CAPITAL ADEQUACY (E) TASK FORCE

Draft: 11/20/25

Capital Adequacy (E) Task Force
Virtual Meeting
November 19, 2025

The Capital Adequacy (E) Task Force met Nov. 19, 2025. The following Task Force members participated: Doug Ommen, Chair, represented by Mike Yanacheak (IA); Judith L. French, Vice Chair, represented by Tom Botsko (OH); Heather Carpenter represented by David Phifer (AK); Mark Fowler represented by Charles Hale (AL); Ricardo Lara represented by Shaowei Yang (CA); Michael Conway represented by Rolf Kaumann (CO); Andrew N. Mais represented by Wanchin Chou (CT); Karima M. Woods represented by Philip Barlow (DC); Michael Yaworsky represented by Carolyn Morgan (FL); Ann Gillespie represented by Matt Cheung (IL); Holly W. Lambert represented by Roy Eft (IN); Vicki Schmidt represented by Chut Tee (KS); Sharon P. Clark represented by Vicki Lloyd (KY); Timothy J. Temple represented by Tom Travis (LA); Grace Arnold represented by Fred Andersen (MN); Angela L. Nelson represented by John Rehagen (MO); Jon Godfread represented by Matt Fischer (ND); Eric Dunning represented by Tadd Wegner (NE); Justin Zimmerman represented by Paul Lupo (NJ); Elizabeth Kelleher Dwyer represented by Liz Ammerman (RI); Michael Wise represented by Thomas Baldwin (SC); Carter Lawrence represented by Trey Hancock (TN); Cassie Brown represented by Jamie Walker and Rachel Hemphill (TX); Scott A. White represented by Greg Chew (VA); Patty Kuderer represented by Steve Drutz (WA); and Nathan Houdek represented by Amy Malm (WI).

1. Heard Introductory Remarks

Yanacheak reported that the Capital Adequacy (E) Task Force met Oct. 23 in joint session with the Risk-Based Capital Model Governance (EX) Task Force to address the risk-based capital (RBC) preamble issue. The Risk-Based Capital Model Governance (EX) Task Force determined that further discussion of this matter would be more appropriately handled within its own group. As a result, the Capital Adequacy (E) Task Force has been requested to postpone any action regarding the preamble at this time. Yanacheak noted that the issue remains on the working agenda in a pending status, and the Capital Adequacy (E) Task Force will refrain from further deliberation until additional guidance is received from the Risk-Based Capital Model Governance (EX) Task Force.

2. Adopted the Risk-Based Capital Model Governance (EX) Task Force and Capital Adequacy (E) Task Force's Oct. 23 Joint Minutes and the Capital Adequacy (E) Task Force's Summer National Meeting Minutes

Yanacheak reported that the Capital Adequacy (E) Task Force met Oct. 23 in joint session with the Risk-Based Capital Model Governance (EX) Task Force and took the following action: 1) heard introductory remarks; 2) received an update on the RBC preamble issue; 3) discussed comments received on proposed preamble changes; and 4) discussed related issues at the Risk-Based Capital Model Governance (EX) Task Force.

Botsko made a motion, seconded by Kaumann, to adopt the Capital Adequacy (E) Task Force and Risk-Based Capital Model Governance (EX) Task Force's joint Oct. 23 minutes (*see NAIC Proceedings – Fall 2025, Risk-Based Capital Model Governance (EX) Task Force*) and the Capital Adequacy (E) Task Force's Aug. 12 minutes (*see NAIC Proceedings – Summer 2025, Capital Adequacy (E) Task Force*). The motion passed unanimously.

3. Adopted the Reports of its Working Groups

A. Risk-Based Capital Investment Risk and Evaluation (E) Working Group

Barlow reported that the Risk-Based Capital Investment Risk and Evaluation (E) Working Group met Nov. 4 and Sept 8. During these meetings, the Working Group took the following action: 1) adopted its Sept. 8 minutes, which included the following action: a) adopted its June 23 meeting minutes; and b) heard an update from the American Academy of Actuaries (Academy) on the structured securities project with an emphasis on collateralized loan obligations (CLOs); and 2) discussed comment letters received on proposal 2025-12-IRE (Securities Valuation Office Funds Alignment Project).

B. Life Risk-Based Capital (E) Working Group

Barlow reported that the Life Risk-Based Capital (E) Working Group met Nov. 14; Oct. 31 in joint session with the Variable Annuities Capital and Reserve (E/A) Subgroup; and Sept. 11. During these meetings, the Working Group took the following action: 1) adopted its Sept. 11 minutes, which included the following action: a) adopted the Working Group and Variable Annuities Capital and Reserve (E/A) Subgroup's joint July 21 minutes and the Working Group's June 18 minutes; b) heard a presentation from the Academy on C-3 alignment; and c) exposed the covariance slide deck for a 60-day public comment period ending Nov. 10; 2) adopted the Working Group and Variable Annuities Capital and Reserve (E/A) Subgroup's joint Oct. 31 minutes, which included the following action: a) discussed comments received on the proposed changes to C3 Phase I and Phase II calculations and the life RBC instructions; b) re-exposed modified changes for a 60-day public comment period ending Jan. 5, 2026; c) adopted the proposed changes to the Valuation Manual (VM)-21, Requirements for Principle-Based Reserves for Variable Annuities, supplement blanks and instructions; d) exposed scope clarification proposals for VM-21 and life RBC for a 28-day public comment period ending Dec. 1; and e) heard updates on C3 Phase II analysis; 3) discussed comment letters received on the exposed covariance slide deck; 4) adopted its 2026 working agenda; and 5) exposed the conceptual proposal 2025-16-L (Collateral Loans) for a 60-day public comment period ending Jan. 13, 2026.

C. Property and Casualty Risk-Based Capital (E) Working Group and Catastrophe Risk (E) Subgroup

Botsko reported that the Property and Casualty Risk-Based Capital (E) Working Group and Catastrophe Risk (E) Subgroup met Nov. 12 and Oct. 8 in joint session. During these meetings, the Working Group and Subgroup took the following action: 1) adopted their Oct. 8 minutes, which included the following action: a) adopted their June 30 minutes; b) discussed the catastrophe modeling wildfire review and impact analysis; c) discussed the possibility of updating the Rcat covariance formula; d) discussed the possibility of separating the earthquake and hurricane losses experience PR100s; e) discussed the Securities Valuation Office (SVO)-funded RBC alignment project; f) heard updates from the Academy regarding property/casualty (P/C) RBC premium and loss concentration factors; and g) discussed accident and health structure in the P/C RBC formula; 2) adopted proposal 2025-08-CR (Jan. 1-Oct. 15 Cat Event List); 3) exposed proposal 2025-19-CR (Separating Earthquake and Hurricane Lines Experience Data in PR100s); 4) exposed proposal 2025-20-CR (Wildfire Rcat Implementation); 5) discussed their working agenda; 6) discussed the SVO-funded RBC alignment project; 7) received an update from the Health Risk-Based Capital (E) Working Group regarding proposal 2025-15-CA (A&H Underwriting Risk Structure Change); and 8) exposed a presentation from the Academy regarding the P/C RBC premium and loss concentration factors report.

D. Health Risk-Based Capital (E) Working Group

Drutz reported that the Health Risk-Based Capital (E) Working Group met Nov 6. During this meeting, the Working Group took the following action: 1) adopted its June 20 minutes, which included the following action: a) adopted its April 30 and Spring National Meeting minutes; and b) discussed the 2024 health RBC statistics; 2) adopted its Sept 29 minutes, which included the following action: a) discussed comments received on the Academy's H2—

Underwriting Risk Component and Managed Care Credit Calculation in the Health RBC Formula Report; b) discussed the impact analysis of the factors and structure from the Academy's H2 report; and c) exposed a referral from the Risk-Based Capital Investment Risk and Evaluation (E) Working Group for a 65-day public comment period ending Dec. 3; 3) adopted its 2025 working agenda; 4) exposed proposal 2025-15-CA (A&H Underwriting Risk Structure Change) for a 75-day public comment period ending Jan. 20, 2026; and 5) exposed a conceptual draft of the managed care credit (MCC) for a 75-day public comment period ending Jan. 20, 2026.

Drutz made a motion, seconded by Botsko, to adopt the reports of the Risk-Based Capital Investment Risk and Evaluation (E) Working Group, including its Nov. 4 and Sept. 8 minutes (Attachment Four); Life Risk-Based Capital (E) Working Group, including its Nov. 14, Oct. 31, and Sept. 11 minutes (Attachment Two); Property and Casualty Risk-Based Capital (E) Working Group and Catastrophe Risk (E) Subgroup, including their Nov. 12 and Oct. 8 minutes (Attachment Three); and Health Risk-Based Capital (E) Working Group, including its Nov. 6 minutes (Attachment One). The motion passed unanimously.

4. Adopted Proposal 2025-08-CR (Jan. 1-Oct. 15 Cat Event List)

Chou stated that proposal 2025-08-CR consolidates both U.S. and international catastrophe event lists spanning from 2016 to 2025 for use in year-end 2025 reporting. This comprehensive list encompasses major peril types, including hurricanes, earthquakes, wildfires, and severe convective storms. The first version of the 2025 event list, covering incidents from January through October, was made available for public comment via an e-vote on Nov. 3, with no feedback received during the seven-day exposure period. Chou further noted that a revised iteration of the event list will be released for additional public comment in early January 2026, with adoption anticipated by February 2026.

Chou made a motion, seconded by Botsko, to adopt proposal 2025-08-CR (Attachment Five). The motion passed unanimously.

5. Adopted its Working Agenda

Yanacheak listed the following edits to the health RBC section of the Task Force's 2026 working agenda: 1) line X1 was updated to reference the adoption of proposal 2025-03-CA; 2) a previous H2 working agenda item was split into lines X4, X5, and X6 to align with the three work products from the Academy report (i.e., the H2 structure, H2 factors, and MCC expansion); 3) line X8 was added to address the Statutory Accounting Principles (E) Working Group referral on moving some non-bond debt to Schedule BA as a result of the principles based bond project; and 4) line X9 was added because the Working Group decided to take up the long-term care (LTC) topic.

Yanacheak also listed the following changes to the Risk-Based Capital Investment Risk and Evaluation (E) Working Group section of the working agenda: 1) the item regarding structured notes is proposed to be removed; 2) the item on RBC treatment of asset-backed securities (ABS) has merged with the item on tail risk of privately structured securities due to their similarity; and 3) the item on RBC treatment of residual tranches was expanded to document the adoption of a proposal to affect a 45% RBC charge for residual tranches/interests for life insurers only.

Yanacheak indicated that the following edits were included in the life section of the working agenda: 1) the item regarding the structured proposal to split Schedule D, Part 1, into two parts is proposed to be removed based on the completion of proposal 2024-24-L MOD; 2) the item regarding the Longevity Risk (E/A) Subgroup has been expanded to include longevity reinsurance; and 3) the item on tax credit investments was added as a result of a referral from the Statutory Accounting Principle (E) Working Group.

Yanacheak noted the following updates within the P/C section of the working agenda: 1) revising expected completion dates, ongoing items, and comments for items P1, P3, P4, P5, P6, and P7; 2) removing completed items from the original P7 and P8; and 3) introducing the following three initiatives to the "New Items" section: a) evaluating the possibility of adding wildfire peril in the Rcat component; b) evaluating the possibility of separating earthquake and hurricane loss experience data in PR100s; and c) evaluating the possibility of updating the loss and premium concentration factors in PR017 and PR018.

Additionally, Yanacheak reported several changes in the general Task Force section: 1) items CA1 through CA6 have been updated to incorporate recent developments and decisions; 2) three items have been removed from the agenda, reflecting their completion; and 3) the following item has been added to the "New Items" section: a) evaluating whether to expand the instructions for LR034, LR035, PR033, PR034, and XR027 to promote consistent labeling of various company action levels across different lines of business.

Botsko made a motion, seconded by Wegner, to adopt the Task Force's working agenda (Attachment Six). The motion passed unanimously.

6. Discussed the Statutory Accounting Principles (E) Working Group Referral Regarding Collateral Loan Schedule BA Reporting Changes

Yanacheak stated that the Task Force received a referral from the Statutory Accounting Principles (E) Working Group on June 5, which focused on proposed changes to how collateral loans are reported under Schedule BA. To ensure transparency and gather stakeholder input, this referral was exposed for a 45-day public comment period ending Aug. 14. Notably, no comment letters were submitted during this exposure period. Yanacheak clarified several key points about collateral loans: these financial instruments are distinct from traditional securities—they are not classified as securities, are not rated by any nationally recognized statistical rating organization (NRSRO), and are not designated by the SVO. Instead, collateral loans are categorized and reported as "Other Long-Term Invested Assets" on Schedule BA. Currently, regardless of the type of assets backing these loans, all collateral loans are reported in line PR009 for P/C insurers and XR008 for health insurers. These loans are subject to a fixed RBC charge of 5%.

To provide further insight into the prevalence of collateral loans, Yanacheak referenced a report prepared by committee support that summarized collateral loan holdings as reported in the 2024 annual filings, broken down by type of business (Attachment Seven). The findings revealed that collateral loans represent a very small fraction of total cash and invested assets (specifically, only 0.04% for P/C insurers and effectively 0.00% for health insurers). This data suggests that, at present, collateral loans do not pose a significant concentration risk within these sectors.

Tee stated that the Life Risk-Based Capital (E) Working Group exposed a conceptual proposal regarding collateral loans on Nov. 14 for a 60-day public comment period ending Jan. 13, 2026. Tee inquired whether, following the receipt and review of comments, the Working Group would develop and subsequently expose a formal proposal. Additionally, Tee inquired whether the proposal would be presented again to the Task Force and the Financial Condition (E) Committee for further consideration after it is forwarded. Yanacheak responded that, unless the proposal contains controversial issues, it is not customary for the Task Force and Committee to re-expose it.

Barlow noted that the conceptual proposal on collateral loans is not yet ready for adoption. There are outstanding issues related to asset valuation reserve (AVR) that the Life Risk-Based Capital (E) Working Group has requested further insight on from the Academy. Barlow concurred with Yanacheak that any comments received should be directed to the Working Group, where the technical discussions will take place.

7. Received an Update Regarding the RBC Treatment for SVO-Designated Investments

Botsko stated that the Property and Casualty Risk-Based Capital (E) Working Group received three comment letters during the exposure period. One comment letter strongly supported the initiative to harmonize RBC requirements for SVO-designated bond funds, which include exchange-traded funds (ETFs), mutual funds, and private funds. The authors of this letter emphasized that such harmonization would be especially beneficial for smaller insurance companies, as these organizations often lack the resources or portfolio size needed for direct investments in individual bonds. Therefore, enabling access to diversified bond funds would help them manage risk more effectively without increasing their exposure.

Botsko stated that the second letter expressed confidence in the existing regulatory framework, highlighting the strengths of the current two-step process that allows issuers and insurers to submit investment fund holdings to the SVO for designation as certain bond funds. The authors recommended that, before making any changes to RBC requirements, the Working Group should conduct a comprehensive analysis of the risks associated with these funds. They also cautioned that any changes requiring additional regulatory infrastructure or increased expenses for companies should be carefully considered to ensure they provide meaningful benefits for solvency oversight.

Botsko stated that the third comment letter suggested that the proposal could be improved by including a detailed analysis of its actual impact on RBC charges and ratios at the individual company level. This analysis should aggregate results across various scenarios, particularly those involving changes to R2 factors. The letter also pointed out that the data used in the analysis was skewed by two large P/C companies with significant equity holdings, which distorted the R2 results. Chou agreed with Botsko on the importance of conducting a thorough risk assessment to ensure the proposal's effectiveness and fairness.

Drutz stated that the Health Risk-Based Capital (E) Working Group exposed the referral for a 65-day public comment period ending Dec. 3. The Working Group will provide the status of this issue to the Task Force during the Task Force's next meeting.

8. Discussed Other Matters

Yanacheak announced that the Task Force will not convene in person at the Fall National Meeting. Instead, it plans to reconvene in spring 2026 to address outstanding agenda items.

Having no further business, the Capital Adequacy (E) Task Force adjourned.

SharePoint/NAIC Support Staff Hub/Member Meetings/E CMTE/CADTF/2025-2-Summer/June 30 CADTF minutes.docx

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Health Risk-Based Capital (E) Working Group
Virtual Meeting
November 6, 2025

The Health Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met Nov. 6, 2025. The following Working Group members participated: Steve Drutz, Chair (WA); Matthew Richard, Vice Chair (TX); Wanchin Chou (CT); Kyle Collins (FL); Sarah Smith (KS); Danielle Smith (MO); and Margaret Otto (NE).

1. Adopted Sept. 29 and June 20 Meeting Minutes

The Task Force met Sept. 29 and June 20. During its Sept. 29 meeting, the Working Group took the following action: 1) discussed comments received on the American Academy of Actuaries' (Academy's) H2—Underwriting Risk Component and Managed Care Credit Calculation in the Health Risk-Based Capital (RBC) Formula Report; 2) discussed the impact analysis of factors and structure from the Academy's H2 report; and 3) exposed a referral from the Risk-Based Capital Investment Risk and Evaluation (E) Working Group. During its June 20 meeting, the Working Group took the following action: 1) adopted its April 30 and Spring National Meeting Minutes; and 2) discussed the 2024 health RBC statistics.

Chou made a motion, seconded by Smith, to adopt the Task Force's Sept. 29 (Attachment One-A) and June 20 (*see NAIC Proceedings – Summer 2025, Capital Adequacy (E) Task Force, Attachment Three*) minutes. The motion passed unanimously.

2. Adopted its Revised 2025 Working Agenda

Drutz said the next agenda item was to update the Working Group's working agenda for 2025. He stated that changes to the working agenda were identified using track changes and included the following edits: 1) line X1 was updated to reference the adoption of proposal 2025-03-CA; 2) a previous H2 working agenda item was split into lines X4, X5, and X6 to align with the three work products from the Academy report (i.e., the H2 structure, H2 factors, and managed care credit expansion); 3) line X8 was added to address the Statutory Accounting Principles (E) Working Group referral on moving some non-bond debt to Schedule BA as a result of the principles based bond project; and 4) line X9 was added because the Working Group decided to take up the long-term care topic.

Smith made a motion, seconded by Chou, to adopt the Working Group's 2026 working agenda (Attachment Six). The motion passed unanimously.

3. Exposed Proposal 2025-15-CA (A&H Underwriting Risk Structure Change)

Drutz said the Academy presented its H2—Underwriting Risk Component and Managed Care Credit Calculation in the Health RBC Formula Report to the Working Group during its April 30 meeting. The report included a revised structure to more closely align the underwriting risk pages with the lines of business as presented in the analysis of operations of the Health Annual Statement. The report also advised changing the implementation in the life and property/casualty RBC to mirror the line of business changes in the health RBC. The proposal incorporates the proposed changes to the underwriting risk structure found on XR013, LR020, and PR020, as well as the removal of the two times individual risk from the alternate risk charge.

Drutz said a few tables were truncated in the materials and asked committee support what was missing. Committee support said the lines for dental, vision, and stand-alone Medicare Part D were truncated but would be available in full and posted for exposure.

Drutz noted that the proposal was only the structure for the underwriting risk pages. He asked if there were any objections to exposing the proposal. Drutz noted that the exposure would be mentioned to life, health, and P/C working groups during their respective meetings to ensure they are all aware.

Hearing no objections, the Working Group exposed the proposal for a 75-day comment period ending Jan. 20, 2026.

4. Requested Comments on the Conceptual Draft for Managed Care Credit

Drutz said the Academy's H2—Underwriting Risk Component and Managed Care Credit Calculation in the health rbc formula report proposed collecting additional information on managed care credit contracts to align with new forms utilized in the industry. Industry members commented on the report and inquired whether the new information could be collected at the line-of-business level. The draft contained possible instructions and tables to collect the information on a line-of-business basis. He said the draft would be exposed to receive comments from interested parties so the Working Group could develop a proposal for the Blanks (E) Working Group.

Drutz asked if there were any objections to exposing the draft. Hearing no objections, the proposal was exposed for a 75-day comment period ending Jan. 20, 2026.

5. Discussed Other Matters

Drutz reminded attendees that the Working Group will not meet at the Fall National Meeting. He also reminded attendees that the Working Group has an exposed referral with comments due Dec. 3.

Having no further business, the Health Risk-Based Capital (E) Working Group adjourned.

https://naiconline.sharepoint.com/sites/NAICSupportStaffHub/Member%20Meetings/E%20CMTE/CADTF/2025_3Fall/CADTF/11_19/HRBC/AttE_11_06_25_HRBC_Interim%20Meeting%20Minutes%20TPRd.docx

Draft: 10/14/25

Health Risk-Based Capital (E) Working Group
Virtual Meeting
September 29, 2025

The Health Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met Sept. 29, 2025. The following Working Group members participated: Steve Drutz, Chair (WA); Matthew Richard, Vice Chair (TX); Wanchin Chou (CT); Kyle Collins (FL); Tish Becker (KS); Danielle Smith (MO); Margaret Otto (NE); and Diana Sherman (PA). Also participating was: Tom Botsko (OH).

1. Discussed Comments Received on the Academy's H2—Underwriting Risk Component and Managed Care Credit Calculation in the Health RBC Formula Report

Drutz said the Working Group met Sept. 24 in regulator-to-regulator session, pursuant to paragraph 3 (specific companies, entities, or individuals) of the NAIC Policy Statement on Open Meetings, to discuss the results of the analysis of the factors and structure presented in the American Academy of Actuaries' (Academy's) report.

Drutz said the Academy's report was exposed during the Working Group's April 30 meeting, with the comment period ending on June 30. The report was available on the Working Group's web page. The Working Group received three comment letters: one from AHIP, one from the Blue Cross Blue Shield Association (BCBSA), and one from UnitedHealth Group (UHG).

Raymond Nelson (AHIP) said that AHIP was supportive of adding the additional product line columns to align with the annual statement analysis of operations, and that the premium break points had not been changed for many years, but the combination could be problematic for some companies. For example, if a company writes $100 million in group premium and $100 million in individual premium, under the current scheme, the first $25 million would have the high factor and the remaining $175 million would have a lower factor, while under the Academy's proposed revisions, all $200 million would be subject to the higher factor.

Nelson then discussed AHIP's concerns with the factor development, as the data used did not include companies that filed the blue blank, and also that the data set includes both the Affordable Care Act (ACA) implementation and the COVID years. AHIP is also concerned that the changes proposed were conservative and that a lower risk percentile may be needed. AHIP also supports the redesign of the Managed Care Credit but emphasized the need for clear instructions for reporting consistency between companies.

Drutz asked the Academy if combining lines of business for the flat alternate risk charge or reducing the flat alternate risk charge for the lines of business as described in the comment letter would impact the Academy's conclusions. Derek Skoog (Academy) believed the changes would have little impact on the factors but would matter to the issuers that are utilizing the alternate risk charge. Steve Guzski (Academy) agreed with Skoog on the possible impact.

Drutz said that the health data in the blue blank has recently changed to align with the formatting and structure found in the orange Blank and would be used in future factor analysis, as the data was not available for the current analysis. Nelson agreed, adding that while the historical blue blank data was not available, the current blue blank data should be included as soon as is feasible.

Drutz addressed the comment in the letter regarding stop loss, saying that the process to update stop loss would likely take time, and updating the underwriting factors can be done independently of any changes to stop loss.

Drutz asked Nelson to expand on the volatility of the data from the ACA and COVID years compared to the volatility in the current health markets, and if certain years would be a better data set. Nelson was not sure if there would be a best set of years to use for data and was more concerned about the impact. During the COVID-19 pandemic, there were years of under-utilization and years of over-utilization, and he asked what the results would be if 2023 and 2024 annual data were added to the analysis. Drutz asked the Academy if the data was used on a yearly basis or aggregated, and if the Academy noticed any differences year to year.

Guzski said the Academy's view was to use a large swath of data, 2012 through 2021, and analyze it on different bases, including one-year, two-year, and five-year chunks. He said that the goal of the analysis was to be as unbiased as possible while providing factors for the NAIC and interested parties to utilize. He also said that those interested in the data trends review Appendix 2b of the report for detailed statistics of loss ratios.

Drutz asked what AHIP meant when discussing a lower risk percentile, as the report had factors at an 87.5% risk percentile. Nelson said that before seeing any impact analysis, the 87.5% risk percentile may be more appropriate when considering the other conservatism in the report, and that maybe the percentile should be lower than 87.5% after AHIP has time to consider the impact analysis.

Chou said that the Society of Actuaries (SOA), when developing the mortality tables for the Life Actuarial (A) Task Force, the data for the COVID years were separated and analyzed to help determine what the possible impact of the event could be. He also encouraged the Academy to consider adding the annual data through 2024 and performing the analysis to include more current data and review the risk percentiles. Chou also said that he would rather take time to consider the appropriate factors to not disrupt the industry. Drutz said the implementation is something the Working Group would need to discuss, as large changes in risk factors have historically been spread over a period of years, and if the Working Group does implement the factors over a period of years, analysis can still be done on the factors.

