tax Effect for Life and Fraternal Risk-Based Capital Column (2) Line (140)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(52) Net (C-3a) - Post-Tax</td>
<td>Line (50) - Line (51)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Health Credit Risk (C-3b)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(53) Total Health Credit Risk - Pre-Tax</td>
<td>LR028 Health Credit Risk Column (2) Line (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(54) (C-3b) Tax Effect</td>
<td>LR030 Calculation of Tax Effect for Life and Fraternal Risk-Based Capital Column (2) Line (141)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(55) Net (C-3b) - Post-Tax</td>
<td>Line (53) - Line (54)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Market Risk (C-3c)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(56) Total Market Risk - Pre-Tax</td>
<td>LR027 Interest Rate Risk Column (3) Line (37)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(57) (C-3c) Tax Effect</td>
<td>LR030 Calculation of Tax Effect for Life and Fraternal Risk-Based Capital Column (2) Line (142)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(58) Net (C-3c) - Post-Tax</td>
<td>Line (56) - Line (57)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Alternative with Guardrail Factor:**

\[
\text{LR}(45) + \text{LR}(46) + \text{LR}(44b) + \text{LR}(44b) + \sqrt{\left[ \left( \text{LR}(43) + \text{LR}(44) \right)^2 + \left( \text{LR}(44b) \right)^2 + 2 \times (\text{TBD Correlation Factor}) \times (\text{LR}(43) + \text{LR}(44)) \times \text{LR}(44b) \right]}
\]

\[
\text{LR}(45) + \text{LR}(46) + \text{LR}(44b) + \text{LR}(44b) + \text{L}(44b) + \sqrt{\left[ \left( \text{LR}(43) + \text{LR}(44) \right)^2 + \left( \text{LR}(44b) \right)^2 + 2 \times (\text{TBD Correlation Factor}) \times (\text{LR}(43) + \text{LR}(44)) \times \text{LR}(44b) \right]}
\]
November 26, 2019

Mr. Philip Barlow  
Chair, NAIC Life Risk-Based Capital (E) Working Group

Re: Longevity Risk (A/E) Subgroup Recommendation for incorporating an RBC charge for longevity risk

Dear Philip:

The American Council of Life Insurers (ACLI)\(^1\) appreciates the opportunity to provide comments regarding the November 25\(^{th}\), 2019 Recommendation for incorporating an RBC charge for longevity risk (Recommendation) from Longevity Risk (A/E) Subgroup (Subgroup).

While ACLI believes the memorandum itself appropriately captures the deliberations and decisions made by the Subgroup, we are concerned about the removal of the formula reflecting the correlation adjustment between the C-2 mortality and longevity factors in LR030 and LR031. As the Recommendation makes clear, the Subgroup deemed it appropriate that any decision on the correlation adjustment be made by the Life Risk-Based Capital (E) Working Group (Working Group). However, the removal of the formula is equivalent to a +100% correlation between the factors, which is inconsistent with the Recommendation and the American Academy of Actuaries’ (Academy) proposal. ACLI strongly urges any exposure from the Working Group reflect the correlation factor in the formulas on LR030 and LR031. We note that the Academy recommended formula would work correctly regardless of the level of correlation that the Working Group ultimately decides.

The following table illustrates the formula using the examples of the Academy deck, and specifically that a +100% correlation factor is equivalent to the sum of the mortality and longevity risk charges. Formulaically, the C-2 risk is SQRT(C2a^2 + C2b^2 + 2*(Correlation Factor)*C2a*C2b):

| C2a Mortality/Other Insurance Risk | 25.1   | 25.1   | 25.1   | 25.1   |
| C2b Longevity Insurance Risk       | 75.4   | 75.4   | 75.4   | 75.4   |
| Correlation Factor                 | 100%   | 0%     | -25%   | -33%   |
| C-2 Insurance Risk                 | 100.5  | 79.5   | 73.3   | 71.2   |

We appreciate the consideration of our comments in the Working Group’s exposure.