Carl Labus (BCBSA) said that the BCBSA looks forward to working with the Academy and Working Group on the implementation of recommendations from the report. Labus said its comment letter supports the structural change to show the lines of business at a more granular level and supports review of a possible diversification credit. The letter also supported the review of the Managed Care Credit, as the underwriting risk had not been reviewed for some time. Labus also said the BCBSA supports including blue blank data, as many companies that report on the blue blank were single-state mutuals or not-for-profit companies. The BCBSA also supports a lower risk percentile for factors and supports a phase-in of factors over an extended period when factors are determined.

Jim Braue (UHG) said that its comment letter expressed concern about utilizing the 95% risk percentile factors, and the Academy report acknowledged that the current factors, while developed at the 95% risk percentile, used a different methodology. Braue also referenced the impact analysis included in the meeting materials, noting that the 95% risk percentile would require a substantial increase in capital requirements at any time horizon, causing many companies to fall into the severe risk-based capital (RBC) action levels, and UHG does not believe the current market justifies that.

He also noted that the separation of lines of business and applying the factors independently would be more conservative than the factors as originally developed. The appendix to the Academy's report shows significant variation over the various time periods and said the exclusion of blue blank data, even if unavoidable for this

analysis, could have a substantial impact on the results. UHG generally agrees with the expansion of the Managed Care Credit, noting that the descriptions need to be specific and that the letter lists some concerns with the ability to obtain data. UHG also would like to see the information collected on a line-of-business basis, and the data analysis should determine how the different payment methods are grouped. He asked the Academy to provide clarity on whether the net of reinsurance includes ceded and assumed reinsurance.

Braue said that UHG would like to see the Medicaid factor use a revenue threshold and have two tiers of factors instead of eliminating the tiers and having a single factor. UHG would also like a line added to the structure to show the investment income adjustment, separate from the factors.

Drutz asked the Academy if tiering the Medicaid risk factors would be possible. Skoog responded that he would need to confirm with other members of the Academy working group, but tiering the Medicaid risk factors seemed feasible.

Chou asked the Academy if, upon revisiting the analysis, it could include blank data. Skoog believed that with the changes to the blue blank reporting matching the orange blank reporting line for line, the data could be included in future analysis.

Drutz thanked the commentators, adding that the comments and discussion are very helpful to the Working Group, and that the discussion will continue in future calls.

2. Discussed the Impact Analysis of the Factors and Structure from the Academy's H2 Report

Drutz said the analysis was performed at the cocode level and used a flat alternate risk charge assumption of $500,000 for the lines that made up the comprehensive medical, which were Comprehensive Individual, Comprehensive Group, Title XVIII Medicare, and Title XIX Medicaid. The analysis also used $50,000 as the flat alternate risk charge for the vision-only and dental-only lines.

Derek Noe (NAIC) said that the charts provided show a comparison of the action levels between the 2024 RBC filings and the recalculation under the Academy structure and rate change recommendations. The far right column showed the total for the original filings at each action level, and the bottom row of each chart showed the total for the Academy rate and structure scenario. Noe said that for the structure-only scenario, four companies have improved RBC action levels, and six companies have detrimental RBC action level movement. He said the movement for the 95% risk percentile factors, as noted earlier, was larger than the 87.5% risk percentile factors.

Noe said that when looking at the 95% risk percentile one-year time horizon analysis, 1,105 companies had no action level in their 2024 RBC filings. However, when recalculated with the Academy-provided risk factors and structure change, that number decreased to 780 companies. Drutz added that those companies that moved would be around 25% of the health RBC filers.

Chou said that when comparing the 87.5% risk percentile factors to the 95% risk percentile factors, the 95% risk percentile factors have a couple hundred more companies that move from no action level to an action level compared to the 87.5% risk percentile factors. Drutz said that the previous factors were developed at the 95% risk percentile using a different method, making a direct comparison difficult. He also noted that the property/casualty (P/C) factors are developed at 87.5% risk percentile. Botsko confirmed that the Academy, when developing premium and reserve factors for the P/C RBC formula, used many risk percentiles in the analysis, and the 87.5% risk percentile was adopted by the Working Group.

Drutz asked if the Working Group had any concerns with developing the structure proposal separately while continuing to discuss the factors. Chou said he agreed with the approach, noting that all three comment letters supported the structure change, while the risk factor impact was large and the factors were developed with older data.

Drutz directed NAIC staff to develop a structure proposal that incorporates the separation of lines of business and includes an independent line for the investment income adjustment.

3. Exposed a Referral from the Risk-Based Capital Investment Risk and Evaluation (E) Working Group

Drutz said the referral on Securities Valuation Office (SVO)-designated bond funds sent by the Risk-Based Capital Investment Risk and Evaluation (E) Working Group includes the American Council of Life Insurers (ACLI) presentation on bond fund principles, comment letters received on the presentation, and the exposed proposal 2025-12-IRE, which was drafted for the life formula only. The referral asks the Health Risk-Based Capital (E) Working Group to consider the applicability of the alignment of bond fund implementation in the health RBC formula.

Drutz asked staff to explain the missing structure in the health RBC formula. Maggie Chang (NAIC) said that the health and P/C RBC formulas are missing the structure for both the public registered bond funds and the private bond funds. The scope of the referral was to consider whether public registered bond funds should be included and whether private bond funds should be included. Drutz asked if the public and private funds would require separate changes to the health RBC Blanks. Chang said that the health blanks would need to change so the funds could be separated by the NAIC designation granted by the SVO and given separate factors. Drutz emphasized that commentators should consider the need for changes to the health RBC structure as they are providing comments, and the impacts the changes to the structure could have on the commentator's internal RBC process.

Drutz proposed exposing the referral for a 30-day comment period ending Oct. 29. Chou said that since the Working Group would have to add new structures to the health RBC formula if the exposure period could be extended to 60 days. Drutz asked staff if there were concerns with extending the comment deadline. Noe advised having a comment deadline of Dec. 3 to avoid Thanksgiving. The Working Group agreed and exposed the referral with a comment period ending Dec. 3.

4. Discussed Other Matters

Drutz said that the Health Risk-Based Capital (E) Working Group plans to meet in early November to adopt minutes, adopt the working agenda, and expose the structure proposal. He also said the Working Group will not be meeting in person at the Fall National Meeting.

Having no further business, the Health Risk-Based Capital (E) Working Group adjourned.

https://naiconline.sharepoint.com/sites/NAICSupportStaffHub/Member%20Meetings/E%20CMTE/CADTF/2025_3Fall/CADTF/11_19/HRBC/9-29-25/01_Minutes_HRBC_09_29_25_TPRd.docx

Draft: 11/17/25

Life Risk-Based Capital (E) Working Group
Virtual Meeting
November 14, 2025

The Life Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met Nov. 14, 2025. The following Working Group members participated: Philip Barlow, Chair (DC); Ben Slutsker, Vice Chair (MN); Sanjeev Chaudhuri (AL); Thomas Reedy (CA); Wanchin Chou (CT); Hannah Howard (FL); Mike Yanacheak and Kevin Clark (IA); Matt Cheung (IL); William Leung (MO); Michael Muldoon (NE); Seong-min Eom (NJ); William B. Carmello (NY); Rachel Hemphill (TX); and Tomasz Serbinowski (UT).

1. Adopted its Sept. 11 Minutes

The Working Group met Sept. 11. During this meeting, it took the following action: 1) adopted its July 21 and June 18 minutes; 2) heard a presentation from the American Academy of Actuaries (Academy) on C-3 alignment; and 3) exposed the covariance slide deck for a 60-day public comment period ending Nov. 10.

Hemphill made a motion, seconded by Slutsker, to adopt the Working Group's Sept. 11 minutes (Attachment Two-A). The motion passed unanimously.

2. Adopted its Oct. 31 Joint Minutes

The Working Group met Oct. 31 in joint session with the Variable Annuities Capital and Reserve (E/A) Subgroup. During this meeting, the Working Group and Subgroup took the following action: 1) discussed comments received on the proposed changes to C-3 Phase I and C-3 Phase II calculations as well as the life risk-based capital (RBC) instructions and re-exposed the changes for a 60-day public comment period ending Jan. 5, 2026; 2) adopted the proposed changes to the Valuation Manual (VM)-21 supplement blanks and instructions; 3) exposed scope clarification proposals for VM-21 and life RBC for a 28-day public comment period ending Dec. 1; and 4) heard updates on C-3 Phase II analysis.

Reedy made a motion, seconded by Chou, to adopt the Working Group and Subgroup's Oct. 31 joint minutes (*see NAIC Proceedings – Fall 2025, Life Actuarial (A) Task Force*). The motion passed unanimously.

3. Discussed Comments Received on the Exposed Covariance Slide Deck

Barlow stated that during the Working Group's Sept. 11 meeting, it exposed the covariance slide deck for a 60-day public comments period ending Nov. 10. Four comment letters were received (Attachment Two-B).

Chris Trost (Northwestern Mutual) spoke on behalf of the organizations that submitted the joint comment letter; Brian Bayerle (American Council of Life Insurers—ACLI) spoke on the ACLI's comment letter; Erik Sorensen (Genworth) spoke on Genworth's comment letter; and Rhonda Ahrens (Thrivent) spoke on Thrivent's comment letter. All commenters noted concerns and/or areas for refinement that the Academy should consider, and urged the Working Group not to implement any changes to covariance until the full impact analysis of implementing the Generator of Economic Scenarios (GOES) has been performed.

Cheung noted that under the current framework, there is an inconsistency when economic scenarios include both equity and interest rate components. For variable annuity (VA) risk, he said companies are required to allocate

portions of the risk between equity and interest rate categories, even though the underlying calculation already integrates both factors. Cheung stated that this split allows for applying covariance adjustments, but noted that such an approach did not exist under Phase I procedures. Additionally, in C-3 Phase I, all VA risk was categorized under interest rate risk, without splitting into equity and interest rate components. Cheung emphasized that this structural difference highlights the need for careful consideration when designing the overall framework, as it depends heavily on scenario design.

Bayerle stated that Cheung's comments reflect only one part of a much larger framework that the Working Group must address. He emphasized that moving forward with the proposal will be a significant effort, and without clarity on the major changes planned for 2026, there is concern about continuing work without first assessing their impacts.

Barlow stated that all the concerns raised were valid. He assured the commenters that the Working Group will not implement changes to covariance until the impact of the GOES implementation is quantifiable. However, he stated that he did not want to pause the Academy's work to further refine the covariance proposal.

The Working Group did not object to Barlow's suggestion to continue working on covariance, taking into consideration the issues raised by interested parties.

4. Adopted its 2026 Working Agenda

Barlow stated that some updates were made to the Working Group's draft working agenda. Maggie Chang (NAIC) walked through the following key changes: 1) the item regarding the structured proposal to split Schedule D, Part 1, into two parts is proposed to be removed based on the completion of proposal 2024-24-L MOD; 2) the item regarding the Longevity Risk (E/A) Subgroup has been expanded to include longevity reinsurance; and 3) the item on tax credit investments was added to the working agenda as a result of a referral from the Statutory Accounting Principle (E) Working Group. Staff noted that a milestone is the adoption of structural changes through the adoption of proposal 2024-21-L MOD. Any possible factor changes for investments in tax credit structures will be contemplated if deemed necessary.

Chou made a motion, seconded by Leung, to adopt the Working Group's revised working agenda (*see NAIC Proceedings – Fall 2025, Capital Adequacy (E) Task Force.*). The motion passed unanimously.

5. Exposed the Conceptual Proposal on Collateral Loans

Barlow stated that at the Working Group's June 18 meeting, it received a referral from the Statutory Accounting Principles (E) Working Group regarding collateral loan Schedule BA reporting changes for more granular asset valuation reserve (AVR) reporting of collateral loans by underlying collateral type, effective starting in 2026, based on the adopted blanks proposal 2024-19BWG MOD. The Working Group was also asked to consider RBC and AVR factors that are commensurate with the risks associated with the respective collateral types. He added that the proposal was conceptual, with some key areas for the Working Group's consideration as recommended by the Statutory Accounting Principles (E) Working Group.

Chang said that collateral loans are unique to statutory accounting. Unlike collateralized loan obligations (CLOs), collateral loans are not securities, not rated by a nationally recognized statistical rating organization (NRSRO), and not designated by the Securities Valuation Office (SVO). Collateral loans are reported as Schedule BA Other LT Invested Assets. Prior to 2024, all collateral loans, regardless of the type of assets backing the loans, were reported in LR008, subject to a fixed charge of 6.8% (between NAIC 3C/BB- and 4A/B+). In addition, collateral loans were

not subject to AVR/not reported on the AVR schedule. Research into historical discussions suggests that this treatment was justifiable, as this asset type was immaterial.

Chang stated that starting in 2024, the Working Group adopted an interim solution to allow collateral loans backed by mortgage loans to be assessed as RBC charges based on the underlying quality of the mortgage loan's "look-through" treatment. The impetus of such a change was documented in the Statutory Accounting Principles (E) Working Group's referral letter (see attachment in 2025-16-L Conceptual proposal on Collateral Loans). She said that prior to adoption of the interim provision, the ACLI presented the argument to allow "look-through" for this subset of collateral loans, but acknowledged that it was an interim solution, stating, "Note that this is designed to solve 2024 reporting and capital with no disruption on the transition year. If a more comprehensive set of changes is adopted in 2025, we would expect those changes would supersede this fix. In other words, the focus of this proposal is to maintain current capital treatment this year, even as accounting changes occur".

Today, the conceptual proposal has been drafted to solicit feedback as to whether the "look-through" provision should be more risk-based and look through to collaterals that are afforded higher RBC charges, such as limited partnership (LP)/limited liability corporation (LLC)/joint venture interests, and residual tranches/interests. The feedback should also address the extent of the alignment between direct ownership of the collaterals versus indirect exposure via collateral loans.

The final two points address that: 1) the conceptual proposal was drafted with a preference to bring collateral loans backed by mortgage loans back to LR008, such that all collateral loans are captured in LR008, which should enhance transparency and reduce complexity for filers (for reference, the interim solution currently has those collateral loans in LR009; and 2) balancing operational efficiency and materiality, staff recommend collateral loans backed by assets such as real estate, fixed income, common and preferred stock, etc., be grouped as one bucket and refrain from look through. The drafting note section of the conceptual proposal memorializes additional input needed to finalize the proposal.

Clark stated that Iowa strongly supports implementing the proposed changes effective in 2026 and asked whether RBC procedures permit this. Barlow affirmed that they do.

Carmello asked if the AVR factors update is subject to the same timeline. Robin Marcotte (NAIC) clarified that any updates proposed by the Working Group would need to be adopted by the Blanks (E) Working Group by late May or June 2026.

Barlow solicited volunteers from the Academy to look into the AVR factors. Jason Kehrberg (Academy) said he would coordinate with Stephen Smith (Academy), as he chairs the Life Capital Adequacy Committee.

The Working Group agreed to expose the conceptual proposal on collateral loans for a 60-day public comment period ending Jan. 13, 2026.

6. Discussed Other Matters

Barlow stated that the Working Group will not meet in person at the Fall National Meeting but will schedule meetings as needed. He added that during its Oct. 31 joint meeting with the Variable Annuity Capital and Reserve (E/A) Subgroup, the Working Group and Subgroup re-exposed the GOES effectuation for a 60-day public comment period ending Jan. 5, 2026, and exposed the proposal 2025-17-L scope clarification for VM-21 for a 28-day comment period ending Dec. 1, 2025.

Barlow added that the H2—Underwriting Risk proposal has been exposed for a 75-day public comment period ending Jan. 20, 2026. This proposal will impact the life RBC calculation for health components.

Having no further business, the Life Risk-Based Capital (E) Working Group adjourned.

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Draft: 10/30/25

Life Risk-Based Capital (E) Working Group
Virtual Meeting
September 11, 2025

The Life Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met Sept. 11, 2025. The following Working Group members participated: Philip Barlow, Chair (DC); Ben Slutsker, Vice Chair (MN); Sheila Travis (AL); Thomas Reedy (CA); Wanchin Chou (CT); Mike Yanacheak and Kevin Clark (IA); Matt Cheung (IL); William Leung (MO); Michael Muldoon (NE); Jennifer Li (NH); Seong-min Eom (NJ); William B. Carmello (NY); Andy Schallhorn (OK); and Rachel Hemphill (TX).

1. Adopted its July 21 and June 18 Minutes

The Working Group met July 21 in joint session with the Variable Annuities Capital and Reserve (E/A) Subgroup. During the meeting, the Working Group and Subgroup took the following action: 1) discussed comments received from the American Academy of Actuaries (Academy); 2) discussed comments received from the American Council of Life Insurers (ACLI); and 3) exposed the risk-based capital (RBC) proposal form and the proposed changes to RBC instructions for C-3 Phase I and C-3 Phase II.

The Working Group also met June 18. During this meeting, it took the following action: 1) adopted its May 1 and Spring National Meeting minutes; 2) adopted its April 9 minutes; 3) adopted its May 7 minutes; 4) adopted proposal 2025-10-L (RBC Asset Credit Modco/FWH); 5) discussed and paused the exposure of proposal 2025-13-L (Covariance); 6) discussed 2024 life RBC statistics; 7) discussed its referral to the Statutory Accounting Principle (E) Working Group; and 8) received a referral from the Statutory Accounting Principle (E) Working Group on collateral loans.

Slutsker made a motion, seconded by Reedy, to adopt the Working Group's July 21 (*see NAIC Proceedings – Fall 2025, Life Actuarial (A) Task Force*) and June 18 minutes (*NAIC Proceedings – Summer 2025, Capital Adequacy (E) Task Force*). The motion passed unanimously.

3. Heard Updates on C-3 Alignment

Barlow noted that this was a follow-up presentation from the Academy on C-3 alignment. Rick Hayes (Academy) reiterated the objectives of the presentation (Attachment Two-A1) and thanked the Working Group for the opportunity to present the update. He said the objective was to outline the current C-3 harmonization framework recommendations and highlight the framework decisions that require further analysis. Hayes noted that in previous presentations, his team had thought that its proposed timeline would be aligned with the Valuation Manual (VM)-22, Statutory Maximum Valuation Interest Rates for Income Annuities principle-based reserving (PBR) and generator of economic scenario (GOES) implementation, but that, in view of its present findings, it would be more reasonable to start looking at a 2027 framework. In addition, he would want to understand if there is anything the regulators or interested parties strongly believe should be implemented in 2026, and what should be looked at in 2027.

Barlow responded that their recommendations could be partially implemented early. Hayes said his team was trying to gauge exactly what elements the Working Group believes should be implemented, either partially or entirely, at a certain point in time, and what might be viewed as in scope and out of scope. He noted the divergence of opinions among the Academy C-3 subcommittee members regarding how to view and address certain items.

Hayes went on to say that his team believed that field tests and the model office analysis would be required to make decisions, and that if there is a strong viewpoint that certain elements in his team's suggestions should not be in scope, then his team would be able to refine them and move forward efficiently. Hayes reiterated that he looked forward to feedback from regulators and interested parties to help his team define the field tests and model office analysis. He said their feedback would enable his team to finalize the recommendation set, specifically regarding the current framework proposals, the adoption date, and the phase-in adoption date, which is currently undetermined. He proposed a three-year phase-in period, contingent upon field testing and the model office schedule. He also proposed that the current product's scope, subject to C-3 Phase I and Phase II, would transition into the new methodology.

Hayes then expanded on the subcommittee's proposed alignment of C-3 Phase I with C-3 Phase II methodology where possible, as well as the timeline, adoption, and phase-in period. He said he hoped to gather preliminary feedback from the regulators on the call to begin shaping the next phase of the analysis and discussion.

After Hayes presented the slide regarding framework proposals on which additional feedback has been requested, Slutsker identified two overarching questions: 1) what decisions should be made for each component; and 2) when those decisions should be made. He suggested temporarily setting aside the "what" to focus on the "when," noting that timing is more of a project management issue than an actuarial one and that it is important to explore the Working Group's views on both aspects. Slutsker also said he believes that the timing question applies not only to C-3 Phase I but also to C-3 Phase II.

Slutsker said that, from a project management perspective, he recommends first aligning C-3 Phase I with C-3 Phase II (i.e., using C-3 Phase II as a blueprint). He said that after the alignment, the Working Group can revisit individual areas raised by the Academy for potential refinement.

Barlow responded that Slutsker's proposed approach seems reasonable, and achieving consistency between C-3 Phase I and C-3 Phase II as quickly as possible would be beneficial. He said that once alignment is established, improvements to the newly unified framework can be made as needed, based on how the work progresses.

Cheung asked whether harmonization is necessary and feasible in the end. Reflecting on the differences between C-3 Phase II for variable annuities (VAs) and C-3 Phase I for fixed annuities, Cheung noted that a fully surplus-based metric may be feasible for VAs, especially given the presence of a clearly defined hedging strategy (CDHS), but may not be as meaningful for fixed annuity business.

Barlow stated that he heard Cheung, but he emphasized that the more that is done to simplify the number of distinct processes within the RBC calculation, the better.

Maambo Mujala (Academy) responded to comments from both Slutsker and Cheung, explaining that when the Academy began this project, C-3 Phase II was used as the starting point for harmonizing methodologies, given that it had been reviewed more recently. That said, Mujala noted divergence in opinion among the Academy's volunteers on whether it is sound to have exact alignment, especially considering default costing and stochastic equity. The Academy would, therefore, seek to perform testing to understand the materiality of those considerations if applied to C3 Phase I.

Hayes said he agreed with Mujala and added that there was also divergence in views regarding the metric. The subcommittee questioned whether the C-3 Phase II metric adequately captures the risk for the C-3 Phase I product scope, and, if not, which metric would be more appropriate.

Slutsker responded by acknowledging that default cost has been an ongoing topic but discussing it now could add unnecessary complexity to the project. Instead, he suggested committing to addressing it after achieving initial convergence between C-3 Phase I and Phase II.

Regarding stochastic equity, Slutsker sought clarification on whether the Academy's question was whether stochastic equity should be included in the C-3 Phase I calculation. Hayes confirmed that the key question is how equity performance should be reflected in the assets backing the business, particularly in the context of the Phase I product scope. Slutsker expressed some surprise that it was even a question, noting that if indexed products are included and option modeling is involved, then stochastic equity seems like a natural fit. Similarly, if general account equities or equity-like assets support portfolios, it would make sense for them to be modeled stochastically as well. He clarified that if the default assumption based on convergence with C-3 Phase II is to include stochastic equity, then the question becomes whether to scale it back. In his view, this would not require significant additional testing or coding (perhaps just an extra run), and the implementation should not be too difficult. He expressed comfort with including this question in the initial phase. Turning to other components, Slutsker highlighted two areas he considers more complex:

- Metric selection: Whether to use a surplus-based or asset-based metric. Slutsker believes that field testing both would add substantial weight to the project.
- Default costs: Slutsker views this as an additional layer of complexity that should be explored after initial convergence.

He noted that other items, such as the scalar and possibly the time horizon, could likely be addressed through initial analysis without requiring extensive testing. His overall recommendation is to first achieve convergence between C-3 Phase I and Phase II, answer the simpler questions upfront, and then tackle the more complex issues like metric selection and default costs, which are relevant to both phases.

Barlow commented that the reference in the slide deck to "exploring the materiality of double-counting default costs" gave him some pause and made him undecided about default costs. He noted that if there is a real risk that default costs could result in a material impact, it would make sense to address the issue sooner rather than later. However, he questioned whether there is truly a potential concern that double-counting default costs could materially impact the results. He sought Slutsker's perspective.

Slutsker suggested exploring the default cost materiality without delaying progress on the alignment project. He proposed that if the goal is to use the NAIC model, there may be a straightforward way to run a sensitivity analysis. He noted that for VM-20, Requirements for Principle-Based Reserves for Life Products, and VM-21, Requirements for Principle-Based Reserves for Variable Annuities, a single premium structure could be used to make the test more capital-intensive, though VM-22 may differ. He pointed out that the prescribed default levels, such as those based on conditional tail expectation (CTE)-70, are already quantified from prior table development and, therefore, a simple run might be sufficient to assess materiality. While he expects the impact to be immaterial (perhaps just a few basis points), he agreed it is worth testing to confirm.

Hayes said that the C-3 subcommittee members hold a range of opinions on the issue, with many members believing that the potential for double-counting default costs warrants further exploration. While no analysis has yet quantified the materiality of the issue, there is a shared concern within the subcommittee that it could be significant and should not be overlooked.

Barlow acknowledged the Academy's concern and asked if there was a feasible way to proceed with that kind of early assessment. Hayes responded that discussions have already taken place regarding model office capabilities.

The expectation is that by early 2026, the NAIC will be able to have resources for model office support, and the Academy can accommodate stress or sensitivity tests to help quantify materiality. Hayes added that he envisions the model office will be able to accommodate stress or sensitivity testing, which could be used to quantify the potential materiality of default cost double-counting.

Scott O'Neal (NAIC) clarified that the current models developed for life businesses include universal life, secondary guarantee products, and term products, which are not within the scope of the current C-3 Phase I. In addition, no capital calculations have been built into those models so far. However, the VA model office does include capital calculations. If the Working Group is looking to conduct a sensitivity analysis related to the potential double-counting of default costs, the NAIC could explore that. Additionally, the NAIC has access to the VM-22 model office, including reserving and capital calculations. O'Neal said the NAIC needs to look into these options to support the sensitivity analysis. Slutsker asked if there is a fixed account as part of the VA model. O'Neal confirmed that there is. Slutsker suggested proceeding with a single premium with 100% fixed account as the testing approach. O'Neal said he would explore that option and report back to the Working Group.

Mujala suggested that the VM-22 field testing model could be suitable for evaluating the potential double-counting of default costs since much of the C-3 Phase I business falls under the VM-22 PBR. Slutsker asked O'Neal whether that model is operational and could be used for sensitivity testing. O'Neal confirmed that his team has recently completed extensive validation on the VM-22 model office, which was transitioned from EY. As a result, it may now be usable for additional studies. He noted that while some work would be required to assess available resources and timelines, it is a viable option worth exploring. Slutsker agreed, adding that if the default cost issue proves material, it should be addressed early in the process, as Barlow suggested. He emphasized that this would also need to be revisited for C-3 Phase II to avoid any period of unintended double-counting. He said that if the team can leverage existing models to run upfront sensitivity tests, that would be a fair and efficient approach. He expressed greater concern about including the metric decision in the initial phase, as this could introduce inconsistencies. His preference was to address metric consideration across principle-based frameworks.

Hayes said that the conversations were very helpful. He recapped that the guidance obtained from the Working Group is to move forward with a metric consistent with C-3 Phase II (i.e., the asset-based approach). He said the Working Group should also proceed with including stochastic equity. Regarding default costs, the Working Group will explore how to quantify materiality using a model office, potentially leveraging either the VA model or the VM-22 PBR model. Based on the results, the Academy can determine how to incorporate default cost consideration into the C-3 update. Mujala said it would be helpful to get feedback from interested parties on whether they would be able to participate in the field test and, specifically, whether they could test any of these components. Otherwise, it may be necessary to rely solely on the model office to inform them of these decisions.

Brian Bayerle (ACLI) suggested that, based on experience, the NAIC has previously conducted surveys to assess industry interests in field test participation. He proposed using a similar approach this time. Barlow responded that it sounds reasonable. He requested that the Academy put something together for the Working Group to share with the industry. Hayes agreed that it aligns well with the Academy's goals and that they want the field test to be as robustly participated in as possible and to generate meaningful insights. He said that understanding where the industry stands in terms of capabilities and timing is key to that. As such, the Academy will work on developing a questionnaire.

4. Exposed the Proposal 2025-13-L (Covariance) Slide Deck

Barlow said that during the Working Group's June 18 meeting, the Academy was asked to provide more information on two key issues. He added that the Academy has provided its viewpoints on the two questions (Attachment Two-A2).

Jason Kehrberg (Academy) presented a summary of the Academy's letter, which responded to two questions raised during the June 18 meeting regarding public comments on covariance within the life RBC formula. He said that the first question was whether the GOES (E/A) Subgroup's work should impact decisions on covariance in life RBC. He said the affirmative perspective is that the GOES influences statutory reporting and should align with covariance assumptions in life RBC to maintain consistency. He also said that misalignment could undermine the coherence of the framework. He said the negative perspective is that the GOES primarily applies to reserves and C-3 capital. It does not apply to correlations with other risks, such as credit. Differences in statistical safety levels and scope justify independent treatment. Consistency can be maintained without identical assumptions.

Kehrberg said the second question was whether changes to individual capital factors should be considered concurrently with changes to covariance. He said that the affirmative perspective is that capital factors involve both data and regulatory judgment. Changes to covariance could affect that judgment, especially for factors such as C-4, where data is limited. Additionally, including C-4 in the covariance formula may warrant a review of its factor. He said the negative perspective is that capital factors can be handled independently if they are calibrated to consistent safety levels. Historical calibration practices support this separation, even with differing time horizons for risk categories.

Kehrberg concluded by emphasizing the Academy's intent to present balanced perspectives and welcomed further questions or follow-up.

Barlow expressed a preference for the negative perspectives on both questions, indicating support for moving forward with the covariance project without waiting for GOES developments.

Bayerle recommended exposing only the slide deck, and not the full RBC proposal form, to allow for conceptual feedback before technical details are finalized. He also requested a longer exposure period of 60 days to allow for thorough review and analysis.

Barlow acknowledged the feedback. The Working Group decided that the slide deck should be exposed for a 60-day public comment period ending Nov. 10, focusing on conceptual input and welcoming technical comments.

5. Discussed Other Matters

Barlow said that the Working Group will not meet in person at the Fall National Meeting but will schedule meetings as needed. He added that a joint meeting with the Variable Annuity Capital Reserve (E/A) Subgroup will be scheduled to discuss the GOES proposal, which has a comment period ending Sept. 19, and that additional meetings will be planned to address other pending items before year-end.

Having no further business, the Life Risk-Based Capital (E) Working Group adjourned.

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Correlation in Life Risk Based Capital

Life Investment and Capital Adequacy Committee

About the Academy

Mission:
To serve the public and the U.S. actuarial profession.

Community:
Serving over 20K MAAAs & public stakeholders for 60 years

Standards:
Setting qualification, practice, and professionalism standards

Impact:
Delivering over 300 insight-driven publications & resources annually

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Guiding Principles for this review

Consistent measure of aggregate company risk

- A best estimate view of tail risk aggregation supports the regulatory objective to identify potentially weakly capitalized companies and provides consistent differentiation between companies with concentration or diversification of risks

Consistent with targeted statistical safety level of RBC

- Target a correlation approach that achieves a Company Action Level RBC that maintains the statistical safety level to which the individual risk factors within RBC are calibrated over a multiyear horizon
- Recognize that correlations may not be linear across all outcomes

Practical to implement

- Avoid false precision in both methodology and numerical values: maintain simple linear correlation approach with appropriate rounding of correlation factors

Recommendation

Linear correlation between major risk categories expressed as a correlation matrix:

No change to the structure of how existing risk factors are defined

	Credit C-1o, C-3b	Equity C-1cs, C-3c	Interest Rate C-3a	Insurance C-2a, C-2b	Business C-4a, C-4b
Credit	100%	50%	25%	0%	0%
Equity	50%	100%	50%	0%	0%
Interest Rate	25%	50%	100%	0%	0%
Insurance	0%	0%	0%	100%	0%
Business	0%	0%	0%	0%	100%

Nested correlation used to combine C risks that fall within each major risk category:

Credit	C-1o	C-3b
C-1o	100%	25%
C-3b	**25%**	100%

Insurance	Mortality C-2a	Longevity C-2b
Mortality C-2a	100%	-25%
Longevity C-2b	**-25%**	100%

Equity	C-1cs	C-3c
C-1cs	100%	100%
C-3c	**100%**	100%

Business	C-4a	C-4b
C-4a	100%	0%
C-4b	**0%**	100%

Data Sources and Limitations

Recommendations are informed by analysis of historical correlations among data used to proxy C-risks within LRBC

Risk	Proxy Data	Key Assumptions
Credit	**Primary** – Issuer weighted corporate bond default rates **Secondary** – NCREIF real estate index total returns	Correlation of data weighted by issuer used as a proxy for correlations for mix of insurer bond holdings
Equity	S&P 500 Total Return	Insurer equity holdings under C-1cs assumed to be correlated with other risks similarly to S&P 500 equity returns
Interest Rate	Total Return of Investment Grade Bond Fund FBNDX	Correlations in bond fund returns driven by rates and spreads are assumed to be a reasonable proxy for more the complex C-3 calculation Recommend the absolute value of correlations with interest rates since rate & spread movements could be in either direction and not practical to differentiate correlation between up rate and down rate binding scenarios given the current structure of the C-3 calculation
Insurance	United States population mortality rates by age and socioeconomic decile	Age weighting based on SOA Mortality Experience Studies for Individual Life Insurance and Individual Payout Annuity used to represent Mortality and Longevity risks
Business	Life and Annuity State Guaranty Association Assessments as a Percentage of Capacity; *data available 1988 to 2021*	Represents portion of C-4a whose factor is in part intended to cover potential exposure to guaranty fund assessments

Time Period – Core period of 1982 to 2019 to create a consistent period for all risks (except Business); longer time periods were also reviewed for individual pairs where available to check for consistency with core period

Calibration

The guiding principle for calibration is a linear correlation assumption that achieves an aggregate RBC amount that maintains the statistical safety level to which the individual risk factors were calibrated.

Our approach to achieving this calibration result considered three elements:

1. **Analysis of average risk correlation**
    - Numerous metrics were considered aimed at calibrating the average observed correlation between risks across different time horizons
    - A mathematical appendix demonstrates that for normally distributed risks that are linearly correlated, this average correlation achieves this calibration objective
2. **Confirmed that average correlation remains appropriate for non-normal market loss distributions**
    - Analysis was done to confirm that for market losses that are not normally distributed the average correlation remains an appropriate calibration target for the approximate level of statistical significance targeted by RBC
3. **Considered if there is evidence of non-linear correlations that are higher in unfavorable risk scenarios**
    - Cumulative 5 year risk losses were calculated and compared to the corresponding rolling 5 year correlations to identify risk pairs where higher correlations have been observed in years where losses were greater (e.g. tail events)

Summary Results & Rationale – Market Risks

The primary metric was the average annual correlation over the core 1982-2019 period

Numerous secondary metrics along with qualitative factors were also considered; more information on these additional considerations is included in the appendices

Risk Pair	Average Annual Correlation	Recommend	Reasonable Alternatives	Key Additional Insights from Secondary metrics
Credit - Equity	24% with bond default 9% with real estate	50%	25%, 75%	• Multi-year cumulative correlations more strongly supported 50% • Rolling 5 and 10 year distributions were most consistent with 25% or 0% • Data was consistent with nonlinearity with higher correlations in stress scenarios which could support 50% or 75% assumption
Interest Rate - Credit	18% with bond default 17% with real estate	25%	0%	• Rolling 5 and 10-yr distributions were consistent with both 0% and 25% while 50% was a much poorer fit
Interest Rate - Equity	43%	50%	75%	• Rolling 5-year distribution tail supported both 50% and 75% • Other metrics most consistent with 50%

Summary Results & Rationale – Insurance Risks

There was little quantitative evidence or qualitative considerations supporting a non-zero correlation for Insurance risk

Risk Pair	Average Annual Correlation	Recommend
Insurance – Credit	8% Life Mortality with Bond default -10% Life Mortality with Real Estate -6% Annuity Mortality with Bond default 8% Annuity Mortality with Real Estate	0%
Insurance – Equity	16% with Life Mortality -14% with Annuity Mortality	0%
Insurance – Interest Rate	4% with Life Mortality -1% with Annuity Mortality	0%

Correlations for mortality risk based on q(x) values while longevity risk represented by p(x) = 1 - q(x)

Results reflect total population mortality, though analysis done on the wealthiest population decile showed similar results

Summary Results & Rationale – Business Risk

The average annual correlations for business risk analysis used the available 1988-2021 period

The 1998-2021 results were also considered which exclude the wave of guaranty fund assessments in the early 1990's and also supported the recommendation

Risk Pair	Average Annual Correlation	Recommended
Business - Credit	-34% with bond default 29% with real estate	0%
Business - Equity	-28%	0%
Business – Interest Rate	-5%	0%
Business - Insurance	-46% with Life 48% with Annuity	0%

Current RBC includes a C-4b health administrative component within the correlation matrix with 0% correlation to the other risks, while C-4a is excluded from the correlation matrix and added to the total after covariance

- The limited historical data supports a 0% correlation assumption which is achieved by including Business Risk within the correlation matrix
- A theoretical argument for keeping Business Risk as additive outside of the correlation matrix is that guaranty assessments result from insurance company failures which would be caused by the realization of RBC risks in aggregate, therefore should be expected to have high correlation with the total RBC amount in times of stress
- Counterarguments include cases of insolvencies driven by underpricing or a lack of diversification rather than systemic risk events along with the lag between low RBC indicating financial difficulty and the ultimate guaranty fund assessment
- Recommend combining C-4a and C-4b to a single Business Risk value then treating all business risk consistently whether included within or additive to the correlation matrix

Nested Correlation Rationale

Rationale for nested correlations rely on descriptions of risks covered and judgment of reasonable correlations in the absence of data

Credit: Recommend 25% Correlation between C-1o and C-3b

- C-3b Health Credit Risk covers the risk that the company will pay capitation payments to health care providers but will not receive the agreed-upon services and will encounter unexpected expenses in arranging for alternative coverage
- It seems plausible that this risk would be independent from asset default risk covered in C-1o which would support a 0% correlation assumption
- It could also be possible that a weak economic environment that would lead to C-1o asset defaults could also be associated with increased incidence of failure of health care provider entities
- In the absence of data, we recommend the more conservative argument for a correlation of 25%.

Equity: Recommend 100% Correlation (additive) between C-1cs and C-3c

- Both C-1cs and C-3c capture market risk of equity assets and therefore the existing approach of combining the risks for covariance purposes is reasonable

Nested Correlation Rationale - Continued

Insurance: Recommend no change to existing -25% Correlation between C-2a and C-2b

- Correlation between C-2a mortality and C-2b longevity was recently reviewed when Longevity risk was added to LRBC; we are not recommending changes to the existing negative 25% correlation between C-2a and C-2b.

Business: Recommend 0% Correlation between C-4a and C-4b

- C-4a premium and liability components cover in part the risk of guaranty fund assessments following the failure of other insurers in addition to other risks not covered elsewhere in the RBC formula such as exposure to litigation
- C-4b health administrative expense component provides for the risk that actual expenses of administering certain types of health insurance will exceed the portion of the premium allocated to cover these expenses
- The lack of an expected relationship between these components supports a zero correlation assumption

Impacts – 2023 Aggregate Industry Mix

The recommendation would increase the effective required capital after covariance for Equity and Credit Risk and decrease the effective required capital for Insurance, Interest Rate and Business Risks

The net impact to a hypothetical company with a risk distribution equal to the 2023 aggregate industry mix would be an increase of 1.6% to RBC After Covariance

YE'23 Industry Mix	
C-0	15.5%
C-1cs	26.1%
C-1o	30.0%
C-2	14.5%
C-3a	7.3%
C-3b	0.0%
C-3c	1.1%
C-4a	5.3%
C-4b	0.3%
Total	**100.0%**

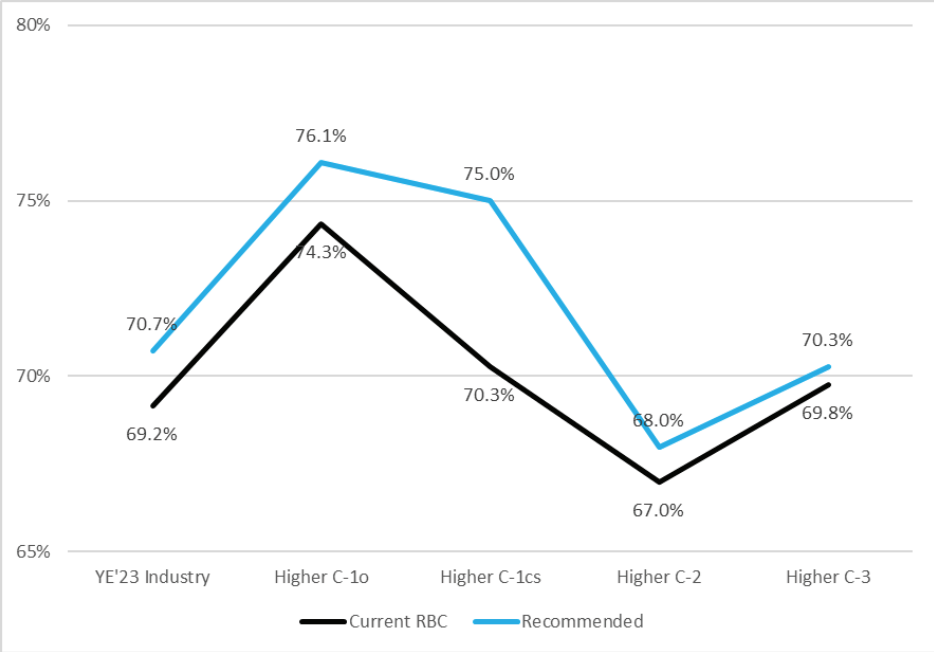
RBC After Covariance as a % of RBC Before Covariance

	Current RBC	Recommended	Change
Equity	56%	83%	27%
Credit	77%	82%	5%
Insurance	30%	26%	-4%
Interest Rate	77%	51%	-26%
Business	100%	10%	-90%
Total	**69.2%**	**70.7%**	**1.6%**

Impact shown for a hypothetical company with a distribution of risks equal to the reported 2023 aggregate industry RBC mix
This is not necessarily representative of the impact to average company RBC across the industry

Impact Sensitivities

Each of the sensitivities tested resulted in an increase to RBC after covariance
The impact is greatest for companies with higher concentration of C-1cs risk



Sensitivities increase the percentage of each risk noted by 50% relative to the 2023 Aggregate Industry baseline while all other risks are reduced proportionally

	YE'23 Industry	Higher C-1o	Higher C-1cs	Higher C-2	Higher C-3
C-0	15.5%	15.5%	15.5%	15.5%	15.5%
C-1cs	26.1%	18.9%	39.2%	23.4%	24.9%
C-1o	30.0%	45.0%	23.3%	26.9%	28.6%
C-2	14.5%	10.5%	11.2%	21.7%	13.8%
C-3a	7.3%	5.3%	5.6%	6.5%	10.9%
C-3b	0.0%	0.0%	0.0%	0.0%	0.0%
C-3c	1.1%	0.8%	0.8%	1.0%	1.0%
C-4a	5.3%	3.9%	4.1%	4.8%	5.1%
C-4b	0.3%	0.2%	0.2%	0.2%	0.2%

Questions?

For more information, please contact:

Amanda Barry-Moilanen, Policy Analyst, Life
barrymoilanen@actuary.org

Appendix

Overview of Secondary Metrics

Several metrics were used to inform the recommendation and improve consistency with core principles:

- Average annual correlation over core 1982-2019 period (primary metric)
- Average annual correlation over extended period where data is available for each risk pair
- Average correlation of cumulative multi-year risk outcomes (rolling 2-year, 5-year and 10-year periods) – recognizes the fact that the calibration of RBC factors considers losses over the risk cycle which is generally longer than one year
- Distribution of observed multi-year rolling correlations (5-year, 10-year):
  - Correlations observed from data over rolling 5 and 10-year periods
  - Observations rounded to nearest 10% and plotted as a histogram
  - Expected histogram distributions for 0%, 25%, 50% correlations developed through simulation
  - Goodness of fit (error sum of squares) evaluated to quantify best fit to data distribution
  - Considered error sum of squares for only values >=0 and >=50% to ensure appropriate right tail
  - Also provided graphical perspective on level of uncertainty from only 37 years of data

Calibration

Demonstration that within a linear correlation framework, the average correlation is appropriate for calculating target capital

- Let X1 and X2 denote individual risk random variables
- Y = X1 + X2 is the aggregate outcome resulting from the risks
- Assume for illustration that X1 and X2 are standard normally distributed with mean zero and variance 1
- It follows that Y is also normally distributed with variance = $\sigma_{X1}^2 + \sigma_{X2}^2 + 2\,\rho\,\sigma_{X1}\,\sigma_{X2} = 2 + 2\,\rho$ where ρ is the linear correlation between X1 and X2
- C1 and C2 are capital factors for risks X1 and X2
- Assume that C1 and C2 are calibrated to capture risk of X1 and X2 between 1 standard deviation and 95th percentile, so that C1 and C2 both equal ~0.645
- Assume that aggregate reserves cover aggregate risk of Y at approximately 1 standard deviation
- Assume the objective is to combine C1 and C2 with covariance to achieve an aggregate capital requirement C_A equal to the excess of the 95th percentile of Y over the 1 standard deviation covered by reserves
- The targeted C_A is achieved across all correlations by combining C1 and C2 using the average linear correlation ρ between X1 and X2

Risk correlation ρ	**0**	**25%**	**50%**	**75%**	**100%**
Y 95th	2.33	2.60	2.85	3.08	3.29
Y 1σ	1.41	1.58	1.73	1.87	2.00
Target Capital	0.91	1.02	1.12	1.21	1.29
Correlation that achieves Target	0%	25%	50%	75%	100%

Analysis was done to empirically validate this result using the observed loss distributions for equity, credit and interest rate risk as well as using loss distributions output by the published ESG

Tail Calibration

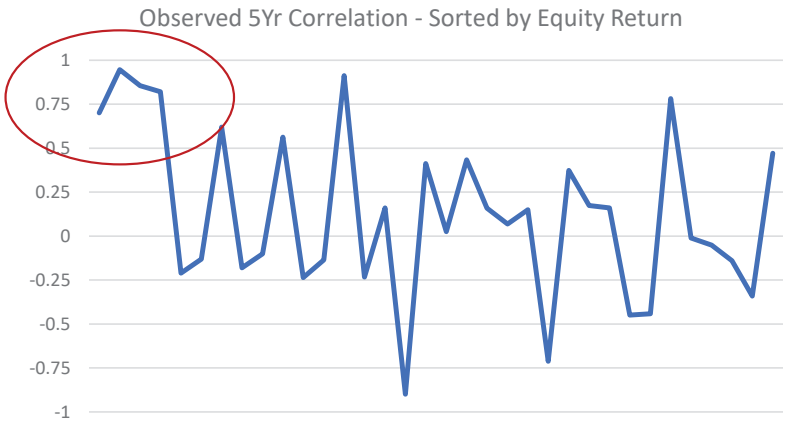
A key assumption in a linear correlation framework is that correlations are static across time

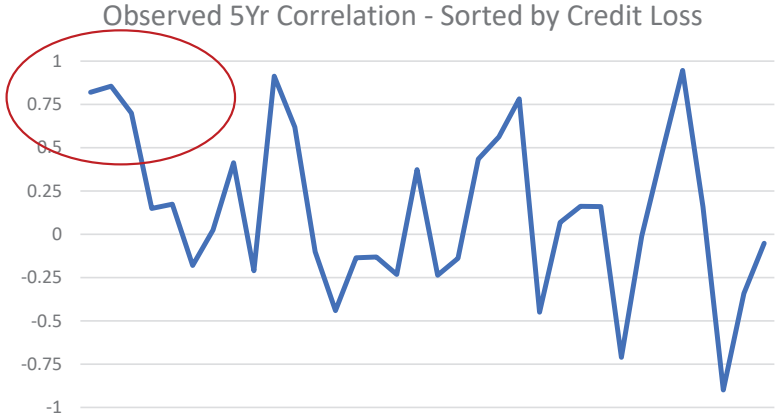
The calibration process also considered whether there was evidence to suggest that correlations may be higher in tail scenarios

The Credit – Equity risk pair showed the most evidence consistent with correlations increasing during times of stress, and this observation influenced the recommendation

The graphs below show observed rolling 5 year correlations between Equity and Credit data, each sorted with the worst outcomes for each risk on the left. In both cases the worst several risk outcomes were observed to also have higher observed correlations

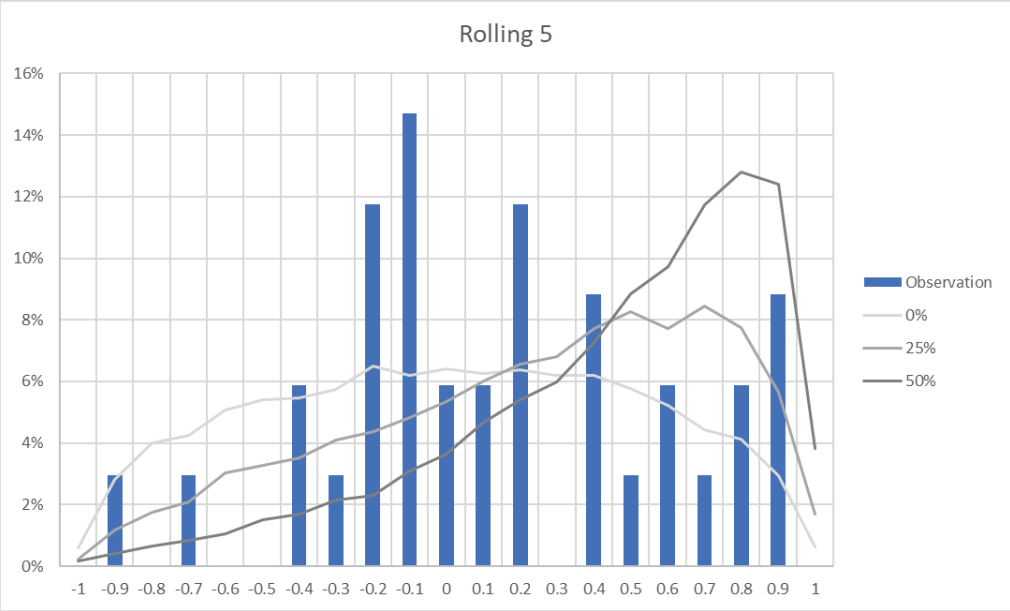
The small number of data points available in stress scenarios limits the credibility that should be assigned to this observation