---

\(^1\) The American Council of Life Insurers (ACLI) advocates on behalf of 280 member companies dedicated to providing products and services that promote consumers’ financial and retirement security. 90 million American families depend on our members for life insurance, annuities, retirement plans, long-term care insurance, disability income insurance, reinsurance, dental and vision and other supplemental benefits. ACLI represents member companies in state, federal and international forums for public policy that supports the industry marketplace and the families that rely on life insurers’ products for peace of mind. ACLI members represent 95 percent of industry assets in the United States. Learn more at www.acli.com.
Sincerely,

[Signature]

cc  Dave Fleming, NAIC
Academy C-2 Mortality Work Group Update

Chris Trost, MAAA, FSA
Chairperson, C-2 Work Group
American Academy of Actuaries
Agenda

- Methods and assumptions
  - Follow-up from June update
  - Directional change in individual life C-2 mortality factors
- Next steps
C-2 Mortality Overall Approach

- C-2 requirement covers mortality risk at the 95th percentile and is net of risk covered in statutory reserves
- C-2 requirement includes mortality risks related to:
  - Volatility Risk – natural statistical deviations in experienced mortality
  - Level Risk – error in base mortality assumption
  - Trend Risk – adverse mortality trend
  - Catastrophe Risk – large temporary mortality increase from a severe event
- Evaluate mortality risks using Monte Carlo simulation
- Express capital requirement using a factor-based approach (e.g., factor applied to NAR)
# Current C-2 Life Mortality Risk-Based Capital

## Pre-Tax RBC Factors*

<table>
<thead>
<tr>
<th>Per $1000 of NAR</th>
<th>Individual</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>First $500M</td>
<td>2.23</td>
<td>1.75</td>
</tr>
<tr>
<td>Next $4.5B</td>
<td>1.46</td>
<td>1.16</td>
</tr>
<tr>
<td>Next $20B</td>
<td>1.17</td>
<td>0.87</td>
</tr>
<tr>
<td>&gt;$25B</td>
<td>0.87</td>
<td>0.78</td>
</tr>
</tbody>
</table>

*Reflects updates due to tax reform
# Method and Assumption Comparison

<table>
<thead>
<tr>
<th>Item</th>
<th>Current</th>
<th>Updated - Preliminary</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Method</td>
<td>Monte-Carlo Model—PV of Mortality Losses</td>
<td>Monte-Carlo Model—PV of Mortality Losses</td>
</tr>
<tr>
<td>Capital Quantification</td>
<td>$95^{th} \ [PV(\text{Scenario Actual}) - 105% \cdot PV(\text{Scenario Expected})]$</td>
<td>Evaluating multiple methods including:</td>
</tr>
<tr>
<td></td>
<td>$\cdot \ 105%$ represents assumed margin (approx. one standard deviation) available to offset losses in excess of expected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Same as described in “Current”</td>
<td>$PV(95^{th}) - PV(84^{th})$</td>
</tr>
<tr>
<td>Projection Period</td>
<td>5 years (3 years for Group)</td>
<td>5 years (3 years for Group)</td>
</tr>
<tr>
<td></td>
<td>$\cdot$ Assumed exposure past 5 years could be offset through management actions (raise premium, etc.)</td>
<td>$\cdot$ Will consider other periods as well</td>
</tr>
<tr>
<td>Discount rate</td>
<td>6% after tax</td>
<td>5% pretax (3.95% after tax)</td>
</tr>
<tr>
<td>Base Mortality</td>
<td>88% of 1975–1980 Male Basic Table</td>
<td>2017 Unloaded CSO</td>
</tr>
<tr>
<td></td>
<td>$\cdot$ 15Y Select &amp; Ultimate Structure</td>
<td>$\cdot$ 25Y Select &amp; Ultimate structure</td>
</tr>
<tr>
<td></td>
<td>$\cdot$ Male/Female not explicitly modelled</td>
<td>$\cdot$ Gender distinct—Male/Female</td>
</tr>
<tr>
<td></td>
<td>$\cdot$ Underwriting adjustments applied based on generation</td>
<td>$\cdot$ 5 underwriting classes (3 nonsmoker/2 smoker)</td>
</tr>
<tr>
<td>Base Improvement</td>
<td>Unknown source</td>
<td>2017 Improvement Scale for AG-38</td>
</tr>
<tr>
<td></td>
<td>$\cdot$ 1.00%</td>
<td>$\cdot$ Varies by gender and age</td>
</tr>
</tbody>
</table>
### Directional Impact on Individual Life C-2 Factors