Results Detail – Credit & Equity

Recommended:	50%
Average Annual Correlation – Core 1982-2019	24%
Average Annual Correlation – Extended 1972-2021	11%
Average Cumulative 2yr, 5yr, 10yr Correlations	46% 2-year 56% 5-year 53% 10-year
5-year Rolling Distribution best fit	**0% best fit** using all data (25% also good fit)
10-year Rolling Distribution best fit	**0% best fit** using all data (25% also good fit)
Tail Correlation in Worst 10% & 20% of 5Yr Credit Outcomes	63% in worst 4 rolling 5yr data points 36% in worst 7 rolling 5yr data points
Tail Correlation in Worst 10% & 20% of 5Yr Equity Outcomes	81% in worst 4 rolling 5yr data points 51% in worst 7 rolling 5yr data points

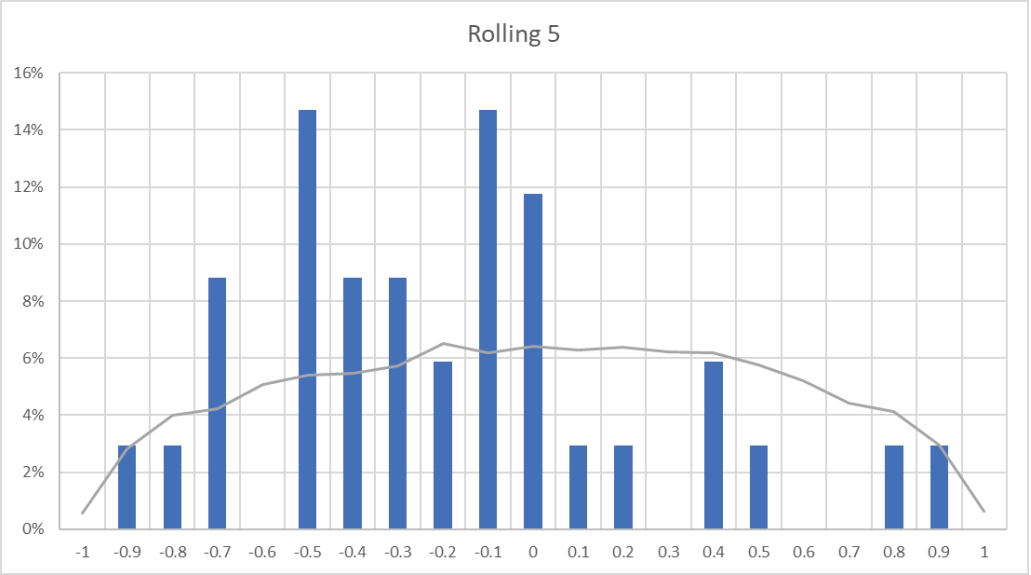


Qualitative Considerations

- Expect positive correlation given the nature of the risks
- Weak economic environment with company credit defaults to debt holders would also be expected to be unfavorable for equity holders
- There may be a time lag in the data between the risks which weakens the observed correlations
- The longer time period for calibration of risks within LRBC would support a lower correlation compared to 1 year capital frameworks

Results Detail – Credit & Interest Rate

Recommended:	25%
Average Annual Correlation – Core 1982-2019	18%
Average Annual Correlation – Extended 1972-2021	33%
Average Cumulative 2yr, 5yr, 10yr Correlations	31% 5-year 5% 10-year
5-year Rolling Distribution best fit	**25% best fit** using all data, taking the absolute value of -25% (0% also good fit)
10-year Rolling Distribution best fit	**25% best fit** using all data
Tail Correlation in Worst 10% & 20% of 5Yr Credit Outcomes	49% in worst 4 rolling 5yr data points 27% in worst 7 rolling 5yr data points
Tail Correlation in Worst 10% & 20% of 5Yr Rate Outcomes	3% in worst 4 rolling 5yr data points 9% in worst 7 rolling 5yr data points

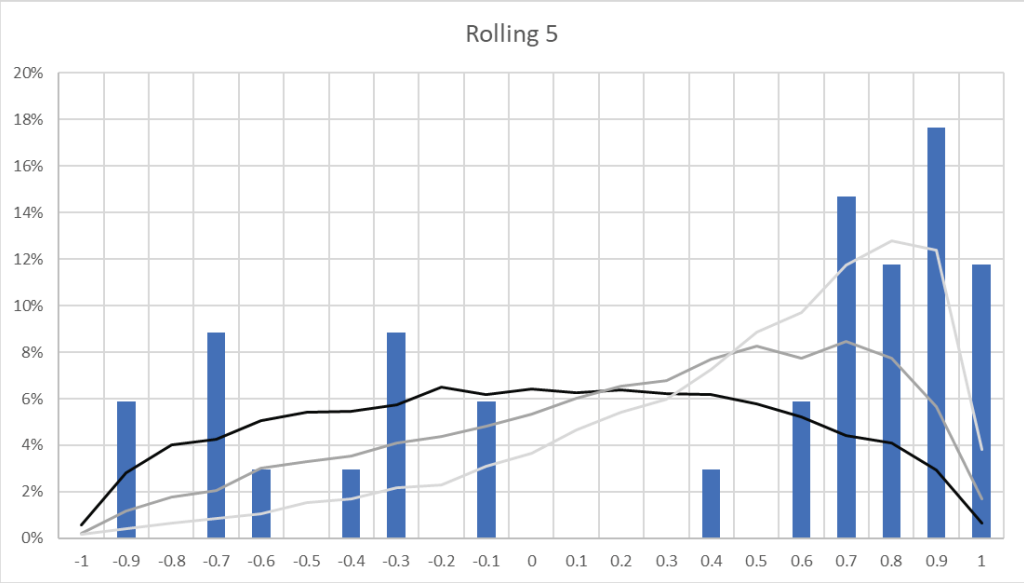


Qualitative Considerations

- Since interest rate losses could be driven by either increases or decreases in rates, we have considered the absolute value of all interest rate correlations in our results
- Correlations may differ in up rate vs down rate binding scenarios; the current structure of RBC does not easily allow for this differentiation
- The data used for interest rate risk captures both rate and spread movements; we might expect a positive relationship between credit defaults and increase in spreads

Results Detail – Equity & Interest Rate

Recommended:	50%
Average Annual Correlation – Core 1982-2019	43%
Average Annual Correlation – Extended 1972-2023	46%
Average Cumulative 2yr, 5yr, 10yr Correlations	12% 5-year 42% 10-year
5-year Rolling Distribution best fit	**75% best fit** using all data (50% also good fit)
10-year Rolling Distribution best fit	**50% best fit** using all data
Tail Correlation in Worst 10% & 20% of 5Yr Equity Outcomes	31% in worst 4 rolling 5yr data points 2% in worst 7 rolling 5yr data points
Tail Correlation in Worst 10% & 20% of 5Yr Rate Outcomes	91% in worst 4 rolling 5yr data points 68% in worst 7 rolling 5yr data points



Qualitative Considerations

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- Correlations may differ in up rate vs down rate binding scenarios; the current structure of RBC does not easily allow for this differentiation
- The data used for interest rate risk captures both rate and spread movements; we might expect a positive relationship between credit defaults and increase in spreads

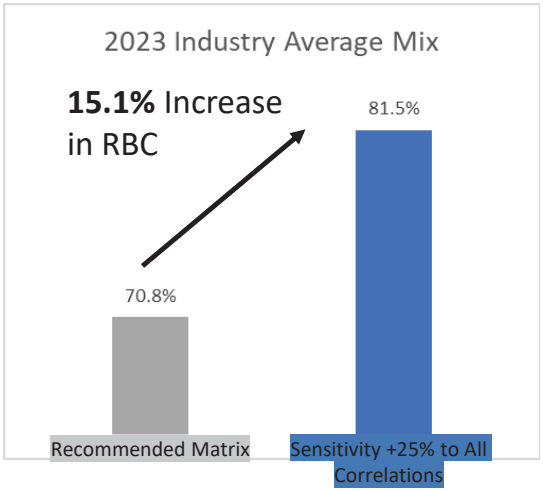
Conservatism in Calibration

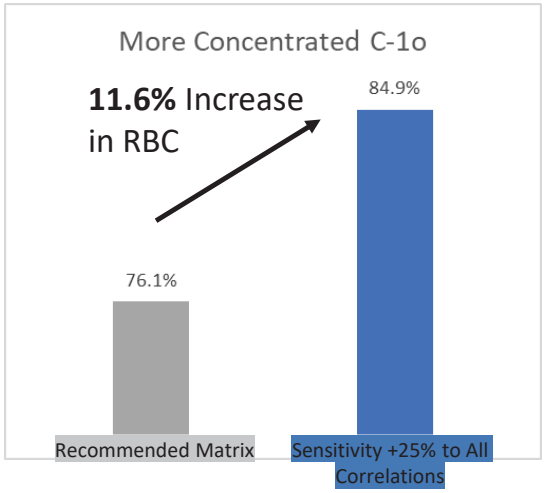
Higher correlation assumptions are 'conservative' in that they will increase aggregate RBC

However the impact would disproportionately impact diversified companies while having less impact on aggregate RBC for companies with relatively more concentrated risk exposures

This could weaken the effectiveness of RBC as a tool for identifying potentially weakly capitalized companies

Recommend best estimate correlations without explicit conservatism consistent with the objective of maintaining the statistical safety level to which risk factors were calibrated





Sensitivity shows the impact of increasing correlations between major risk categories 25% higher than the recommendation

Higher correlations increase RBC for both companies, but the impact less for companies with more concentrated risk exposures

The "More Concentrated C-1o" sensitivity increases C-1o risk by 50% while proportionally reducing all other C risks

Background

- The Life Risk Based Capital Working Group has reviewed and made updates to many areas of the LRBC formula in recent years to maintain the effectiveness of LRBC as a regulatory tool to identify potentially weakly capitalized insurers
- The calculation of each individual risk factor within LRBC has been reviewed and/or updated since the introduction of formula in the 1990s
- A holistic review of correlation of risks within the formula has not yet been undertaken
  - In 2001, the C1-cs component was created with separate covariance from C-1o
  - In 2021, C-2b longevity risk was introduced, including correlation with mortality C-2a
- Except for longevity and mortality risk, all correlations within LRBC are either 0% or 100%
- The scope of this analysis is initially focused on correlation between C-risks within LRBC; an extension of this effort could also consider correlation within individual C-risks (such as within C-1o)

Rationale for Review of Covariance Within LRBC

Due for regular maintenance review

- Every C-factor within LRBC has been individually reviewed in recent years; covariance between C-factors is due for a routine review to maintain the effectiveness of LRBC

Current approach is simplistic

- Except for C-2b longevity which was recently added, every correlation within LRBC is either 0% or 100%
- A more refined approach could be considered that improves effectiveness without adding undue complexity

Impact to effectiveness of LRBC could be material

- Changes to covariance could improve the effectiveness of RBC in differentiating between companies with concentration or diversification of risks

Current Life Risk Based Capital

RBC after Covariance =

C0 + C4a + Square Root of [(C1o + C3a)^2 + (C-1cs + C-3c)^2 + (C2)^2 + (C3b)^2 + C4b)^2]

Expressed as a correlation matrix, all correlations are either 0% or 100% except for the nested correlation within C-2 between mortality and longevity:

	C-1cs	C-1o	C-2	C-3a	C-3b	C-3c	C-4b
C-1cs	100%						
C-1o	0%	100%					
C-2	0%	0%	100%				
C-3a	0%	100%	0%	100%			
C-3b	0%	0%	0%	0%	100%		
C-3c	100%	0%	0%	0%	0%	100%	
C-4b	0%	0%	0%	0%	0%	0%	100%

Nested correlation for C-2:

	C-2 Mortality	C-2 Longevity
C-2 Mortality	100 %	
C-2 Longevity	-25%	100 %

September 8, 2025

Mr. Philip Barlow
Chair, Life Risk-Based Capital (E) Working Group (LRBC)
National Association of Insurance Commissioners

Re: Questions on covariance topic raised at 6/18/25 meeting

Dear Chair Barlow,

On behalf of the Life Investment and Capital Adequacy Committee of the American Academy of Actuaries,[1] I am providing comments on the two questions that were posed for the Academy to consider during the June 18, 2025, meeting as part of the discussion on whether to seek public comment regarding the topic of covariance within the Life Risk-Based Capital formula.

(1) Would the work of the Generator of Economic Scenarios (GOES) (E/A) Subgroup impact a decision on Covariance within Life Risk-Based Capital?

Considerations supporting the view that **"Yes"** GOES changes would likely impact RBC Covariance:

- It is important to ensure consistency across the statutory framework. Relationships between market variables prescribed for statutory reporting expressed through GOES should be consistent with relationships between risks expressed by covariance within Life Risk-Based Capital.

Considerations supporting the view that **"No"** GOES changes are not likely to impact RBC covariance:

- The scope and application of the economic scenarios are materially different from those of covariance within Life Risk-Based Capital. GOES work applies to reserves and calculation of C-3 capital and does not directly impact the relationship between capital risks. While scenarios do include values for interest rates, equities, and fixed income returns, they are for the purpose of calculating C-3 Market Risk capital only and do not address correlations with other capital risks such as Credit Risk.
- The statistical safety level targeted for reserves is different than for capital, and different correlation assumptions for capital purposes may be justified to appropriately capture relationships in tail scenarios.
- Both the GOES scenarios and preliminary work on capital covariance indicate a correlation between interest rates and equities. Consistency across statutory reporting can be achieved with assumptions that do not contradict each other even if specific

[1] The American Academy of Actuaries is a 20,000-member professional association whose mission is to serve the public and the U.S. actuarial profession. For 60 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.

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assumptions differ when designed for different purposes. Consistency across statutory reporting also does not require that the GOES generator be used directly in the calibration of correlations for capital.

(2) Would it be necessary to consider changes to individual capital factors concurrent with any changes to Covariance within Life Risk-Based Capital?

Considerations supporting the **"Yes"** view that changes should be considered together:

- Capital factors have been set considering both historical data as well as some degree of regulatory judgment. Changes to the covariance formula may impact that judgment element on appropriate capital factors even if the starting analysis of historical data were calibrated consistently across risks. For example, the calibration of C-4 capital factors requires a greater level of judgment given the scarcity of historical data relative to market risks. It seems plausible that this judgment could in part be impacted by the overall effect of Business Risk on final company capital requirements. The preliminary recommendation to include C-4 within the covariance formula would materially reduce the effect of Business Risk on final company capital requirements which could be cited as rationale to review that capital factor concurrent with a review of covariance.
- The scope of the current review has been limited to correlation between existing capital factors. We had previously noted that correlation within a risk category could be another subject of review such as within C-1o between corporate credit, mortgage loans, and real estate[2]. Since there may be offsetting impacts of these changes, it may be appropriate to broaden the scope to avoid unintended volatility in RBC.

Considerations supporting the **"No"** view that changes should be considered separately:

- If existing capital factors are calibrated to a consistent statistical safety level, then the capital factors themselves are appropriate, and it is therefore reasonable to consider changes to covariance separately. While there is no explicit target for the statistical safety level of RBC, past analysis used in setting and reviewing LRBC capital factors has consistently targeted values in an approximately consistent range.
- The observation that capital factors have been calibrated to different time horizons complicates the analysis but does not fundamentally change the conclusions on risk correlations. For example, the key observation of our analysis that Credit Risk and Equity Risk have exhibited positive historical correlations remains true for 2-year cumulative Equity Risk correlated with longer 10-year cumulative Credit Risk.
- The observation that changes to correlation could impact final RBC amounts at a company or industry level does not necessarily indicate that the changes are inappropriate or inconsistent with the purpose of RBC. A guiding principle in the review of correlation was to target a statistical safety level for LRBC after covariance consistent with how individual capital factors have been calibrated.

[2] Per slide 23 of Life-Presentation-LRBC-Correlation-4-24.pdf, "The scope of this analysis is initially focused on correlation between C-risks within LRBC; an extension of this effort could also consider correlation within individual C-risks (such as within C-1o)".

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*****

Should you have any questions or comments regarding this letter, please contact Amanda Barry-Moilanen, life policy project manager at the Academy (barrymoilanen@actuary.org).

Sincerely,

Jason Kehrberg, MAAA, FSA
Chairperson, Life Practice Council
American Academy of Actuaries

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BY E-MAIL

November 5, 2025

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

Attention: Kazeem Okosun (kokosun@naic.org)

Re: Correlation in Life Risk Based Capital – American Academy of Actuaries Presentation Exposure

Dear Chair Barlow,

Guardian, MassMutual, New York Life, Northwestern Mutual, TIAA, and Western & Southern appreciate the opportunity to comment on the exposed American Academy of Actuaries (AAA) presentation regarding correlations in Life Risk Based Capital (RBC).

While we recognize the effort invested in this project, we believe the proposed changes could create disruption in the insurance industry without improving regulators' ability to identify weakly capitalized companies. Based on the Academy's analysis, industry average effective risk category charges may increase by as much as 50% (equity risk) and decrease by as much as 90% (business risk). Such extreme shifts without appropriate analysis could produce shocks to companies' capital adequacy levels, risk management practices, and investment strategies—potentially leading to unintended consequences and worse outcomes for policyholders.

We appreciate the Academy's effort to examine diversification among risks—an important and valid theoretical consideration. However, with any such theoretical refinement to a major framework, it is essential to ensure that the methods and assumptions are robust, and that all relevant data are carefully evaluated. For this reason, regulators should reconsider whether this is the right time to devote significant resources to a project that may divert attention from other regulatory initiatives. If the Working Group ultimately determines that it is important to move forward with this initiative, more extensive analysis will be critical before any formal proposal is made.

Over the past several months, we have carefully reviewed and studied the Academy's proposal and found that many important questions remain unanswered. Several aspects rely on subjective judgments that, as our analysis shows, can materially alter the resulting capital outcomes. We urge regulators to consider whether introducing such subjectivity without further critical analysis, is consistent with an objectively and accurately calibrated capital standard. Specifically, we believe the following aspects of the Academy's proposal would need to be addressed:

- Broader discussion should be conducted on the proper correlation measurement methodologies. This includes choice of data sets, loss metrics, and loss measurement periods, as well as the consistency of these choices with the base factors.
- Longer data periods should be used to incorporate varied economic environments.

- Consideration should be given to incorporating more granular correlations within the broader fixed income and equity categories to better reflect insurance company asset allocations and diversification.
- Revisit the base 30% equity factor given that prior reviews noted that the base factor determination was influenced by the assumed correlation.
- Revisit the appropriateness of changes to C-4 business/operational risk and evaluate the potential structural issues with the proposed change.
- Conduct robust industry field testing, including incremental impacts of each risk factor, to better understand the effects across the industry and across different insurer risk profiles.
- Maintain consistency with emerging NAIC RBC Model Governance Task Force (MOGO) principles.

In the following sections, we present further details underlying the recommendations above.

Credit & Equity Correlation

Methodology

Although the recommended correlation is 50% for credit & equity, the analysis provided by the AAA indicates that a wide range of correlations could be viewed as appropriate (0% to 75%) and does not provide definitive reasoning for why 50% is deemed the best option. The results underscore the importance of getting alignment on key questions such as the appropriate measurement period (e.g., 1 year, 2 years, 5 years), proper indices to represent risks (Appendix Table 2 highlights index sensitivity), and whether a rolling, tail-view, or cumulative methodology should be used. We believe this is especially important given that this recommendation represents a significant shift from the detailed analysis[1] conducted in 1997 based on an extensive data period (1926 – 1996) from which the current 0% correlation was recommended.

An additional consideration when aligning on the proper methodology is to maintain consistency with the underlying bond and common stock C-1 factors as well as among various correlation analyses (i.e., equity & credit versus interest & credit). The current recommendation appears to have potential inconsistencies across both these views without clear explanation of the basis for these impactful decisions. As an example, if the equity & credit correlation was developed focusing on the same rolling 5- and 10-year metrics used for the interest & equity relationship, it would suggest that the best correlation fit would be 0% and not 50%.

Data Period

We believe that a longer data period should be used for this correlation metric. The core data period (1982-2019) only reflects 38 years. This is not a long enough period when looking at

[1] Report on the Treatment of Common Stock in the Life Risk-Based Capital Formula; American Academy of Actuaries 12/6/1997

cumulative, rolling, or tail correlations as single years will be given outsized weight because they are incorporated multiple times in overlapping periods. In addition, we are concerned about the tail correlation analysis, which appears not to have enough data points at the worst 10% - 20% level to be credible over that shortened period. Our recommendation is to at least use the data period starting from 1946. This reflects a longer period to address the statistical shortcomings and is consistent with the 2013 C-1cs analysis.[2] For this work, many data periods were investigated and ultimately data from 1946 – 2012 was used, as it contained a variety of economic environments with both rising and falling interest rates (i.e., it was not dominated by one persistent trend like 1982+) and avoided possibly unrepresentative Great Depression and WWII periods.

We have conducted preliminary analysis with longer data periods that suggests a significantly lower correlation level. We believe this is a better methodology given the longer periods contain multiple economic cycles and interest rate regimes.

Default vs. SP500[3]	Annual	2-Yr Cumulative
1982-2019	23%	43%
1972-2021	8%	16%
1946-2024	5%	10%
1929-2024	2%	12%

Correlation within Asset Classes

Another improvement the project should contemplate is expanding the correlation framework to also include correlations within C-1cs and C-1o categories. Currently, all positions within these categories are correlated 100%, which we believe reflects significant conservatism if the more detailed relationships are not considered. Table 3 in the Appendix highlights this conservatism by showing that when correlation is studied within risk categories, the average correlation measures are materially less than 100%. In addition, more granular correlation analysis would better reflect the actual diversification and type of equities that exist within the portfolios of most insurance companies.

We note that the Academy acknowledges the benefit of this approach. In the AAA letter[4] on 9/8/2025, it states in regard to correlation within risk category that "*Since there may be offsetting impacts of these changes, it may be appropriate to broaden the scope to avoid unintended volatility in RBC*."

[2] Pages 2 – 3 from the NAIC Common Stock Final Subgroup Report 7 9 2013: Section B – 2013 Review of Base Factor.
[3] Default data from Moody's Annual Default Study March 2025; S&P500 Data from SPX Index sourced from Bloomberg.
[4] American Academy of Actuaries Letter, September 8, 2025 Re: Questions on covariance topic raised at 6/18/25 meeting.

Relationship with 30% Equity Charge

Lastly, if the covariance factors are updated, we believe the 30% equity charge needs to be reconsidered for several reasons. Correlation has always been a key consideration[5] when setting the base charges. Specifically, in the 1997 Academy report re-examining covariance, the Academy[6] noted conservatism within the 30%, when considering the 0% equity & credit correlation. We also note that property and casualty (P/C) RBC after-tax charges are 15% with a 0% equity & credit correlation. This was based on the original view prior to 1994 that 30% was too conservative and the fact that a significant number of P/C insurers had common stock exposure.[7] Lastly, the 30% stock charge is beta and concentration charge adjusted; thus, when the market goes up and there is an increase in unrealized gains on common stock, it will become increasingly likely that the company experiences a decreased RBC ratio. We do not believe that outcome is appropriate given the very long and well-understood history of common stocks.

Interest & Equity Correlation

Just as with the link between equity & credit, our preliminary analysis has raised some key questions about the recommendation for the interest & equity correlation.

- Using a total bond fund index may not be the best proxy data for understanding the relationship between interest rates and equities due to its incorporation of credit exposure. Utilizing a dataset with historical Treasury rates (which are not impacted by credit) would be a better interest rate proxy.
- Utilizing the absolute value correlation methodology introduces significant conservatism into the calculation. It incorrectly implicitly assumes symmetrical risk underlying C-3 calculations and ignores diversification benefits between products and between interest rate and equity risks. Our analysis, utilizing Treasury rate data and shifting away from the absolute value method, produces a correlation of -6% (much closer to the current 0% value).
- Again, the small data period largely reflects one interest rate trend which calls into question its ability to represent the interest rate and equity relationship across various economic regimes.
- The 50% correlation is inconsistent with other regulatory regimes. Solvency II and Bermuda Solvency Capital Requirements both utilize bifurcated correlation depending on the direction of rate movements of 0%/50% and 0%/25%.

[5] Page 817 of the Fall 2012 NAIC Fall Proceedings: *Achieving risk sensitivity requires that individual risk charges and the correlation among those risk charge be properly calibrated. Confirming that individual risk charges are properly calibrated is technically challenging. The calibration of correlations is even more difficult.*
[6] Page 17 of the 1997 AAA Report on Common Stock: *This recommendation is based on the factor's inherent conservatism and the recognition that the covariance recommendation has a larger effect on the ultimate risk-based capital requirement*.
[7] Pages 307-310 from the 1996 Proceedings https://www.casact.org/sites/default/files/database/proceed_proceed96_96297

Business Risk

The setting of the Business Risk (C-4) capital factors involves a high degree of judgment given the complexity of these exposures and the more limited data available compared to other risk categories. The Academy's proposal to include Business Risk within the correlation framework represents a notable evolution of the RBC structure and should be evaluated alongside the other correlation updates to ensure consistency and robustness.

As with the other proposed updates—such as those for equity & credit—we recommend confirming that the Business Risk component is incorporated in a manner consistent with the broader methodology and is supported by sufficient analysis. This will help ensure the framework recognizes diversification effects while maintaining an adequate level of capital to provide coverage for business and operational risks encompassed within C-4.

We would note that under the Proposal, there is also a technical issue that regulators may want to consider. LR031 of the current framework applies a 3% charge for operational risk but allows for an offset from business risk (C-4a) subject to a floor of $0. The proposal does not impact operational risk such that the full C-4a amount prior to covariance is still allowed as the offset, even though the post-covariance C-4a RBC amount held is much smaller, resulting in a material reduction in combined business and operational risk charges.

Industry Impact Analysis

Our preliminary analysis indicates that the proposed correlation factors would have a substantial impact on the RBC for many companies. A more thorough impact analysis needs to be performed. The exposed AAA presentation impact analysis shows percentage changes for theoretical companies rather than a comprehensive analysis based on actual company and industry data. While we acknowledge that the evaluation of whether the changes should be made should not be based solely on the magnitude of the change, we are concerned that the magnitude of the changes may not be aligned with a company's actual risk profile and will create unintended consequences that would not be in the best interest of policyholders.

We have put together the estimated impacts for an average company (based on the 2023 YE Academy Report) reflecting each correlation change in the current Proposal (Appendix Table 1). The results highlight the significant movement each individual change can create and imply that company impacts will likely vary significantly depending on their mix of risks. This provides further support for the need to get a more complete view of the distribution of changes across the industry as well as indicate that it would be helpful to analyze the impacts of the individual correlation changes to be able to properly evaluate them independently.

In conclusion, we hope we have demonstrated that there are numerous foundational questions that must be resolved before any change to the correlation factors can be responsibly considered. Even if those questions were to be addressed, many elements of this work require judgment-based assumptions that will materially affect outcomes. Therefore, regulators should carefully

weigh whether introducing this change is prudent, given the level of subjectivity involved. If outcomes depend so heavily on individual judgment, rather than objective calibration standards, it is worth asking whether such a judgment-driven proposal should fundamentally reshape RBC results without further robust analysis.

Additionally, any proposed change should be held to the standards of process and review under the emerging NAIC RBC Model Governance principles. Any revision of this magnitude must clearly demonstrate regulatory value, avoid unnecessary complexity, and promote the stability of the capital framework for the long-term benefit of policyholders.

We appreciate the Working Group's consideration of these comments and would welcome the opportunity to discuss these points further.

Sincerely,

Signed by:
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23CEFA60BB49473...
Jeffrey Turcotte
Corporate Chief Actuary
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Signed by:
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cc: Ben Slutsker, Vice Chair – LRBCWG

Appendix

Table 1: Isolating Impact of Individual Correlation Changes in Academy Proposal

Current YE 2023 RBC	**436%**
Business risk included in covariance	+29%
Equity/Credit correlation 0% to 50%	-47%
Interest/Credit correlation 100% to 25%	+21%
Equity/Interest correlation 0% to 50%	-12%

Table 2: Correlation Sensitivity to Underlying Equity Index

1982-2019	**Annual**	**2-Yr Cumulative**
Default vs. Large Cap	23%	43%
Default vs. Mid Cap	-4%	22%
Default vs. Small Cap	11%	28%

Default data from Moody's Annual Default Study March 2025

Equity Data from SPX (Large Cap), M ID (Mid Cap), RTY (Small Cap) sourced from Bloomberg.

Table 3: Average Correlation within Major Asset Classes

- Values represent the average correlation for all the indexes listed in the sub-bullet for each larger asset category.
- Indexes selected to be representative of common asset sub-types underneath the larger asset category.

Intra-Correlations C1cs Proxy	Monthly Data & Returns 01/79-9/25	Quarterly Data & Returns 03/81-03/25
Public Equity[1]	0.72	0.79
Public and Private Equity[2]	NA	0.53

Note:
1. Public Equity includes the S&P 500, Russell 2000, and the MSCI EAFE index.
2. Public and Private Equity includes the indexes in note 1 and the Burgiss LBO <$5Bn Index.

Intra-Correlations C1o Proxy	Monthly Data & Returns 02/97 - 08/25	Quarterly Data & Returns 06/97 – 03/25
Public Credit[1]	0.50	0.50
Public Credit and Real Estate/ Ag/ Timber Equity[2]	NA	0.30

Note:
1. Public Credit includes thirteen Bloomberg indexes: eight corporate rating-based indexes, two ABS indexes, two CMBS indexes and an EM USD debt index.
2. Public Credit and RE/Ag/Timber Equity includes the indexes in note 1 and the NCREIF ODCE, NCREIF Farmland and NCREIF Timberland indexes that are only available at a quarterly frequency.

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November 10, 2025

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

Re: LRBC-Academy Correlation Presentation Exposure

Dear Chair Barlow:

The American Council of Life Insurers (ACLI) appreciates the opportunity to provide feedback on the American Academy of Actuaries' (Academy) RBC Correlation presentation that LRBC exposed in September. We would also like to take this time to express our gratitude towards regulators and NAIC for allowing a longer comment period with which to collect our thoughts and analyze the exposure.

Although we appreciate the Academy's work on the topic of covariance, we believe that the interdependence of the RBC framework will require in-depth, deliberate and holistic analysis to accomplish effective and meaningful improvements to it. Given the myriad projects underway relating to RBC and their potential impact, most notably the Generator of Economic Scenarios (GOES) that will have an uncertain but likely material impact on capital, this proposal should be slowed down until those other important matters are settled. The correlation between various risk factors is a foundational component of the RBC framework and any potential changes should be considered only after a thorough analysis of the underlying assumptions and potential outcomes to best mitigate the possibility of any unintended consequences, especially at the company level.

Prioritize comprehensive impact analysis before finalizing changes

While we appreciate the desire of regulators to move forward with this Life RBC Working Group agenda item, ACLI suggests that this impactful update should be paused over the near term to ensure the impacts are well understood across a range of valuation date conditions and company level risk profiles and intended by all parties involved. The potential outcomes of any review of covariance are especially data dependent, and as demonstrated below, the proposal would benefit from additional development and documentation in several respects, warranting more time.

The correlation proposal is coming at a time when the industry is facing several other framework updates. The current analysis does not reflect what RBC will look like under the new Generator of Economic Scenarios (Generator), as Generator enhancements now explicitly reflect additional risks in the framework that are likely to be exacerbated by the proposed covariance updates. We are particularly

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concerned that, if improperly analyzed and vetted, it could lead to inappropriate capital requirements. This would be contrary to the draft foundational RBC principles of the RBC Model Governance (EX) Task Force (proposed September 23, 2025) related to "equal capital for equal risk" and ensuring consistency across the statutory framework.

Given the stability of the current framework across diverse economic conditions, we believe a data-driven, phased approach will yield better results and more sustainable outcomes. The existing framework has worked well to measure solvency risks and has corresponded to capital levels at companies with understandable movements across a range of stressed economic environments (e.g., low for long, COVID, etc.). ACLI is not aware of a weakness in the covariance framework that requires immediate attention, so we urge regulators to take a measured approach crafting a proposal and running the appropriate analysis to develop a solution that meets durable regulatory objectives.

Therefore, it would be most prudent for regulators and the Academy to run a new analysis based on the year-end 2026 data, as the Generator becomes operational on January 1, 2026, for a more holistic and accurate impact assessment. This new analysis should take into account the considerations outlined below about the data and data sources, assumptions and methodology to be used.

Thoroughly review company-level impact and assumptions

As the analysis to date is based on aggregate Life RBC industry statistics, it does not account for the potential range of results when viewed on an individual company basis. We expect company results will meaningfully differ from the average due to differences in product mixes, portfolio allocations, reinsurance programs, and risk management (among other considerations). Accordingly, in order to understand potential impact, we encourage the Working Group to analyze and consider results for actual companies or representative proxies rather than focusing on aggregate industry statistics. As a first step, since regulators have access to prior years' RBC data, it may be possible to assess the impact on individual companies without additional data collection. This may indicate that the potential impact of the proposal is larger than originally presented and that more thorough analysis will very likely also be warranted.

After reviewing the Academy presentation, we have several questions about the underlying data and methodology used that we believe warrant updates and a revised proposal in the future.

Regarding the underlying data and analysis, significantly more documentation is required so that interested parties can adequately respond and provide potential alternatives. As the Academy presentation indicates, there is a potential wide range of reasonable assumptions that can result in a wide range of outcomes. We note the following:

- The Academy used a 38-year time horizon of 1982 – 2019. When possible, it would be best to use a longer data period, with the most recent years available, that would incorporate multiple economic environments. This would be more aligned with how the time horizon was selected for the 2013 C-1cs analysis that ultimately chose starting in 1946 to accomplish the goal of reflecting a variety of economic environments with both rising and falling rates. We believe utilizing this longer time frame, when possible, supports stability in this metric, provides more credible levels of data points for any tail analysis, and better reflects a variety of economic environments. More recent experience and potentially sensitivity analysis on more recent valuation dates provides more information on newer asset classes and better aligns with current company asset portfolios.

- We also want to better understand the underlying data used to develop the equity and credit correlation. Different underlying data suggests a range of correlation outcomes, which could drastically change the conclusions.
- Correlations within C-1-other and C-1-CS are not reflected in the Academy analysis; this topic should be discussed and analyzed before further work is undertaken to determine the appropriateness of including those correlations.
- The underlying data used to develop the interest and equity correlations for covariance and GOES appears to be inconsistent; ideally, these methodologies should align within the RBC framework. For the covariance analysis the Academy used the total return of investment-grade bond funds as the data source to develop the correlation between interest rate and equity risk. Therefore, most of the positive 50% rate/equity correlation is driven by the excess return (i.e., credit spread) from 1982 to 2019. This is inconsistent with the 20% correlation used for GOES between interest rate and equity to develop the C-3 factor. 20% is based on the realized correlation of monthly changes in 20-year Treasury rates vs S&P return from 2000 to 2020. If the Treasury bond index return were used, it would produce a near zero to negative correlation.

Thank you once again for considering our comments. We look forward to further discussion at a future LRBC meeting and to continued collaboration with regulators and the Academy. Given the potential magnitude of these changes, it is essential that any future work proceeds deliberately and only after key data, analytical and methodological questions are fully addressed. Any revision to covariance should clearly demonstrate regulatory value, avoid unnecessary complexity, and strengthen—not disrupt—the stability and relevance of the RBC framework for the long-term benefit of policyholders.

Sincerely,

cc: Kazeem Okosun, NAIC

Genworth Financial, Inc.
Kelly A. Saltzgaber
Executive Vice President & Chief Investment Officer
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November 10, 2025

Philip Barlow, Chair
Life Risk-Based Capital Working Group
National Association of Insurance Commissioners (NAIC)
Via email kokosun@naic.org

Re: Exposure of "Correlation in Life Risk-Based Capital"

Dear Chairman Barlow:

Thank you for the opportunity to provide comments on the American Academy of Actuaries' (the "Academy") presentation regarding "Correlation in Life Risk-Based Capital". We appreciate the magnitude of the Academy's efforts to reexamine the correlation assumptions for Risk-Based Capital ("RBC"). While the current RBC formula assumes no correlation between credit risk and equity risk or between interest rate risk and equity risk and assumes 100% correlation between interest rate risk and credit risk, we are heartened that the Academy's new proposed methodology attempts to remedy this binary assumption to better reflect market realities. We applaud the Academy's continuing work in this area; however, we respectfully submit some observations and recommendations for your consideration.

We support the Academy's reduction of the assumed 100% correlation between interest rate risk and credit risk, as empirical data suggests a significantly lower correlation (*see* Table below). Conversely, we recommend maintaining a 0% correlation between interest rate risk and equity risk, given their historically inverse relationship, the increasing complexity of liability structures, and the ongoing analytical work of NAIC in this area. Similarly, we recommend maintaining a 0% correlation between credit risk and equity risk, as historical evidence does not demonstrate a consistent or meaningful relationship between these components. The current RBC charge for equities and common stock (30%) incorporates a substantial degree of conservatism; we suggest that this existing conservatism obviates the need for an additional layer of risk management. Introducing positive correlations involving equity risk into the RBC framework raises the concern that excessive capital charges could unfairly penalize companies prudently seeking equity investments to match longer duration liabilities. Accordingly, we suggest deferring changes to equity-related correlations until further quantitative analysis can be conducted to ensure such adjustments are reasonable and warranted.

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						Tails				
	Correlations	Current	AAA Proposal	Genworth Proposal	Historical All Data (1986-2024)	Historical Combined Tail (1986-2024)	By Private Equity Tail Periods	By S&P 500 Tail Periods	By Default Tail Periods	Correlation
Quarterly Series	Rates-Credit	100%	25%	0-25%	1%	27%	19%	29%	31%	Slightly Positive
	Rates-Equity	0%	50%	0%	-21%	-41%	-49%	-49%	-35%	Negative
	Credit-Equity	0%	50%	0%	7%	-32%	15%	9%	-17%	Unclear

NB: "Credit" in the table above is proxied by the inverse of default rates. Equity-related correlation values shown in the table above are calculated using the S&P 500 Index as the reference benchmark.

We have additional concerns regarding some aspects of the Academy's methodologies and assumptions, which reinforce our recommendation for additional consideration and analysis:

First, the Academy's RBC impact analysis applies its correlation methodology changes to aggregate industry RBC mix. While we understand the need to test their methodology broadly, this generalized approach disregards the heterogeneity of insurance company business models. Significant deviations from the industry average, driven by differences in liability characteristics and asset allocation are inherent to the industry. Accordingly, we recommend that the impact analysis be grounded in actual company data or representative proxies to best evaluate the methodology's appropriateness, effectiveness, and implications.

Second, Academy's proposed methodology uses total returns of bond funds as a proxy for the C-3 interest rate risk calculation, however, this proxy is less than perfect because bond fund returns are impacted by both interest rate risk and credit risk. We respectfully suggest that the use of purely government bond-based returns is a more appropriate proxy for interest rate risk under the current C-3 framework.

We agree with the Academy's assessment that refining the C-3 calculation is a complex undertaking. Currently, for example, equity market elements may be impacting C-3 Phase 1 ("C3P1") cash flow testing and interest rate elements may be impacting C-3 Phase 2 ("C3P2") modeling. Material changes to C3 methodologies are currently under consideration to account for these market dynamics, including the adoption of the Generator of Economic Scenarios ("GOES") to incorporate elements of interest rate risk. Given the wide scope and potential impact of such changes, we recommend deferring adoption until there is visibility into results under revised C-3 methodologies. In addition, more meaningful RBC framework updates are anticipated, including RBC for CLOs and C-2 Longevity Reinsurance. Prior to implementing framework changes, it is critical to evaluate the combined impact of these proposed changes to ensure accurate insight into underlying asset and liability risks in the industry.

Third, the proposed methodology applies the absolute value of all interest rate correlations instead of considering positive and negative interest correlation values. Although we appreciate that losses can result from either rising or falling rates, the use of absolute values in the context of RBC calculations raises concerns about accuracy. Converting negative correlations between interest rate risk and equity risk into positive values disregards diversification benefits typically observed in the market.

Fourth, the proposal adopts (i) a 50% correlation between credit risk and equity risk, (ii) a 50% correlation between interest rate risk and equity risk, and (iii) a 25% correlation between interest rate risk and credit risk. While there is statistical support for the third assumption, analyses of historical stressed scenarios do not support the first two proposed correlation assumptions:

i. Credit default rates display a slight negative correlation with Private Equity ("PE") and S&P index returns across all data (1986 to 2024) and with a narrowed focus

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on PE tail return periods and S&P index tail return periods[1]. This weak negative correlation is not, however, uniformly applicable in every tail scenario. During credit default tail periods, default rates demonstrate positive correlations with PE and S&P index returns (i.e. lower default rates during periods of poor PE and S&P index performance, likely due to reporting time lag). Analysis of all tail periods in aggregate also produces positive correlations, suggesting a decrease in risk rather than an increase.

ii. Our analysis indicates that interest rate risk, represented by U.S. long government bonds, has a strong negative correlation with PE and S&P index returns. This negative correlation persists whether the analysis includes all data (1986 to 2024) or narrows in focus to either PE tail return periods, S&P index tail return periods, or credit default tail periods (*see Appendix A attached*). Such correlations tend to provide diversification benefits which decrease rather than increase risk.

iii. Analysis of all data from 1986 to 2024, as well as from individual and combined tail return periods, indicates a slight negative correlation between interest rate risk and credit default rates i.e. low positive correlation between interest rate risk and credit risk, substantially below the current assumption of 100% correlation which supports a decrease in correlation as ACADEMY has proposed.

Finally, the misalignment of risk duration assumptions used in developing C-1cs factors (a 2-year period) and C-3 cash flow testing (much longer durations) with those considered by the Academy in drawing their conclusions (5-years) is concerning. The current RBC model treats equities as short-term speculative investments and penalizes companies who engage in strategic asset liability management by pairing long duration liabilities with a long-term equity investment strategy. Applying short-term correlations to long-term risks only exacerbates this mismatch.

Based on the above observations and analysis, we are apprehensive about the potential effect of the Academy's proposal on the industry. As currently designed, these correlation assumptions could misrepresent actual risk relationships within the RBC formula leading to inaccurate capital requirements for insurers.

We recognize that a robust RBC framework is essential to risk management and to the NAIC's critical work of monitoring insurer solvency and that precise measurement of the correlation of investment risks is central to that task. Any changes to the RBC formula adopted in connection with this proposal, however, must consider both market realities and the broader regulatory discussions which may impact RBC which are currently underway at the Capital Adequacy (E) Task Force, the Risk-Based Capital (RBC) Model Governance (EX) Task Force and the GOES Subgroup.

[1] PE tail return defined as less than 0% return in a quarter; S&P index tail return defined as less than -5% return in a quarter; and credit default tail defined as greater than 2.3% in a year.

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Sincerely,

Kelly A. Saltzgaber

Cc: Kazeem Okosun, Senior Life RBC Analyst

Genworth

Appendix A

Average of 5 Year Rolling Correlations					
All Data (1986-2024)	Default	US Long Credit	Private Equity	S&P 500	US Long Gov
Default	100%				
US Long Credit	7%	100%			
Private Equity	-19%	1%	100%		
S&P 500	-7%	22%	59%	100%	
US Long Gov	-1%	74%	-25%	-21%	100%

Tail Correlations					
By Private Equity Tail Periods	Default	US Long Credit	Private Equity	S&P 500	US Long Gov
Default	100%				
US Long Credit	-17%	100%			
Private Equity	-18%	-5%	100%		
S&P 500	-15%	5%	40%	100%	
US Long Gov	-19%	61%	-35%	-49%	100%
By S&P 500 Tail Periods	Default	US Long Credit	Private Equity	S&P 500	US Long Gov
Default	100%				
US Long Credit	-32%	100%			
Private Equity	-48%	17%	100%		
S&P 500	-9%	-32%	18%	100%	
US Long Gov	-29%	70%	-12%	-49%	100%
By Default Tail Periods	Default	US Long Credit	Private Equity	S&P 500	US Long Gov
Default	100%				
US Long Credit	12%	100%			
Private Equity	2%	30%	100%		
S&P 500	17%	50%	63%	100%	
US Long Gov	-31%	31%	-10%	-35%	100%
Combined Tail Periods	Default	US Long Credit	Private Equity	S&P 500	US Long Gov
Default	100%				
US Long Credit	11%	100%			
Private Equity	15%	33%	100%		
S&P 500	32%	33%	45%	100%	
US Long Gov	-27%	45%	-7%	-41%	100%

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November 10, 2025

Philip Barlow

Chair, NAIC Life Risk-Based Capital (E) Working Group

Re: Life Risk Based Capital – Academy of Actuaries Correlation Presentation Exposure

Dear Chair Barlow:

Thrivent appreciates the opportunity to provide feedback on the American Academy of Actuaries' (Academy) RBC Correlation presentation which the Life Risk-Based Capital Working Group ("Working Group") exposed at its September 11, 2025 conference call. As a member-owned, Fortune 500 company, Thrivent's mission is to help our members and their communities thrive through having a client-focused, long-term view in all we do. We are dedicated to fulfilling the promises we make to our clients - whether they're protecting their finances, investing for the future or generously giving back to others. The Risk-Based Capital framework is a key component in how we manage our capital, and we want to make sure potential changes are the result of thorough analysis to best mitigate the possibility of any unintended consequences.

In consensus with the comments provided by the ACLI, Thrivent urges the Working Group to prioritize a more comprehensive analysis before considering adoption of revised correlation factors in the RBC formula.

- Within the guiding principles of the proposal is a desire to "provide consistent differentiation between companies." To ensure this result is achieved as the result of any changes, it is critical to evaluate the impact of each revised correlation factor for individual companies, not only the industry averages or for hypothetical companies.

- Also, within the guiding principles of the proposal, the intent of the recommendation is to "avoid false precision in both methodology and numerical values." For this principle to be met, any complexity and factors that are supported by studies and reports need to be well vetted and fully thought through. A more comprehensive discussion and consideration of the primary and secondary metrics and qualitative factors used to justify the proposed changes as presented on the "Summary Results & Rationale - Market Risks" slide (page 7) of the exposure is necessary.

- The correlation between various risk factors is a foundational component of the RBC framework and any potential changes should not be considered without consideration of the underlying components. For example, the original C-1cs base equity charge (30%) was determined considering the current correlation matrix structure. If the correlation factors applied to equities are modified, we believe the C-1cs base equity charge needs to be re-

evaluated. The same would be true for each of the individual C-factors underlying the proposed changes to the correlation matrix.

We are unsure if there is an absolute target to make changes to the correlation matrix effective for year-end 2026, but we do not feel that adoption before year-end 2027 is reasonable. Based on our initial review of the changes, Thrivent's RBC results differ significantly from the high-level industry average shown in the exposed materials. We expect results from across industry to also meaningfully differ from the industry average due to differences in product mixes, asset allocations, reinsurance programs, and risk management among other considerations. To effectively understand these differences and ensure any changes are appropriate, a review of company-level impact is critical and will take time, especially since we are all also currently focusing on other upcoming RBC framework updates (including C-3 Phase 1 and C-3 Phase 2 alignment with GOES, RBC for Collateralized Loan Obligations, and C-2 Longevity Reinsurance). Due to the materiality of the proposed changes, we are observing and our assumption that many other companies are likely to see this as well, a hasty adoption of any changes will not allow companies time to seriously consider responsive modifications in how our credit, equity, insurance, and interest rate risks are calibrated and managed before implementation of the changes. In the extreme, a rushed timeline could force companies to be a forced seller of risk-assets in a condensed window, in order to reposition their balance sheet, which is suboptimal to good risk management practices.

Thank you for your consideration of our comments. We welcome further discussions on this topic, and we will continue to be active and willing to participate in any public or regulator-only discussions, impact studies and comment letter requests to enhance necessary further analysis and potential modifications to the proposal.

Sincerely,

Rhonda K Ahrens

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Cc: Kazeem Okosun, NAIC

Draft: 11/14/25

Property and Casualty Risk-Based Capital (E) Working Group
and Catastrophe Risk (E) Subgroup
Virtual Meeting
November 12, 2025

The Property and Casualty Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met Nov. 12, 2025, in joint session with the Catastrophe Risk (E) Subgroup of the Property and Casualty Risk-Based Capital (E) Working Group. The following Working Group members participated: Tom Botsko, Chair (OH); Wanchin Chou, Vice Chair (CT); Rolf Kaumann and Eric Unger (CO); Shalice Rivers (FL); Sandra Darby (ME); Melissa Robertson (NM); Ni Qin (NY); Will Davis (SC); and Adrian Jaramillo (WI). The following Subgroup members participated: Wanchin Chou, Chair (CT); Shalice Rivers (FL); Rolf Kaumann and Eric Unger (CO); Travis Grassel (IA); Sandra Darby (ME); Melissa Robertson (NM); Tom Botsko (OH); Andy Schallhorn (OK); and Will Davis (SC). Also participating was: Steve Drutz (WA).

1. Adopted the Working Group and Subgroup's Joint Oct. 8 Minutes

Botsko said the Working Group and Subgroup met Oct. 8 and took the following action: 1) adopted their June 30 minutes; 2) discussed the catastrophe modeling wildfire review and impact analysis; 3) discussed the possibility of updating the Rcat covariance formula; 4) discussed the possibility of separating the earthquake and hurricane losses experience PR100s; 5) discussed the Securities Valuation Office (SVO)-funded risk-based capital (RBC) alignment project; 6) heard updates from the American Academy of Actuaries (Academy) regarding property/casualty (P/C) RBC premium and loss concentration factors; and 7) discussed accident and health structure in the P/C RBC formula.