<table>
<thead>
<tr>
<th>Risk Component</th>
<th>Impact on current factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatility</td>
<td>Possible decrease</td>
</tr>
<tr>
<td>Level</td>
<td>Possible decrease</td>
</tr>
<tr>
<td>Trend</td>
<td>Possible increase</td>
</tr>
<tr>
<td>Catastrophe</td>
<td>Possible increase</td>
</tr>
<tr>
<td>Overall</td>
<td>Possible decrease</td>
</tr>
</tbody>
</table>

Assumes 5-year projection period
# Risk Component Comparison

<table>
<thead>
<tr>
<th>Risk Component</th>
<th>Key Updates</th>
<th>Estimated Directional Impact on the C-2 Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatility</td>
<td>• Lower base mortality rates</td>
<td>Decrease 5-10%</td>
</tr>
<tr>
<td>Level</td>
<td>• Exclusion of AIDS scenarios based on early ’90s estimates</td>
<td>Decrease 20-30%</td>
</tr>
</tbody>
</table>
# Risk Component Comparison

<table>
<thead>
<tr>
<th>Risk Component</th>
<th>Key Updates</th>
<th>Estimated Directional Impact the C-2 factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trend</td>
<td>• Greater range of mortality trends and possible differences by age/sex cohort</td>
<td>Increase 5-15%</td>
</tr>
</tbody>
</table>
| Catastrophe    | • Similar pandemic severity  
• Addition of 9/11-type terrorism event                                       | Increase 0-5%                               |
Summary of Current Developments

- Preliminary analysis suggests a possible decrease in C-2 requirement, however more analysis needed
- Biggest reductions are due to exclusion of AIDS scenarios at early ’90s estimates and improvement in mortality levels compared to what was expected in the original C-2 factors
- Some increase in trend and catastrophe components
Next Steps

- Additional analysis
  - Appropriate projection period
  - Differences between products
  - Size breakpoints; exposure base
  - Analysis of industry data; implication of “high” vs. “low” mortality company
- Group Life
- Preliminary factor development completion targeted for 2020
- Provide LRBCWG call update in Q1/Q2
Questions?

Additional Questions, contact:

Chris Trost, MAAA, FSA
Chairperson, C-2 Work Group

Ian Trepanier
Life Policy Analyst
American Academy of Actuaries
trepanier@actuary.org
Appendix
# Risk Distribution Approach Comparison

<table>
<thead>
<tr>
<th>Risk</th>
<th>Original Work</th>
<th>Current Review- Preliminary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatility</td>
<td>Binomial(Policies, q)</td>
<td>Binomial(Policies, q)</td>
</tr>
<tr>
<td>Level</td>
<td>Implicit from Discrete Scenarios:</td>
<td>LR~N(0, σ&lt;sub&gt;lev&lt;/sub&gt;); σ&lt;sub&gt;lev&lt;/sub&gt; = \sqrt{σ_{Stat Samp.}^2 + σ_{Natural}^2}</td>
</tr>
<tr>
<td></td>
<td>▪ 7 Competitive Pressures scenarios – risk of</td>
<td>▪ Two independent components:</td>
</tr>
<tr>
<td></td>
<td>overoptimistic pricing assumptions</td>
<td>▪ Statistical sampling/credibility volatility (σ&lt;sub&gt;stat samp.&lt;/sub&gt;)</td>
</tr>
<tr>
<td></td>
<td>▪ 15 AIDS scenarios – early ’90s estimates of the</td>
<td>▪ Natural mortality volatility (σ&lt;sub&gt;natural&lt;/sub&gt;)</td>
</tr>
<tr>
<td></td>
<td>impact of AIDS on insured mortality</td>
<td>▪ Continuous normal distribution</td>
</tr>
<tr>
<td></td>
<td>▪ 4 Adverse Lapse Scenarios</td>
<td></td>
</tr>
<tr>
<td>Trend</td>
<td>Discrete Distribution</td>
<td>[D₁, D₂, …, D₆] ~ N(μ, Σ)</td>
</tr>
<tr>
<td></td>
<td>▪ 7 scenarios adjust mortality improvement</td>
<td>▪ 6 gender/age group improvement deviation variables (Dₙ)</td>
</tr>
<tr>
<td></td>
<td>assumption</td>
<td>▪ Correlated normally distributed random variables</td>
</tr>
<tr>
<td>Catastrophe</td>
<td>Discrete Distribution</td>
<td>2 Discrete Distributions</td>
</tr>
<tr>
<td></td>
<td>▪ Pandemic</td>
<td>▪ Pandemic – calibrated from multiple sources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Terrorism – 5% probability of additional 0.05 / 1K</td>
</tr>
</tbody>
</table>
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We are in favor of having a growth risk RBC charge for life insurers. There have been several insolvencies or near insolvencies over the years triggered in part by rapid growth including Executive Life and Mutual Benefit Life in the early 1990s. Many of these involved excessive sale of deferred annuities and/or GICs with high guaranteed interest rates. Even within the last five years, we have had to stop some insurers from selling deferred annuities with high guaranteed interest rates.

William B. Carmello, Jr., FSA, MAAA
Chief Life Actuary

New York State Department of Financial Services
One Commerce Plaza, Albany, NY 12257
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November 20, 2019

Mr. Philip Barlow
Chair, Life Risk-Based Capital Working Group

Re: Life Growth Operational Risk Memorandum

Dear Philip:

The American Council of Life Insurers (ACLI)\(^1\) appreciates the opportunity to comment on the March 27\(^{th}\) NAIC Operational Risk (E) Subgroup Memorandum “Potential Further Work on Life Growth Operational Risk” (Memorandum) on behalf of our member companies.

As previously articulated in comments and captured in the Memorandum, ACLI does not support the inclusion of a life growth risk charge to the Life RBC formula. Our main arguments against the need for a life growth risk charge are summarized as follows:

1) Regulators already have tools to assess life growth risk

The Life Trend Test already captures the impact of growth by testing if a similar amount of strain in the next year would lead to an RBC event. Under today’s RBC formula, fast-growing companies will indeed have corresponding fast-growing RBC requirements. Furthermore, if a company grows through acquisition, regulators must approve such transactions and have extensive access to information about both the acquiring company and the target company.

2) Rapid growth is less prevalent than in health or property/casualty insurance

The purpose of a growth risk charge is to measure the risk associated with rapid growth of a company’s book of business. In the health and property/casualty space, much of the business is renewed annually, and entire books of business may turn over in a few years. Rapid growth is likely a sign of mispricing that is not adequately captured in the pricing risk charge. For life insurance, the duration of the business is measured in years, and does not generally allow for frequent premium re-rating. As such, life books of business are generally stable over time. Further, the life insurance industry is fairly mature which limits aggregate growth. Rapid growth for a life insurer is more likely a sign of a reinsurance transaction or block acquisition, both of which would adequately be covered by the additional C-1, C-2, C-3, and C-4 charges that would occur when the business is added. Both the proposed methods for life growth risk charges may result in many companies being subject to a growth charge, which is not only counterintuitive, but not indicative of additional risk not already captured elsewhere.

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3) Appropriate measurement is difficult and application of a single year charge is inappropriate

Unlike in health or property/casualty insurance, a one-year measurement is not appropriate for life insurance due to the long duration of the business written. Were a life growth risk charge to be developed, it would likely need to look very different than the rest of the RBC framework, applicable for several years after the risk is first added to the life insurance company. The Memorandum acknowledges Method 1 (informational filing) was flawed and would not be an effective measurement of growth risk. Method 2 (enhanced add-on) creates an arbitrary threshold which is not risk sensitive and would create a “cliff effect”. Treating all companies below the threshold identically won’t give regulators reliable information about the riskiness of the various companies. For some companies, this has the potential to lead to an on-again, off-again application of this charge that would be difficult to plan for and would not add meaningful signal value to the company or its regulator.

While we agree that RBC is an integral part of the regulatory framework to address risk, we believe that an explicit life growth charge creates challenges. A question for regulators is whether an explicit life growth charge is necessary for the RBC calculation given that growth is implicitly captured elsewhere in the RBC framework; the absence of an explicit measure is not an indication that a risk is not being captured. Other regulatory risk frameworks have different purposes than RBC, so there is not an apples-to-apples comparison between frameworks. Finally, while we acknowledge that smaller companies may not be subject to the same regulatory tools as larger companies, the introduction of an additional life growth risk charge may introduce unwarranted volatility into the RBC ratio for smaller companies and thus make them less competitive in the marketplace.

We are available to discuss our positions on this topic at the convenience of working group members or other regulators.

Sincerely,

[Signature]

cc Dave Fleming, NAIC