Chou made a motion, seconded by Darby, to adopt the Working Group and Subgroup's joint Oct. 8 minutes (Attachment Three-A). The motion passed unanimously.

2. Adopted Proposal 2025-08-CR (Jan. 1 – Oct. 15 Cat Event List)

Chou stated that proposal 2025-08-CR consolidates both U.S. and international catastrophe event lists spanning from 2016 to 2025 for use in year-end 2025 reporting. This comprehensive list encompasses major peril types, including hurricanes, earthquakes, wildfires, and severe convective storms. The first version of the 2025 event list, covering incidents from January through October, was made available for public comment via an e-vote on Nov. 3, with no feedback received during the seven-day exposure period. Chou further noted that a revised iteration of the event list will be released for additional public comment in early January 2026, with adoption anticipated by February 2026. Darby highlighted the importance of establishing and maintaining consistent terminology when referencing event types. Chou concurred with this recommendation and directed NAIC staff to update and harmonize the terminology prior to the release of the second iteration of the event list.

Grassel made a motion, seconded by Darby, to adopt proposal 2025-08-CR (Attachment Five). The motion passed unanimously.

3. Exposed Proposal 2025-19-CR (Separating Earthquake and Hurricane Lines Experience Data in PR100s)

Chou clarified that, while wildfire and severe convective storm losses are currently reported separately in PR100s, hurricane and earthquake experience data remain combined. The proposed change seeks to separate hurricane and earthquake losses, thereby aligning their reporting with that of other perils. This adjustment will enable both

the Subgroup and the Working Group to more effectively address each risk, taking into account their unique characteristics and impacts.

The Working Group and Subgroup concurred to expose proposal 2025-19-CR (Attachment Three-B) for a 60-day public comment period ending Jan. 11, 2026.

4. Exposed Proposal 2025-20-CR (Wildfire Rcat Implementation)

Chou reiterated that beginning in June and July of this year, the Subgroup collaborated with four modeling vendors to conduct a second round of impact analysis, utilizing consistent exposure inputs across all models. The Subgroup reconvened Sept. 25 to review and address feedback from the impact analysis presentations. A comparative assessment between the initial 2022 impact analysis and the current evaluation demonstrated that model outputs have become increasingly consistent over time. As a result, the Subgroup has greater confidence in the reliability of these models and their applicability to risk management. He stated that this proposal aims to include wildfire peril in the Rcat component, reflecting the enhanced reliability and applicability of the catastrophe models.

The Working Group and Subgroup concurred to expose proposal 2025-20-CR (Attachment Three-C) for a 60-day public comment period ending Jan. 11, 2026.

5. Discussed the Working Group and Subgroup's Working Agenda

Botsko provided an overview of the key updates to the Working Group and Subgroup's 2026 working agenda. Changes include: 1) revising expected completion dates, ongoing items, and comments for items P1, P3, P4, P5, P6, and P7; 2) removing completed items from the original P7 and P8; and 3) introducing three new initiatives to the "New Items" section: a) evaluate the possibility of adding wildfire peril in the Rcat component; b) evaluate the possibility of separating earthquake and hurricane loss experience data in PR100s; and c) evaluate the possibility of updating the loss and premium concentration factors in PR017 and PR018.

6. Discussed the SVO-Funded RBC Alignment Project

Botsko reported that the Working Group received three comment letters on the SVO-funded RBC alignment project during the exposure period. John Muska (American Property Casualty Insurance Association—APCIA) conveyed the APCIA's endorsement of the proposal to harmonize RBC requirements for SVO-designated bond funds, including exchange-traded funds (ETFs), mutual funds, and private funds, as considered by the Working Group. Muska observed that the proposal presents a valuable opportunity to pilot the draft principles established by the Risk-Based Capital Model Governance (E) Task Force. Furthermore, he highlighted that the initiative would be particularly advantageous for smaller insurers, who may not possess the portfolio scale necessary for direct bond investments, by enabling access to diversified bond funds without increasing risk exposure. Muska also requested that the inherent flexibility in filing with the SVO be preserved, ensuring insurers retain the ability to tailor their investment strategies as needed.

Jonathan Rodgers (National Association of Mutual Insurance Companies—NAMIC) expressed support for the current regulatory framework, specifically the established two-step process that enables issuers and insurers to submit investment fund holdings to the SVO for designation of certain bond funds. Rodgers affirmed NAMIC's endorsement of existing RBC governance standards, which emphasize the importance of focusing on measurable risks that could impact insurer solvency. He recommended that the Working Group conduct a thorough analysis of the underlying risks associated with these funds before implementing any changes to RBC requirements. Furthermore, Rodgers stressed that any modifications necessitating additional regulatory infrastructure or increased company expenses should be carefully evaluated to ensure they deliver tangible benefits to solvency

oversight. Finally, he noted NAMIC's support for allowing regulators the discretion to prioritize potential changes to RBC requirements as appropriate. In response, Chou inquired about the recommended approach for conducting risk assessment analyses. Rodgers advised leveraging the expertise of existing SVO staff, supplemented by NAIC RBC staff as needed, to evaluate whether the instruments in question align with the characteristics of traditional bonds. He also referenced prior impact assessments conducted by the Working Group, indicating that this methodology remains suitable under current governance standards.

Kieth Bell (Travelers) provided additional comments supplementing those previously submitted to the Risk-Based Capital Investment Risk and Evaluation (E) Working Group. Bell recommended that the proposal would be strengthened by an analysis of its actual impact on RBC charges and ratios at the individual company level, with results aggregated across various scenarios involving changes to R2 factors. He noted that the data was skewed by two large companies with significant equity holdings, which distorted the R2 analysis. Furthermore, Bell emphasized the importance of considering the additional risks associated with investing in mutual funds and bond funds compared to direct bond investments.

Chou expressed agreement with the recommendations from both NAMIC and Travelers regarding the importance of conducting a comprehensive risk assessment. Chou indicated that such an evaluation would be valuable for the Working Group's deliberations. Botsko concurred, emphasizing that performing a thorough analysis on this topic is essential to ensure its appropriateness for inclusion in the P/C RBC framework.

7. Received an Update from the Health Risk-Based Capital (E) Working Group Regarding Proposal 2025-15-CA (A&H Underwriting Risk Structure Change)

Drutz reported that the Academy presented its H2—Underwriting Risk Component and Managed Care Credit Calculation within the Health Risk-Based Capital Formula Report to the Health Risk-Based Capital (E) Working Group at its April 30 meeting. The report introduced a revised structure designed to closely align the underwriting risk pages with the lines of business as reflected in the analysis of operations of the Health Annual Statement. Additionally, the report recommended implementing similar changes in the life and P/C RBC formulas to mirror the updates made in the health RBC formula. The proposed revisions incorporate changes to the underwriting risk structure found on XR013, LR020, and PR020, and include the removal of the two-times individual risk from the alternate risk charge. Drutz noted that the proposal is exposed for a public comment period ending Jan. 20, 2026, and is available on the P/C, life, and health RBC working groups' web pages under the exposures tab. Botsko encouraged all interested parties to review the proposal and submit comments to the Health Risk-Based Capital (E) Working Group during the exposure period.

8. Exposed a Presentation from the Academy Regarding the Property and Casualty Risk-Based Capital Premium and Loss Concentration Factors Report

Allan Kaufman (Academy) presented the Academy's evaluation of premium concentration factors (PCFs) and loss concentration factors (LCFs) within the RBC formula, emphasizing diversification credit for insurers with multiple lines of business. The presentation addressed: 1) revisions to diversification credit parameters; 2) data and methodology; 3) calculation of maximum diversification credit (MDC); 4) linearity; 5) alternative data; 6) the CoMAxLine% approach; 7) investment income adjustment (IIA) sequencing; and 8) safety and regulatory considerations.

Botsko invited stakeholders to review the report and submit comments during the exposure period. He said feedback will be discussed at the next meeting.

The Working Group and Subgroup agreed to expose the report (Attachment Three-D) for a 60-day public comment period ending Jan. 11, 2026.

9. Discussed Other Matters

Botsko announced that the Working Group and Subgroup will not convene in person at the Fall National Meeting. Instead, they plan to reconvene in spring 2026 to address outstanding agenda items.

Having no further business, the Property and Casualty Risk-Based Capital (E) Working Group and Catastrophe Risk (E) Subgroup adjourned.

SharePoint/NAIC Support Staff Hub/ Member Meetings/E Cmte/CADTF/2025-Fall/PCRBCWG/Joint PCRBC Cat Risk Minutes 111225.docx

Draft: 10/14/25

Property and Casualty Risk-Based Capital (E) Working Group
and the Catastrophe Risk (E) Subgroup
Virtual Meeting
October 8, 2025

The Property and Casualty Risk-Based Capital (E) Working Group of the Capital Adequacy (E) Task Force met Oct. 8, 2025, in joint session with the Catastrophe Risk (E) Subgroup of the Property and Casualty Risk-Based Capital (E) Working Group. The following Working Group members participated: Tom Botsko, Chair (OH); Wanchin Chou, Vice Chair (CT); Charles Hale (AL); Rolf Kaumann and Eric Unger (CO); Jane Nelson (FL); Sandra Darby (ME); Elouisa Macias (NM); Ni Qin and Alexander Vajda (NY); Will Davis (SC); and Rebecca Armon and Miriam Fisk (TX). The following Subgroup members participated: Wanchin Chou, Chair (CT); Jane Nelson, Vice Chair (FL); Rolf Kaumann and Eric Unger (CO); Travis Grassel (IA); Sandra Darby (ME); Elouisa Macias (NM); Tom Botsko (OH); Andy Schallhorn (OK); Will Davis (SC); and Rebecca Armon and Miriam Fisk (TX). Also participating were: Julie Lederer (MO).

1. Adopted the Joint Property and Casualty Risk-Based Capital (E) Working Group and Catastrophe Risk (E) Subgroup's June 30 minutes

Botsko said the Property and Casualty Risk-Based Capital (E) Working Group and Catastrophe Risk (E) Subgroup met June 30. During this meeting, the Working Group and Subgroup took the following action: 1) adopted their Spring National Meeting minutes; 2) adopted their June 11 minutes, which included the following action: a) adopted proposal 2025-09-P (Underwriting Risk Line 1 Factors, and proposal 2025-11-CR (Catastrophe Modeling Attestation); b) discussed 2024 property/casualty (P/C) RBC statistics; c) heard updates on the wildfire impact analysis; d) discussed climate impact disclosures; e) discussed flood peril; and f) discussed property claim services events list enhancement; and 3) adopted their May 2 minutes, which included the following action: a) adopted proposal 2025-06-CR (Disclosure Climate Condition Cat Exposure Instruction); b) exposed proposal 2025-09-P (Underwriting Risk Line 1 Factors), and proposal 2025-11-CR (Catastrophe Modeling Attestation) for a 30-day public comment period that ended June 1; c) heard updates on the wildfire impact analysis; d) discussed holding a summer panel discussion; e) discussed the process for updating the catastrophe event lists; f) discussed the Statutory Accounting Principles (E) Working Group referral for risk-based capital (RBC) assessment for capital notes and non-bond debt securities; g) discussed bond-like treatment for Securities Valuation Office (SVO)-designated mutual funds; and h) discussed the appointment of the Risk-Based Capital Model Governance (EX) Task Force.

Chou made a motion, seconded by Kaumann, to adopt the Joint Property and Casualty Risk-Based Capital (E) Working Group and Catastrophe Risk (E) Subgroup's June 30 minutes (*see NAIC Proceedings – Summer 2025, Capital Adequacy (E) Task Force, Attachment Five*). The motion passed unanimously.

2. Discussed Catastrophe Modeling Wildfire Review and Impact Analysis

Chou reported that a diverse group of catastrophe modelers, regulators, and NAIC staff are actively participating in the Catastrophe (CAT) Modeling Wildfire Review. As the Wildfire Review Ad Hoc Group approaches the final stages of its evaluation, Chou provided an update on the project's background, the convergence of exceedance probability (EP) curves, and the ongoing efforts to formalize the proposal plan and supporting documentation. He explained that, following the precedent set by the 2021 wildfire review, the Ad Hoc Group was re-established and commenced a new review cycle on March 18, guided by the Actuarial Standard of Practice (ASOP) No. 38—Catastrophe Modeling (for All Practice Areas). This process encompasses high-level analysis, confidential

assessments, and comprehensive impact analysis. In addition to the original three vendors—Moody Risk Management Solutions (RMS), Verisk Extreme Event Solutions, and KCC—CoreLogic joined as a new participant for this review.

Beginning in early June and July, the ad hoc group collaborated with all four vendors to conduct a second round of impact analysis using consistent exposure inputs. On Sept. 25, the group reconvened to address feedback from the impact analysis presentations. He presented a comparative analysis between the initial impact assessment conducted in 2022 and the current evaluation, noting that model outputs have become increasingly consistent. He emphasized that the group now has greater confidence in the models and their applicability to risk management.

Additionally, Chou outlined plans to work with committee support to formally document the review process, ensuring comprehensive records are maintained for future reference. In response to a question from Lederer regarding the difference in probable maximum loss (PML) between 2022 and 2025, Chou clarified that the variation was attributable to differences in exposure inputs provided to the catastrophe vendors. The latest results demonstrate a more converged 100-year aggregate PML.

3. Discussed the Possibility of Updating the Rcat Covariance Formula

Chou clarified that the Rcat covariance formula, integral to the RBC calculation, is designed to aggregate catastrophe risks while recognizing that such events are unlikely to occur simultaneously. This adjustment helps prevent the overestimation of total risk. Presently, the formula treats these risks as largely independent. However, with the increasing influence of climate change, there is an expectation that correlations between certain catastrophe risks, such as hurricanes and severe convective storms, will rise. Additionally, the recent inclusion of wildfire and severe convective storm risks in the RBC formula for informational purposes has prompted consideration of whether the covariance formula should be updated to reflect these positive correlations.

To ensure any future changes are based on robust evidence, Chou has requested the American Academy of Actuaries (Academy) to conduct a comprehensive study on this matter. The objective is to provide empirical support for any modifications to the Rcat covariance formula, ensuring that adjustments are grounded in thorough analysis and reliable data. Until the study is completed, the current formula will remain in use, allowing for a careful evaluation of climate change's impact on risk correlations before implementing changes to the RBC framework.

4. Discussed the Possibility of Separating the Earthquake and Hurricane Losses Experience PR100s

Chou noted that, whereas losses from wildfire and severe convective storms are reported separately in PR100s, the current formula combines hurricane and earthquake experience. He suggested that distinguishing hurricane and earthquake losses, similar to the approach used for wildfire and severe convective storms, could enable the Subgroup and Working Group to more effectively manage and address each peril, taking into account their distinct characteristics and impacts. Hearing no objection from the members and the interested parties, committee support will draft a proposal and expose for comment in the upcoming meeting.

5. Discussed the SVO-Funded RBC Alignment Project

   A. Exposed a Referral from the Risk-Based Capital Investment Risk and Evaluation (E) Working Group

Botsko reported that the Working Group received a referral from the Risk-Based Capital Investment Risk and Evaluation (E) Working Group concerning the SVO-funded RBC alignment project. The accompanying comment letter indicated that the Risk-Based Capital Investment Risk and Evaluation (E) Working Group had received nine comment letters regarding the American Council of Life Insurers' (ACLI) RBC principles for bond funds presentations, as well as the NAIC's memorandum on bond funds included in the 2023 annual statement filings. The Risk-Based Capital Investment Risk and Evaluation (E) Working Group agreed to expose the life proposal 2025-12-IRE for a 30-day public comment period ending July 23.

Additionally, Botsko noted that the Risk-Based Capital Investment Risk and Evaluation (E) Working Group requested the Property and Casualty Risk-Based Capital (E) Working Group to consider developing a similar proposal for the P/C RBC formula. He further stated that the life proposal and the associated comment letters are included in the meeting materials. All interested parties were encouraged to review these documents and continue the discussion at the upcoming meeting.

The Working Group and Subgroup concurred to expose this referral, along with the comment letters from the Risk-Based Capital Investment Risk and Evaluation (E) Working Group (Attachment Three-A1), for a 30-day public comment period ending Nov. 7.

B. Comments Received

Botsko reported that the Working Group has received four comment letters in recent months. Premera Blue Cross expressed support for developing a harmonized proposal that would assign bond-like treatment to SVO-designated funds, emphasizing that equitable RBC treatment for fixed income investments is essential to ensuring fair market access.

Helen Remeza (PineBridge Investments) also endorsed the RBC alignment initiative, noting that non-life insurers currently face more conservative RBC charges for funds. Remeza stated that harmonizing RBC treatment for funds with the SVO designation supports two NAIC guiding principles: (1) substance over form and (2) equal capital for equal risk. She further indicated that aligning these charges with those applied to life insurers would allow non-life insurers to utilize SVO designation for RBC relief at their discretion.

United Educators (UE) commented that harmonizing RBC treatment for non-life funds with the life insurance sector would enhance the consistency and accuracy of solvency assessments across all lines of insurance.

The Alternative Credit Council (ACC) added that implementing consistent, risk-based principles reflecting the underlying economic substance would enable the NAIC to reduce unnecessary capital charges, improve comparability, and strengthen the insurance investment framework.

Chou emphasized that while consistency across all lines of business is important, a cost-benefit analysis is necessary to determine applicability for P/C companies. Hale observed that the comment letters were largely similar in content and suggested that companies could collaborate and submit a joint letter. Keith Bell (Travelers) indicated that Travelers will submit a comment letter with additional observations during the exposure period.

6. Heard Updates from the Academy Regarding P/C RBC Premium and Loss Concentration Factors

Ron Wilkins (Academy) reported that, following a letter sent by the Academy to the Working Group in May 2019, three analyses were initiated to calibrate the premium and reserve risk components of the RBC formula. Two reports have already been published: the first in 2021, detailing the indicated risk factors for premium and reserve

risk, and the second in 2023, which included updates on investment income adjustment (IIA) factors and revised risk factors for premium and reserve risk. Wilkins noted that the Academy is nearing completion of the third analysis, with publication anticipated later in 2025. Preliminary findings suggest that as companies diversify across more lines of business, the maximum percentage decreases while the diversification credit increases. This could result in a higher maximum diversification credit for both premiums and reserves. Wilkins concluded by stating that the Academy will present a comprehensive update on the RBC dependency report in November.

7. Discussed Other Matters

A. Accident and Health Structure in the P/C RBC Formula

Botsko stated that the Health Risk-Based Capital (E) Working Group is actively developing the H2—Underwriting Risk Component and Managed Care Credit Calculation for inclusion in the 2026 health RBC formula. To ensure consistency across all lines of business, the Accident and Health section within the P/C RBC formula will also undergo review. He noted that committee support are currently working to develop this structure, drawing upon the health RBC formula as a reference. The updated instructions and framework are scheduled to be released for public exposure in November.

Lastly, Botsko announced that the Working Group and Subgroup are planning to schedule a meeting in November.

Having no further business, the Property and Casualty Risk-Based Capital (E) Working Group and Catastrophe Risk (E) Subgroup adjourned.

SharePoint/NAIC Support Staff Hub/ Member Meetings/E Cmte/CADTF/2025-Fall/PCRBCWG/Joint PCRBC Cat Risk Minutse 100825.docx

NATIONAL ASSOCIATION OF INSURANCE COMMISSIONERS

MEMORANDUM

TO: Steve Drutz, Chair, Health Risk-Based Capital (E) Working Group
Matthew Richard, Vice Chair, Health Risk-Based Capital (E) Working Group

Tom Botsko, Chair, Property and Casualty Risk-Based Capital (E) Working Group
Wanchin Chou, Vice Chair, Property and Casualty Risk-Based Capital (E) Working Group

FROM: Philip Barlow, Chair, Risk-Based Capital Investment Risk and Evaluation (E) Working Group
Thomas Reedy, Vice-Chair, Risk-Based Capital Investment Risk and Evaluation (E) Working Group

DATE: June 23, 2025

RE: Securities Valuation Office (SVO) Fund Risk Based Capital (RBC) Alignment Project

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On June 23, 2025, the Risk-Based Capital Investment Risk and Evaluation (E) Working Group met and received nine comment letters (Attachment A) on the American Council of Life Insurers' (ACLI's) Risk Based Capital (RBC) Principles for Bond Funds Presentation and the NAIC's Memorandum of Bond Funds Reported in 2023 Annual Statement Filings (Attachment B). The Working Group consented to expose Proposal 2025-12-IRE Securities Valuation Office (SVO) Fund Alignment Project (Attachment C) for a 30-day public comment period ending July 23, 2025. Note that this Proposal is specifically drafted for the Life RBC formula as directed by the Working Group during its 2025 Spring National Meeting.

In addition, the Working Group directed NAIC Staff to refer SVO Fund Alignment Project and its applicability to non-life RBC formulas to Health Risk-Based Capital (E) Working Group and Property and Casualty Risk-Based Capital (E) Working Group. The Working Group would appreciate consideration by your Working Groups and should a formal RBC proposal be formulated for respective RBC formula at your Working Groups, the NAIC Staff stands ready to augment the scope of Proposal 2025-12-IRE to ensure coordinated adoption.

Please contact NAIC Staff of the Risk-Based Capital Investment Risk and Evaluation (E) Working Group with any questions.

Washington, DC 444 North Capitol Street NW, Suite 700, Washington, DC 20001-1509 p | 202 471 3990
Kansas City 1100 Walnut Street, Suite 1500, Kansas City, MO 64106-2197 p | 816 842 3600
New York One New York Plaza, Suite 4210, New York, NY 10004 p | 212 398 9000
www.naic.org

NATIONAL ASSOCIATION OF INSURANCE COMMISSIONERS

Cc: Julie Gann, Maggie Chang, Eva Yeung, Kazeem Okosun, Derek Noe

Attachment A - Comment Letters Received on June 23, 2025

Attachment B - ACLI's RBC Principles for Bond Funds Presentation and the NAIC's Memorandum of Bond Funds Reported in 2023 Annual Statement Filings

Attachment C - Proposal 2025-12-IRE

Washington, DC 444 North Capitol Street NW, Suite 700, Washington, DC 20001-1509 p | 202 471 3990
Kansas City 1100 Walnut Street, Suite 1500, Kansas City, MO 64106-2197 p | 816 842 3600
New York One New York Plaza, Suite 4210, New York, NY 10004 p | 212 398 9000
www.naic.org

Capital Adequacy (E) Task Force

RBC Proposal Form

☐ Capital Adequacy (E) Task Force
☒ Catastrophe Risk (E) Subgroup
☐ Variable Annuities Capital. & Reserve (E/A) Subgroup
☐ Health RBC (E) Working Group
☐ P/C RBC (E) Working Group
☐ Economic Scenarios (E/A) Subgroup
☐ Life RBC (E) Working Group
☐ Longevity Risk (A/E) Subgroup
☐ RBC Investment Risk & Evaluation (E) Working Group

DATE: 11/12/25

CONTACT PERSON: Eva Yeung
TELEPHONE: 816-783-8407
EMAIL ADDRESS: eyeung@naic.org
ON BEHALF OF: Catastrophe Risk (E) Subgroup
NAME: Wanchin Chou
TITLE: Chair
AFFILIATION: Connecticut Department of Insurance
ADDRESS: 153 Market St., Hartford CT 06103

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Year 2026

DISPOSITION

ADOPTED:
☐ TASK FORCE (TF)
☐ WORKING GROUP (WG)
☐ SUBGROUP (SG)
EXPOSED:
☐ TASK FORCE (TF)
☒ WORKING GROUP (WG) 11/12/2025
☒ SUBGROUP (SG) 11/12/2025
REJECTED:
☐ TF ☐ WG ☐ SG
OTHER:
☐ DEFERRED TO
☐ REFERRED TO OTHER NAIC GROUP
☐ (SPECIFY)

IDENTIFICATION OF SOURCE AND FORM(S)/INSTRUCTIONS TO BE CHANGED

☐ Health RBC Blanks
☐ Health RBC Instructions
☐ Health RBC Formula
☒ Property/Casualty RBC Blanks
☐ Property/Casualty RBC Instructions
☐ Property/Casualty RBC Formula
☐ Life and Fraternal RBC Blanks
☐ Life and Fraternal RBC Instructions
☐ Life and Fraternal RBC Formula
☐ OTHER _____

DESCRIPTION/REASON OR JUSTIFICATION OF CHANGE(S)

The objective of this proposal is to differentiate hurricane and earthquake losses, following the methodology applied to wildfire and severe convective storm events. This distinction will enable the Subgroup and Working Group to more effectively manage and address each peril, considering their unique characteristics and impacts.

Additional Staff Comments:

** **This section must be completed on all forms.** **Revised 2-2023**

SCHEDULE P PART 1XX - XXXX PR100s (Option 2)

				Earthquake Catastrophe Experience*				Hurricane Catastrophe Experience*				Wildfire Catastrophe Experience*				
	(3)	(24) Total Net Losses and Expenses	(28) Total Losses and Expenses	(24AI)	(28AI)	(24BI)	(28BI)	(24AII)	(28AII)	(24BII)	(28BII)	(24AIII)	(28AIII)	(24BIII)	(28BIII)	(28C)
	Premiums Earned, Net	Unpaid	Incurred, Net	Total U.S. Net Losses Unpaid	Total U.S. Losses Incurred, Net	Total Non-U.S. Net Losses Unpaid	Total Non-U.S. Losses Incurred, Net	Total U.S. Net Losses Unpaid	Total U.S. Losses Incurred, Net	Total Non-U.S. Net Losses Unpaid	Total Non-U.S. Losses Incurred, Net	Total U.S. Net Losses Unpaid	Total U.S. Losses Incurred, Net	Total Non-U.S. Net Losses Unpaid	Total Non-U.S. Losses Incurred, Net	**Total Losses and Expenses Incurred, Net excluding Earthquake, Hurricane and Wildfire Losses**
(2) **2017**	0		0		0		0		0		0		0		0	0
(3) **2018**	0		0		0		0		0		0		0		0	0
(4) **2019**	0		0		0		0		0		0		0		0	0
(5) **2020**	0		0		0		0		0		0		0		0	0
(6) **2021**	0		0		0		0		0		0		0		0	0
(7) **2022**	0		0		0		0		0		0		0		0	0
(8) **2023**	0		0		0		0		0		0		0		0	0
(9) **2024**	0		0		0		0		0		0		0		0	0
(10 **2025**	0		0		0		0		0		0		0		0	0
(11) **2026**	0		0		0		0		0		0		0		0	0
(12) Totals		0		0		0		0		0		0		0		

	Convective Storms Catastrophe Experience*				
	(24III)	(28III)	(24IV)	(28IV)	(28V)
	Total U.S. Net Losses Unpaid	Total U.S. Losses Incurred, Net	Total Non-U.S. Net Losses Unpaid	Total Non-U.S. Losses Incurred, Net	Total Losses and Expenses Incurred, Net excluding Earthquake, Hurricane, Wildfire and Convective Storms Losses
(2) **2017**		0		0	0
(3) **2018**		0		0	0
(4) **2019**		0		0	0
(5) **2020**		0		0	0
(6) **2021**		0		0	0
(7) **2022**		0		0	0
(8) **2023**		0		0	0
(9) **2024**		0		0	0
(10 **2025**		0		0	0
(11) **2026**		0		0	0
(12) Totals	0		0		

vendor link items

manual data entry items

*Please provide losses only; no expenses. Catastrophe losses should 1.) be the net losses incurred for the reporting entity, not net losses incurred for the group; 2.) be a subset of, and therefore, less than, total net losses reported in Column (28); 3.) be reported in 000s to be consistent with all values reported in this exhibit; and 4.) not be reported as negative amounts.

If this line of business has incurred U.S. catastrophe losses arising from events either included on the list of U.S. catastrophe events approved by the Catastrophe Risk Subgroup as available on the NAIC's website or numbered and labeled by PCS as a hurricane, tropical storm, or earthquake, provide only the amount of those catastrophe losses in Catastrophe Experience columns (24AI), **(24AII), (24AIII), (28AI), **(28AII) and (28AIII)**.

***If this line of business has incurred non-U.S. catastrophe losses arising from a hurricane, tropical storm, or earthquake from an event included on the list of non-U.S. catastrophe events approved by the Catastrophe Risk Subgroup as available on the NAIC's website, provide only the amount of those catastrophe losses in Catastrophe Experience Columns (24BI**),(24BII), (24BIII),** (28BI**), (28BII) and (28BIII).**

****Columns 24**III** through 28V are for informational purposes only.

Capital Adequacy (E) Task Force

RBC Proposal Form

☐ Capital Adequacy (E) Task Force
☒ Catastrophe Risk (E) Subgroup
☐ Variable Annuities Capital. & Reserve (E/A) Subgroup
☐ Health RBC (E) Working Group
☐ P/C RBC (E) Working Group
☐ Economic Scenarios (E/A) Subgroup
☐ Life RBC (E) Working Group
☐ Longevity Risk (A/E) Subgroup
☐ RBC Investment Risk & Evaluation (E) Working Group

DATE: 11/12/25

CONTACT PERSON: Eva Yeung
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ON BEHALF OF: Catastrophe Risk (E) Subgroup
NAME: Wanchin Chou
TITLE: Chair
AFFILIATION: Connecticut Department of Insurance
ADDRESS: 153 Market St., Hartford CT 06103

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Agenda Item #2025-20-CR
Year 2026

DISPOSITION

ADOPTED:
☐ TASK FORCE (TF)
☐ WORKING GROUP (WG)
☐ SUBGROUP (SG)

EXPOSED:
☐ TASK FORCE (TF)
☒ WORKING GROUP (WG) 11/12/2025
☒ SUBGROUP (SG) 11/12/2025

REJECTED:
☐ TF ☐ WG ☐ SG

OTHER:
☐ DEFERRED TO
☐ REFERRED TO OTHER NAIC GROUP
☐ (SPECIFY)

IDENTIFICATION OF SOURCE AND FORM(S)/INSTRUCTIONS TO BE CHANGED

☐ Health RBC Blanks
☐ Health RBC Instructions
☐ Health RBC Formula
☒ Property/Casualty RBC Blanks
☒ Property/Casualty RBC Instructions
☐ Property/Casualty RBC Formula
☐ Life and Fraternal RBC Blanks
☐ Life and Fraternal RBC Instructions
☐ Life and Fraternal RBC Formula
☐ OTHER

DESCRIPTION/REASON OR JUSTIFICATION OF CHANGE(S)

Building on the precedent set by the 2021 wildfire review, an ad hoc group was re-established and began a new evaluation cycle on March 18, guided by the Actuarial Standard of Practice (ASOP) No. 38—Catastrophe Modeling for All Practice Areas. This comprehensive process included high-level analysis, confidential assessments, and detailed impact studies. In addition to the original three vendors—Moody Risk Management Solutions (RMS), Verisk Extreme Event Solutions, and KCC—CoreLogic joined as a new participant for this review cycle. Starting in early June and July, the group collaborated with all four vendors to conduct a second round of impact analysis using consistent exposure inputs. On September 25, the group reconvened to address feedback from the impact analysis presentations. A comparative review of the initial 2022 assessment and the current evaluation revealed that model outputs have become increasingly consistent. As a result, the Subgroup now has greater confidence in the models and their suitability for risk management applications.

This proposal formally recommends adding wildfire peril to the Rcat component, reflecting the enhanced reliability and applicability of the catastrophe models.

Additional Staff Comments:

** **This section must be completed on all forms.** **Revised 2-2023**

CALCULATION OF CATASTROPHE RISK CHARGE RCAT
PR027A, PR027B, PR027BI, PR027BII, PR027BIII, PR027BIV PR027C, PR027CI, PR027CII, PR027CIII, PR027CIV, PR027D, PR027, PR027INT, AND PR027INTA

The catastrophe risk charge for earthquake (PR027A), hurricane (PR027B), wildfire (PR027C) and convective storms for informational purposes only (~~PR027C and~~ PR027D) risks is calculated by multiplying the RBC factors by the corresponding modeled losses and reinsurance recoverables. The risk applies on a net basis with a corresponding contingent credit risk charge for certain categories of reinsurers. Data must be provided for the worst year in 50, 100, 250, and 500; however, only the worst year in 100 will be used in the calculation of the catastrophe risk charge. While projected losses modeled on an Aggregate Exceedance Probability basis is preferred, companies are permitted to report on an Occurrence Exceedance Probability basis if that is consistent with the company's internal risk management process.

The projected losses can be modeled using the following NAIC approved third-party commercial vendor catastrophe models: AIR, CoreLogic, RMS, KCC for earthquake, ~~and~~ hurricane, and wildfire only, ~~RMS, KCC,~~ the ARA HurLoss Model (hurricane ~~only~~), or the Florida Public Model for hurricane only, as well as catastrophe models that are internally developed by the insurer or that are the result of adjustments made by the insurer to vendor models to represent the own view of catastrophe risk (hereinafter "own models").

However, an insurer seeking to use an own model must first obtain written permission to do so by the domestic or lead state insurance regulator. In the situation where the model output is used to determine the catastrophe risk capital requirement for a single entity, the regulator granting permission to use the own model is the domestic state. In the situation where the model output is used to determine the catastrophe risk capital requirement for a group, the grantor is the lead state regulator. In the situation where the insurer seeking permission is a non-U.S. insurer, the grantor shall be the lead state regulator. Under all scenarios, the regulator that is granting permission should inform other domestic states that have a catastrophe risk exposure and share the results of the review.

To obtain permission to use the own model, the insurer must provide the domestic or lead state insurance regulator with written evidence of each of the following:

1. The nature, scale, and complexity of the insurer's catastrophe risk make it reasonable for the insurer to use its own model.
2. The own model is used for catastrophe risk management, capital assessment, and the capital allocation process.
3. The insurer has validated the own model(s) for each of the perils included in the RBC catastrophe risk charge. The insurer is including both U.S. and non-U.S. exposures in the calculation of the RBC charge.
4. The insurer has individuals with experience in developing, testing and validating internal models or engages third parties with such experience.
5. The own model was developed using reasonable data and assumptions.
6. The insurer must provide supporting model documentation and/or the differences from the vendor models if modified from the vendor models, supporting that the model was developed using reasonable data and assumptions. The insurer must provide a copy of the latest validation report and the insurer is solely responsible for the relevant cost. The validation report must provide a description of the scope, content, results and limitations of the validation, the individual qualifications of validation team and the date of the validation. Both the model documentation and the model validation report must be provided at a minimum once every five years, or whenever the lead or domestic state calls an examination; whenever there is a material change in the model; or whenever there is a material change in the insurer's exposure to catastrophe exposure.
7. The results of the own model for each relevant peril should be compared with the results produced by at least one of the following models: AIR, CoreLogic, RMS, and KCC for earthquake, ~~and~~ hurricane and wildfire only, ~~RMS, KCC,~~ ARA HurLoss (hurricane ~~only~~), or the Florida Public Model for hurricane only. The insurer must provide the comparison and an explanation of the drivers of differences between the results produced by the internal model vs. results produced by the selected prescribed model. Evidence that the own model produces reasonable results must be provided at a minimum once every five years, or whenever the

lead or domestic state calls an examination; whenever there is a material change in the model; or whenever there is a material change in the insurer's exposure to catastrophe exposure.

8. If the own model has been approved or accepted by the non-U.S. lead supervisor for use in the determination of regulatory capital, the insurer must submit evidence, if available, from the non-US lead supervisor of the most recent approval/acceptance including the description of scope, content, results and limitations of the approval/acceptance process and dates of any planned future approval/acceptance, if known. The name and the contact information of a contact person at the non-US lead supervisor should also be provided for questions on the approval/acceptance process.

If the lead or domestic state determines that permission to use the own model cannot be granted, the insurer shall be required to determine the RBC Catastrophe Risk Charge through the use of one of the third-party commercial vendor models (AIR, CoreLogic, RMS, and KCC for earthquake, ~~and~~ hurricane, and wildfire only, ~~RMS, KCC,~~ ARA HurLoss (hurricane ~~only~~)), or the Florida Public Model for hurricane only, as advised by the lead state or domestic state.

If the lead or domestic state determines that permission to use the own model can be granted to determine the RBC Catastrophe Risk Charge, the model will be subject to additional review through the ongoing examination process. If, as a result of the examination, the lead or domestic state determines that permission to use the own model should be revoked, the insurer may be required to resubmit the risk-based capital filing and any past filings so impacted where own model was used, as directed by the lead state or domestic state.

If the insurer obtains permission to use the own model, it cannot revert back to using third-party commercial vendor models to determine the RBC Catastrophe Risk Charge in subsequent reporting periods, unless this is agreed with the lead or domestic state that granted permission.

The contingent credit risk charge should be calculated in a manner consistent with the way the company internally evaluates and manages its modeled net catastrophe risk.

Note that no tax effect offsets or reinstatement premiums should be included in the modeled losses. Further note that the catastrophe risk charge is for earthquake, ~~and~~ hurricane, and wildfire risks only.

As per the footnote on this page, modeled losses to be entered PR027A, PR027B PR027C and PR027D in Lines (1) through (4) are to be calculated using one of the **third-party** commercial **vendor** models – AIR, CoreLogic, RMS, and KCC for earthquake, ~~and~~ hurricane, and wildfire only, ~~RMS, KCC,~~ ARA HurLoss (hurricane ~~only~~); or the Florida Public Model ~~(~~for hurricane only~~)~~**or the insurer's own catastrophe model**; and using the insurance company's own insured property exposure information as inputs to the model. The insurance company may elect to use the modeled results from any one of the models, or any combination of results of two or more of the models. Each insurer will not be required to utilize any prescribed set of modeling assumptions but will be expected to use the same exposure data, modeling, and assumptions that the insurer uses in its own internal catastrophe risk management process. Any exceptions must be explained in the required *Attestation Re: Catastrophe Modeling Used in RBC Catastrophe Risk Charges* within this RBC Report.

CALCULATION OF CATASTROPHE RISK CHARGE FOR WILDFIRE PR027C
~~**(For Informational Purposes Only)**~~

Wildfire	Reference	Modeled Losses (1) Direct and Assumed	(2) Net	(3)† Ceded Amounts Recoverable	(4)†† Ceded Amounts Recoverable with zero Credit Risk Charge
(1) Worst Year in 50	Company Records				
(2) Worst Year in 100	Company Records				
(3) Worst Year in 250	Company Records				
(4) Worst Year in 500	Company Records				
(5) Worst Year in 1000 **(For Informational Purposes Only)**	Company Records				

	(5) Y/N
(6) Has the company reported above, its modeled wildfire losses using an occurrence exceedance probability (OEP) basis?	

	Reference	(6) Amount	Factor	(7) RBC Requirement (C(6) * Factor)
(7) Net Wildfire Risk	L(2) C(2)	0	1.000	0
(8) Contingent Credit Risk for Wildfire Risk	L(2)(C(3) - C(4))	0	0.018	0
(9) Total Wildfire Catastrophe Risk (AEP Basis)	If L(6) C(5) = "N", L(9) C(6) = L(7) C(7)+ L(8) C(7), otherwise "0"	0	1.000	0
(10) Total Wildfire Catastrophe Risk (OEP Basis)	If L(6) C(5) = "Y", L(10) C(6) = L(7) C(7)+ L(8) C(7), otherwise "0"	0	1.000	0
(11) Total Wildfire Catastrophe Risk	L(9) C(7) + L(10) C(7)			0

Disclosure in lieu of model-based reporting:

	(8) Direct and Assumed	(9) Net
(12) For a company qualifying for the exemption under PR027INT C (10), complete 12a through 12c below:		
a. Provide the company's gross and net 1-in-100-year wildfire losses on a best estimate basis in lieu of model-based reporting.		

b. Provide details on how the company estimated the amounts shown in 12a.

c. Provide a narrative disclosure about how the company manages its wildfire risk.

Lines (1)-(5): Modeled losses to be entered on these lines are to be calculated using one of the following NAIC approved third party commercial vendor catastrophe models - AIR, RMS, ~~or~~ KCC, **Corelogic**~~,~~ or a catastrophe model that is internally developed by the insurer and has received permission of use by the lead or domestic state. The insurance company's own insured property exposure information should be used as inputs to the model(s). The insurance company may elect to use the modeled results from any one of the models, or any combination of the results of two or more of the models. Each insurer will not be required to utilize any prescribed set of modeling assumptions, but will be expected to use the same data, modeling, and assumptions that the insurer uses in its own internal catastrophe risk management process. An attestation to this effect and an explanation of the company's key assumptions and model selection may be required, and the company's catastrophe data, assumptions, model and results may be subject to examination.

† Column (3) is modeled catastrophe losses that would be ceded under reinsurance contracts. This should be associated with the Net Modeled Losses shown in Column (2).

††Column (4) is modeled catastrophe losses that would be ceded to the categories of reinsurers that are not subject to the RBC credit risk charge (i.e., U.S. affiliates and mandatory pools, whether authorized, unauthorized, or certified).

CALCULATION OF CATASTROPHE RISK CHARGE PR027

		Reference	(1) RBC Amount
(1)	Total Earthquake Catastrophe Risk	PR027A L(10) C(7)	0
(2)	Total Hurricane Catastrophe Risk	PR027B L(11) C(7)	0
(3)	Total Wildfire Catastrophe Risk	PR027C L(11)C(7)	0
(4)	Total Convective Storms Catastrophe Risk	PR027D L(10)C(7)	0
(5)	Total Catastrophe Risk (R_{cat})	SQRT(L(1)^2 + L(2)^2 + **L(3)^2**)	0
(5a)	Total Catastrophe Risk (R_{cat} For Informational Purposes Only)	SQRT(L(1)^2 + L(2)^2 +L(3)^2+L(4)^2)	0

Lines ~~3,~~ 4, and 5a are for informational purposes only

Report to the National Association of Insurance Commissioners Property and Casualty Risk-Based Capital (E) Working Group

Property and Casualty Risk-Based Capital Premium and Loss Concentration Factors

Presented by the American Academy of Actuaries[1]
Property and Casualty Risk-Based Capital Committee

November 7, 2025

[1] The American Academy of Actuaries is a 20,000-member professional association whose mission is to serve the public and the U.S. actuarial profession. For 60 years, the Academy has assisted public policy makers 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.

American Academy of Actuaries

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The analysis and conclusions in this Report reflect the opinions of the committee members and do not necessarily reflect the views of their employers or the actuarial organizations in which they are members.

CONTENTS

1. BACKGROUND

The American Academy of Actuaries Property and Casualty Risk-Based Capital Committee ("Committee" or "We") prepared this Report ("Report") at the request of the National Association of Insurance Commissioners' ("NAIC") Property and Casualty (P&C) Risk-Based Capital (RBC) Working Group ("NAIC Working Group" or "Working Group").

In this Report, we evaluate the indicated Loss Concentration Factor ("LCF") and Premium Concentration Factor ("PCF")—RBC Line 14 on pages PR017 and PR018, respectively.[2]

The LCF/PCFs have not been revised since the inception of the RBC Formula.

This is Report 3 in the series of reports described to the NAIC Working Group in May 2019:

- Report 1: Indicated risk factors (Line 4 in the RBC Formula pages PR017 and PR018). We refer to these as Line 4 Factors. This report was submitted to the Working Group in March 2021 and revised in April 2021 ("April 2021 Report"[3]).
- Report 2: Indicated Investment Income Adjustment (IIA) factors (Lines 7/8 in the RBC Formula) and updated indicated Line 4 Factors. This report was submitted to the Working Group in August 2023 ("August 2023 Report"[4]).
- Report 3: This Report on indicated LCFs and PCFs.

The analysis presented in this Report uses the same insurance industry data as Reports 1 and 2, i.e., data evaluated through December 31, 2017.[5]

[2] "PR017" and "PR018" refer to pages in the 2022 NAIC P&C RBC Formula forms, which insurers file annually on a confidential basis.

[3] American Academy of Actuaries Property and Casualty Risk-Based Capital Committee, "Report to the National Association of Insurance Commissioners Property and Casualty Risk-Based Capital (E) Working Group Update to Property and Casualty Risk-Based Capital Underwriting Factors Experience Through December 31, 2017," Presented March 2021 (Revised April 21, 2021).

[4] American Academy of Actuaries Property and Casualty Risk-Based Capital Committee, "Update to Property and Casualty Risk-Based Capital Underwriting Factors and Investment Income Adjustment Factors," Presented Aug. 31, 2023.

[5] Substantial work is involved in data preparation for the three analyses in the May 2019 letter to the NAIC. Therefore, we planned to produce the three reports with the same data. While the Reports have taken longer than we anticipated, adding additional data was not clearly beneficial as (a) processing additional data would have delayed this report, (b) the data includes 30 AYs, 1988-2017, so the effect of adding a small number of years, unless they identify new trends, is not likely to be material, and (c) any new trends from additional data through 2022, for example, would include the initial COVID effects on claim frequency and severity, but not the full cycle of COVID emergence in favorable and unfavorable impacts on loss ratio and reserve development. Furthermore, both this study and CAS Dependency and Calibration Working Party (DCWP) Report #14, which used data through 2010, support an increase in the MDC.

LCF/PCF in RBC Formula

RBC Terminology

Unless otherwise specified, references to the RBC Formula relate to the formula used for the year-end 2022 RBC Formula. "Indicated risk factors" are the indicated Line 4 premium and reserve risk factors presented in the Academy's August 2023 Report 2.[6]

The Authorized Control Level (ACL) capital is 50% of the Company Action Level (CAL) capital value calculated using the RBC Formula.[7] The factors we discuss herein are used to produce the CAL required capital value.

LCF/PCF

The LCF and PCF components of the RBC Formula reduce the Total Reserve RBC value on PR017 and the Net Written Premium RBC value on PR018 for multiline companies. For each company, the concentration is measured as the largest of the 19 RBC lines of business (LOBs) premiums or reserves, divided by the total premium or reserve.

- This ratio is 100% for monoline companies.
- The ratio is lower, though greater than zero, for diversified companies.

We refer to this method of measuring concentration as the Company Maximum Line Percentage of Business or "CoMaxLine%" approach, denoted as $\text{CoMaxLine\%}_{\text{premium}}$ and $\text{CoMaxLine\%}_{\text{reserve}}$, for premium and reserve risk, respectively.

The CoMaxLine% approach includes a parameter we call the Maximum Diversification Credit (MDC). The MDC is the notional maximum diversification credit for a company with a not achievable zero concentration ratio.[8]

[6] The NAIC decided that, except for a small number of LOBs lines affected by specific issues, the Line 4 Factors indicated in the August 2023 Report will be implemented partly in the 2024 RBC Formula and fully in the 2025 RBC Formula.

[7] If the company's Total Adjusted Capital is below the Company Action Level (CAL) value from the RBC Formula, then, according to the RBC Instructions, subject to state laws and regulations, "…the company [is required] to prepare and submit an RBC Plan to the commissioner of their state of domicile. The RBC Plan is to be submitted within 45 days. After review, the commissioner will notify the company if the plan is satisfactory." The value produced by the RBC Formula on PR032, Line 71, is the CAL value.

The Authorized Control Level (ACL) capital is 50% of the CAL value. "Authorized Control Level authorizes the commissioner to take whatever regulatory actions are considered necessary to protect the best interest of the policyholders and creditors of the insurer, which may include the actions necessary to cause the insurer to be placed under regulatory control (i.e., rehabilitation or liquidation)."

[8] 0% concentration is not achievable because the number of LOBs is finite, but premium or reserves equally spread among 19 LOBs would produce a concentration value of 1/19 or approximately 5%. With CoMaxLine% equal to 5%, the concentration factor would be 0.715 and the diversification credit would be 28.5%.

In the current RBC Formula, the MDC is 30%. The MDC is applied linearly based on CoMaxLine%[9] for each company as follows:

- $PCF_{COMPANY} = (1 - MDC) + (MDC * CoMaxLine\%_{premium})$, or
- $PCF_{COMPANY} = 0.7 + 0.3 * CoMaxLine\%_{premium}$

- $LCF_{COMPANY} = (1 - MDC) + (MDC * CoMaxLine\%_{reserves})$, or
- $LCF_{COMPANY} = 0.7 + 0.3 * CoMaxLine\%_{reserves}$

Thus, the diversification credit is 1.0 - PCF or 1.0 - LCF, for premium and reserves, respectively. A monoline company receives no diversification credit as the PCF and LCF equal 1.0.

The Total Net Reserve RBC (PR017) and the Net Written Premium RBC (PR018) are each calculated by summing the RBC amounts across all LOBs and multiplying by the LCF or PCF, on PR017 and PR018 Lines 13 and 14, respectively.

Origin of CoMaxLine% and 30% MDC

The CoMaxLine% approach was originally selected during the mid-1990s when the RBC Formula was developed. The CoMaxLine% formula with the 30% MDC was presented in a February 1993 Actuarial Advisory Committee report to the NAIC P/C Risk-Based Capital Working Group.[10,11]

It was adopted as part of the original RBC Formula and has not been revised since.

[9] For example, a company with 25% of its premium in its largest line would have PCF = 0.7 + 0.3 * 0.25 = 77.5% under the CoMaxLine% approach. It would receive a diversification credit equal to 1.0 – PCF = (1.0 – $CoMaxLine\%_{premium}$) * MDC = 75% of 30% = 22.5%. The credit is applied to the sum of the risk charges by LOB. In other words, the risk charges would be summed across all LOBs and then that sum would be multiplied by 0.775 (77.5% = 100% - 22.5%). A monoline company has a zero diversification credit and CoMaxLine% = 100%.

[10] "Report on Covariance Method for Property-Casualty Risk-Based Capital," pages 173-202.

We have not identified references to NAIC discussion of the 30% MDC in the Actuarial Advisory Committee report.

[11] Our calibration approach and the 1993 calibration approach are different. For example, our MDC calibration approach is based on 87.5th percentile outcomes (consistent with the Line 4 calibration). This differs from the 1993 MDC calibration approach which was based on standard deviations and correlations.

2. IMPACT OF REVISED LCF/PCF

Based on the Committee's work, described in detail in this report, the Committee believes:

- MDCs of 45% for premium and 65% for reserves are reasonable selections and are better supported by the data than the current 30% MDC.

  We refer to these as the indicated MDCs.

- There are alternative reasonable MDC selections that the NAIC might select, and we discuss some of them, below, in Section 3/ Alternative Indicated MDCs.

- With the indicated MDCs, the PCF and LCF formulas would be
  - $PCF_{COMPANY} = 0.55 + 0.45 * CoMaxLine\%_{premium}$
  - $LCF_{COMPANY} = 0.35 + 0.65 * CoMaxLine\%_{reserves}$

- While the CoMaxLine% approach is not perfect, considering the alternatives, the Committee believes it is a reasonable approximation, especially for more diversified companies.

Tables 2-1 through 2-5, below, show the effect on ACL reserve risk charges and premium risk charges of adopting MDCs of 45% for premium and 65% for reserves.

Table 2-1: Average RBC Value Change

Table 2-1 shows the change in RBC values assuming MDCs of 45% and 65%, in total and by Type of Company,[12] based on NAIC staff analysis using 2025 Line 4 risk factors and Line 7/8 IIA Factors.

[12] As described in the April 2021 Report 1 and August 2023 Report 2, each LOB is categorized by the NAIC P&C Working Group as typical of a particular Type of Company, e.g., B-PPA is typical of Personal Lines companies. For each company, the category with the largest amount of net written premium (NWP) + reserves determines the Type for that company. For example, a company with more of its premium in B-PPA, Homeowners A-HO and J-APD than in any of the other groups of LOBs is categorized as Personal Lines as opposed to Commercial Lines. Report 2, Appendix 8, pages 114-115, provides more details.

Table 2-1
Indicated Changes in RBC Values by Type of Company[13]

(1)	(2)	(3)	(4)	(5)	(6)
Row	Type of Company	ACL - $ Billions (2022)	% Change		
			Reserve Risk Charge	Premium Risk Charge	ACL
1	Commercial	84.4	-21.6%	-11.7%	-13.4%
2	Med Prof Liab	2.9	-8.0%	-3.4%	-1.9%
3	NOC	0.7	-6.5%	-3.1%	-2.2%
4	Personal	100.2	-18.2%	-9.2%	-2.1%
5	Reinsurance	9.5	-22.3%	-11.4%	-2.4%
6	Workers Comp	7.5	-10.0%	-4.5%	-5.7%
7	Total	205.3	-20.0%	-10.0%	-6.9%

From individual company RBC Filing data, summarized by NAIC staff and provided, in summary form, to this Committee.
Uses 2022 RBC Formula, but using 2025 Line 4 Factors and Line 7/8 IIA Factors. Compares ACL with 30% MDC to ACL with indicated MDCs.
Including only companies with RBC Filings in 2022 and 2022 non-zero net written premium plus loss reserves (NWP+Rsv>0).
NOC = "Not otherwise classified" Type of Company.[14]

Table 2-1 shows that the weighted average impacts are:

- Reserve risk is decreased by 20%.
- Premium risk is decreased by 10%.
- ACL is decreased by 6.9%.

The Table also shows:

- Reserve risk and premium risk reductions are largest for Commercial, Personal, and Reinsurance Types of Companies.
- However, the ACL reduction for Reinsurance and Personal companies is much smaller than for Commercial companies.

  This is because Reinsurance and Personal Types of Company have a greater share of RBC from risk categories other than reserve risk and premium risk, and the RBC values from those risks are not affected[15] by the change in diversification.

[13] Including only companies with 2022 RBC Filings and non-zero net written premium plus loss reserves.

[14] "NOC," standing for Not Otherwise Classified, means companies for which the portion of net written premium plus loss reserves is greatest for the sum of the following LOBs: G-SL, K-Fid/Sur, L-Other, M-Intl, or S-FG/MG. See glossary for LOB abbreviations definition.

[15] Although, in some cases, the R3-credit risk is affected by the relative values of reserve risk and reinsurance credit risk.

Table 2-2: Distribution of % Change in RBC Value

Table 2-2 shows the number of companies with various percentage changes in ACL value, comparing the ACL value using the current MDC to the ACL value using the indicated MDC.

Table 2-2
Distribution of Number of Companies by Change in ACL Values

(1)	(2)	(3)
% Changes in ACL	# Companies	% Companies
Less than -50%	0	0%
-35% to -50%	0	0%
-25% to -35%	46	3%
-15% to -25%	202	11%
-5% to -15%	500	28%
0% to -5%	676	37%
0%	393	22%
Greater than 0%	0	0%
Total	1,817	100%

Excluding companies with zero NWP+Rsv.

This table shows:

- No company sees an increase in ACL.
- 59% of companies see ACL decreases between 0% and 5%.
- 3% of companies see a decrease in ACL greater than 25%.

The individual company data shows that the largest decrease in ACL value is 29%.

Tables 2-3 through 2-5: ACL Changes by Size and Diversification

These tables show changes in:

- Reserve Risk (Table 2-3)
- Premium Risk (Table 2-4)
- ACL (Table 2-5)

We show five size bands, A-E, each with 20% of the companies. Underwriting (UW) Size in these Tables equals the sum of net written premium and net reserves.

We show six levels of diversification.[16]

- Level "0" refers to monoline companies.

[16] In Table 2-3 through 2-5, diversification by company is the weighted average of the premium diversification and the reserve diversification, calculated as the square root of the sum of (a) the square of premium diversification credit in dollars, plus (b) the square of the reserve diversification credit in dollars.

- Levels 1-5 refer to five levels of diversification, each with 20% of the non-monoline companies.

Table 2-3 – Reserves
% Change in Reserve Risk Value by UW Size and Diversification

Div/Size	A	B	C	D	E	All
0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1	-0.9%	-1.4%	-1.6%	-2.1%	-2.2%	-2.1%
2	-5.8%	-6.0%	-8.4%	-6.5%	-8.4%	-8.2%
3	-10.7%	-12.9%	-10.4%	-14.4%	-12.2%	-12.3%
4	-17.1%	-22.9%	-19.1%	-18.9%	-19.5%	-19.5%
5	-17.9%	-26.4%	-25.4%	-26.4%	-29.3%	-29.2%
All	-3.2%	-8.0%	-11.7%	-13.8%	-20.6%	-20.0%

Table 2-4 – Premium
% Change in Premium Risk Value by UW Size and Diversification

Div/Size	A	B	C	D	E	All
0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1	-0.1%	-0.7%	-0.9%	-1.2%	-1.2%	-1.1%
2	-3.0%	-3.3%	-4.1%	-3.4%	-4.0%	-3.9%
3	-6.5%	-5.9%	-6.9%	-7.1%	-8.1%	-8.0%
4	-8.9%	-8.3%	-9.0%	-9.7%	-11.0%	-10.9%
5	-11.1%	-12.2%	-13.2%	-13.2%	-13.9%	-13.8%
All	-1.4%	-3.2%	-6.1%	-7.3%	-10.4%	-10.0%

Table 2-5 – Total ACL
% Change in Unweighted ACL Value by UW Size and Diversification

Div/Size	A	B	C	D	E	All
0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1	-0.5%	-0.6%	-0.9%	-1.0%	-0.7%	-0.7%
2	-1.8%	-3.3%	-3.3%	-3.7%	-3.9%	-3.2%
3	-4.6%	-6.0%	-6.6%	-8.7%	-8.3%	-7.1%
4	-6.7%	-7.4%	-10.7%	-10.7%	-12.5%	-10.5%
5	-7.4%	-14.9%	-16.2%	-17.7%	-16.6%	-16.6%
All	-3.5%	-5.4%	-6.3%	-7.0%	-7.0%	-6.4%

Table 2-5 shows the unweighted average effect on ACL, as several very large companies have unusual values for RBC risks other than reserve risk and premium risk. As a result, the weighted averages distort patterns by size and diversification that apply to most companies.

Therefore, "All" in Table 2-5, 6.4%, differs from the average in Table 2-1, 6.9%, which is weighted by ACL value.

Tables 2-3 and 2-4 show average effect weighted by premium/reserves, within each cell, so "All" in Tables 2-3 and 2-4 agree with the average in Table 2-1.

These tables show the following:

- The effect of the change in MDC is zero for monoline companies (diversification band 0) and largest for companies with diversification level 5.
- The impact of the change in MDC is greater for reserve risk than for premium risk.
- In total, the row "All," larger companies tend to be more diversified, hence see greater ACL reductions.

Based on past practices, we note that the NAIC might provide additional analysis of MDC impact after evaluating this report; for example, the extent to which there are changes in the number of companies below the various RBC action levels or the distribution of companies with capital at specific multiples of CAL.

3. SUMMARY – APPROACH, KEY FINDINGS, AND SENSITIVITY TESTS

The CoMaxLine% approach assumes:

- The MDC, which determines the total diversification credit arising from the RBC Formula, is 30%, and
- Diversification credit by company is proportional to 1.0-CoMaxLine%.

In this Section, we summarize our analysis of these CoMaxLine% assumptions. For this summary and in the remainder of this report, we assume the reader has some knowledge of the methods used in Reports 1 and 2.

Approach & Findings

Data (Section 4)

Separately for premium and reserves:

1. We compile all-lines loss ratios (LRs) and reserve runoff ratios (RRRs) for each individual company (or each pool, for companies reporting on a pooled basis, for simplicity, referred to below as a "company," "company/year," or "data point") for each year 1988 to 2017.

   There are approximately 50,000 company/years of data across all years, for each of the premium and reserve data sets.

2. We assign each company to one of five size bands, referred to as A-E, with an equal number of companies in each size band.

   We also assign each company to one of six diversification bands, one monoline and 5 multi-line bands, referred to as 0-5, with an equal number of multi-line companies in each size band.

   Thus, there are 5x6=30 size/diversification cells.

Indicated Diversification Credit (Section 5-Part 1)

3. For each of the 30 size/diversification cells, we calculate the 87.5th percentile Accident Year Underwriting Loss % (AYUL%) and Reserve Runoff Ratios (RRRs) for companies in that cell. We refer to this as the **Observed Risk**.
4. For each of the 30 size/diversification cells, we also calculate the company average (each company counts once, regardless of size[17]) of premium and reserve RBC values (PR0018 and PR0017) before and after diversification, for companies in that cell.[18] We refer to this as the **Modeled Risk**, before or after diversification.

[17] This is consistent with the calibration of Line 4 Factors.

[18] The premium and reserve values in the Modeled Risk are based on the RBC formula with some simplifications: We do not include the IIA, the own-company adjustment, the loss-sensitive contract adjustment, or the growth risk charge. For premium risk, we used a simplified expense calculation. Section 7 describes these simplifications further.

5. The percentage difference between the Observed Risk and the Modeled Risk before diversification[19] is the indicated diversification credit for that cell.
6. For each cell, we calculate the MDC that would produce the indicated diversification credit for that cell, using the CoMaxLine% approach.

   By converting the indicated diversification credit by cell to an indicated MDC, we can compare the indicated MDC across diversification bands.

Overall Indicated MDC (Section 5-Part 1)

7. We calculate the weighted[20] average indicated MDC for the 9 cells: size bands C-E and diversification bands 3-5 that we refer to as cells C3-E5, or just C3-E5. These represent:
   a. 34% of premium company/years and 31% of reserve company/years,
   b. 84% of premium and 74% of reserves.
   c. 96% of the total premium diversification credit and 97% of the reserve diversification credit.[21]

   The resulting indicated MDCs are 45% for premium and 65% for reserves.

Finding 1:
Based on the above analysis, the committee believes that MDCs of 45% for premium and 65% for reserves are reasonable selections and are better supported by the data than the current 30% MDC. We refer to these as the indicated MDCs.

There are reasonable alternative MDC selections, some of which we discuss in the Alternative Indicated MDCs subsection below.

RBC Diversification Credit by Company (Section 5-Part 2 and Appendix 3)

8. We use regression through the origin to test the hypothesis that there is a linear relationship between CoMaxLine% and indicated diversification credit by level of diversification.
9. We reviewed the two 2019 Casualty Actuarial Society (CAS) Dependency and Calibration Working Party (DCWP) reports on alternative diversification formulas.[22]
   a. DCWP considered alternatives to CoMaxLine%, including:
      i. The Correlation Factor approach,

[19] Since the Observed Risk and the Modeled Risk are calibrated to the 87.5th percentile, runoff, safety level, we interpret the result as the 87.5th percentile, runoff, MDC.

[20] Weights are equal to the number of data points in each cell.

[21] Diversification credit measured as a percentage of Modeled Risk that does not reflect IIA, the own-company adjustment or the loss-sensitive contract adjustment.

[22] Report 13 - RBC LOB Diversification: Current RBC Approach vs. Correlation Matrix Approach, CAS E-Forum Winter 2019.

Report 14 - Calibration of LOB Diversification in Underwriting Risk Charges, CAS E-Forum Spring 2019

DCWP work was based on data through December 2010.

ii. The CoMaxLine% approach using LOB risk, rather than LOB premium/serves ("volume"),[23] and

iii. The Herfindahl-Hirschman Index (HHI),[24] rather than CoMaxLine%.

b. DCWP found that alternatives to CoMaxLine%:

i. Do not produce very different results, by company,

ii. Do not indicate greater accuracy, and

iii. Are not theoretically more appropriate in the context of the RBC Formula.[25]

10. The indicated MDCs using the approach outlined above are largely independent[26] of the method of measuring diversification by company.

Therefore, to that extent, the choice of diversification formulas largely affects only the allocation by company and has only a limited effect on the total diversification credit across all companies.

Finding 2:
While the linear relationship between diversification credit and CoMaxLine% is not exact, considering the alternatives, the Committee believes it is a reasonable approximation, especially for more diversified companies.

[23] CoMaxLine%-Risk approach applies the CoMaxLine% framework to LOB risk rather than LOB volume, when calculating the LCF and PCF for a company. For clarity, as needed, we refer to the current implementation as CoMaxLine%-Volume and the alternative as CoMaxLine%-Risk.

For this purpose, LOB reserve risk equals reserve value times reserve risk factor. LOB premium risk equals premium value times premium risk factor plus expenses minus 100%. The PCF and LCF are calculated using LOB-risk rather than LOB-volume. For premium risk, implementation of this method requires expense information by LOB.

[24] HHI equals the sum of the squares of the LOB shares of total. For example, if there is only one LOB, HHI is 1.0, as is the case for the CoMaxLine%. With two lines split 25% and 75% HHI is 0.25^2 plus 0.75^2 or 0.625 compared to the CoMaxLine% of 0.750, i.e., HHI shows more diversification. With three lines split 50%, 25% and 25% HHI is 0.50^2 plus 0.25^2 plus 0.25^2 or 0.375, more diversification than the CoMaxLine% of 0.5. With two lines split 50% and 50% HHI and the CoMaxLine% are both 0.5.

[25] Except that CoMaxLine%-risk may be more appropriate than CoMaxLine%-volume.

[26] The indicated diversification credit from Approach Step 6 depends on the diversification allocation method only to the extent that different methods would assign companies to different diversification bands.

The indicated MDC from Step 7 depends on the extent to which diversification credit varies linearly with the CoMaxLine% diversification metric for the larger/more diversified companies, C3-E5.

DCWP analysis indicates the different methods tend to assign companies to the same bands and produce relatively similar diversification credits, especially for the more diversified companies.

Therefore, we can view the total diversification credit implied by Step 7 as being largely independent of the diversification metric, CoMaxLine%, or otherwise.

Finding 3:
We recommend further research on alternatives to the current RBC diversification approach, particularly the method we refer to as CoMaxLine%-Risk, which measures diversification by risk by LOB rather than dollars of premium/reserve.

Alternative Indicated MDCs

Table 3-1 identifies several other MDC selections that the NAIC could reasonably adopt, based on alternative assumptions.

Table 3-1
Alternative Indicated MDCs

Item	Alternative Method	Indicated MDC	
		Premium	Reserve
1	Base indicated MDC	46%	66%
2	Use Size Adjusted Line 4 Factors	42%	56%
3	Using combined RBC and Annual Statement data to calibrate indicated MDCs	**56%**	59%
4	Using 6-cell averge D3.E5 (Largest)	**50%**	**80%**
5	Using 6-cell average C4.E5 (Most diversified)	**48%**	55%
6	Using 4-cell average D4.E5	**50%**	64%
7	Regression analysis	45%	58%
8	Early years only (1988-2002)	42%	58%
9	Recent years only (2003-2017)	**64%**	**85%**
Yellow= MDC lower than row 1			
Green = MDC higher than row 1			

We discuss these alternatives below and provide further details in Section 6: Sensitivity Analysis. We note that any of these alternatives implies an MDC higher than the current 30%.

Row 1: Base Indicated MDC

Row 1 presented the MDC indicated method outlined above and described in more detail in Section 5.

Row 2: Company-size ("Size Adjusted")

The indicated MDC is sensitive to the fact that company-size is not reflected in Line 4 Factors.

Larger companies exhibit both greater diversification and, independently, a lower indicated risk charge. Therefore, part of the apparent diversification effect can be attributed to size.

Notwithstanding that analysis, we do not "remove" the effect of size from the MDC calibration, as our goal is to produce an MDC reflecting the structure of the RBC Formula, which does not reflect variation in risk charge by company-size.

The NAIC could reasonably make a different choice in the treatment of company-size differences and MDCs.

Row 3: Use RBC Filing Data ("AS+RBC")

The base analysis uses Annual Statement (AS) data for both Two-Year LOBs and Ten-Year LOBs. However, RBC Filing data (RBC data) for Two-Year LOB data has certain advantages relative to AS data.[27]

Working with NAIC personnel, we attempted to match AS company/years with RBC company/years, replacing the AS LOB data point with a higher-maturity RBC data point. This match was only partially successful.[28]

Due to limited access to RBC source data, we rely on AS data for our base indications. The NAIC could reasonably make a different choice.

Rows 4-6: Selected Size/Diversification Cells

The indicated MDC uses 9 cells, C3-E5. There is a significant degree of variability in the indicated MDC from each of those cells, especially for the reserve. Using subsets of those 9 cells produces different indicated MDCs, again, especially for the reserve MDC.

In Section 6, we provide more details on the variation in the indicated MDC by size/diversification band.

Row 7: Regression Analysis

We use regression through the origin to test the hypothesis that there is a linear relationship between CoMaxLine% and indicated diversification credit by level of diversification. The slope of the regression curve represents an indicated MDC.

- For premium, the regression slope is very similar to the average of the 9 cells.
- For reserves, the regression slope is lower than the average of the 9 cells.

Row 8-9: Alternative Time Periods

The base analysis uses AYs 1988-2017 for premium and initial reserve years 1988-2016 for reserves (referred to as "2017 (2016)" below). That covers a range of inflation/interest and underwriting environments, which we believe is appropriate.

[27] In AS data, for Two-Year LOBs, the maximum maturity for LRs and for RRRs is two years, but it is ten years in RBC data. For Two-Year LOBs, the RBC data includes only companies that are subject to RBC, while the AS data includes all companies.

A disadvantage of RBC data is that it does not include Prior Year data for reserve development, while AS data does.

[28] RBC Filing data and AS data have claims at different valuation dates, for the same AY or initial reserve year. Therefore, the RBC Filing data and AS data may be assigned to pools differently, and will not "match." Also, companies in runoff will have reserve data in only the "prior" row of Schedule P. Prior row data is not reported in RBC Filings. Not all companies make RBC filings.

When there was no matching year, we used the AS values for Two-Year LOBs.

When we divide the experience into two equal periods--1988-2002 and 2003-2017 (2016)--the earlier period shows substantially lower MDCs, suggesting greater between-line dependencies than in the more recent period. This might be a statistical fluctuation due to variability in the indicated MDCs[29] and because the more recent data is less mature than the older data.

However, two other features that might contribute to this difference are lower catastrophe activity and higher inflation/interest rates in the earlier period. We discuss these issues further in Section 7.

Summary of Alternative Indicated MDCs

While there is a range of indicated MDCs, any of these alternatives indicates an MDC in excess of 30%, the current MDC.

Issues for Future Research

Interaction of Diversification Credit and IIA (Section 7 and Appendix 2)

The indicated diversification credit is **calibrated** based on LR and RRR data on a **nominal value** (NV) basis, not a present value (PV) basis. However,

- The diversification credit is **applied** to premium/reserve risk on RBC PR0017 and PR0018 Line 13 after application of the IIA, i.e., **PV basis**, and
- If the diversification credit (based on NV analysis) were applied to the risk charge before the IIA (i.e., NV basis), the effect of the diversification credit would be larger, and the RBC value would be smaller.

We discuss this further in Section 7/Additional Considerations and Appendix 2

We have not evaluated this issue sufficiently to recommend a change in the RBC Formula.

Effect of Changes in Interest Rate/Inflation Environment (Section 7)

Report 2 showed that there is an interaction between Line 4 risk factors and interest/inflation rates. To address that interaction, we evaluated indicated risk charges on a present value (PV) basis--Line 4 risk factors and Line 7/8 IIA Factors combined. We separated these into NV Line 4 Factors and IIA Factors, which, combined, produced the target PV risk charges.

In this Report, we calibrate the indicated MDC based on a comparison of NV Observed Risk and NV Modeled Risk. In doing this, we assume that the ratio of PV Observed Risk Value to PV Modeled Risk Value is comparable to the corresponding NV ratios.

We discuss this assumption further in Section 7.

[29] Looking across the 9 cells, C3-E5, variability is large. The values for early-year and later-year indicated MDCs are within one standard deviation of the all-year indicated MDC for reserve risk. See Table 5-2 A and B for values of the standard deviation.

Finding 4:
The treatment of the IIA/Diversification interaction and the effect of a fully PV analysis are matters for future research.

Other Areas of Future Research

There are other areas of future research that we identify in this Report. We list those in Finding 5, below.

Finding 5:
Other areas of future research for dependency analyses that we identify in this Report are the following:

Calibration net of cats covered by R-Cat
Resolving issues in combining RBC and AS data
Within the CoMaxLine% approach, or any alternative, test square, square root, or other relationships between diversification index and diversification credit, rather than the current linear relationship.

General Considerations:

Ratemaking versus Risk Theory (Appendix 3)

RBC calibration is often understood in the context of risk theory. However, there are limitations to that framework, as outlined below.

Individual Company Capital Model Calibration: Grounded in Risk Theory

In an individual company capital model (ICCM), each LOB has a company-specific risk distribution, reflecting its underwriting, claims, reinsurance, and other practices. These company-specific LOB risk distributions are aggregated using empirically-derived or expert judgment-based correlations.

RBC Calibration: Grounded in Risk Classification

Unlike the ICCM, the RBC Formula is calibrated from, and applies to, a heterogeneous population of insurers. The ICCM risk correlation assumptions do not apply.

Variation in Risk within LOB

Consider Company 1A (writing LOB A), Company 1B (writing LOB B), and Company 2 (writing LOBs A and B). Company 2 is more diversified than either Company 1A or Company 1B. Risk theory suggests that the risk charge for Company 2 should be lower than the sum of the risk charges for Company 1A plus Company 1B, depending on the degree of correlation between the LOBs.

However, that expectation assumes that the risk distributions for LOBs A and B in Companies 1A and 1B are the same as the risk distributions for LOBs A and B in Company 2, respectively.

That assumption is not routinely valid. See Appendix 3 for examples.

Risk Classification Provides a Better Conceptual Framework

Therefore, risk classification and manual ratemaking provide a better framework for reflecting diversification in RBC. Specifically, in the risk classification framework, calibrating dependency

means measuring the extent to which companies writing more LOBs have different indicated all-lines risk charges than companies writing fewer LOBs.[30]

In this Report, diversification calibration means:

- The total credit for diversification is estimated empirically as we present in Tables 5-2A and 5-2B. This measurement is analogous to calculating the statewide indicated rate levels in manual ratemaking.
- Diversification is a "risk characteristic" that can be used to allocate credits across degrees of diversification using a reasonable formula, e.g., CoMaxLine%, CoMaxLine%-Risk, and Correlation Factor. This is analogous to setting territorial rate differentials.
- Not all risk characteristics are used in a particular risk classification system, e.g., company-size is not used.
    - The RBC Formula does not consider risk characteristics like company-size, Type of Company, or variations in LOB sub-segments that are not in the Formula.
    - Instead, the calibration considers aggregates across those risk characteristics.
- The Formula is intended to be reasonable overall, but will not be "exact" for any particular insurer.

Calibration Safety Level (Section 7)

There is no explicit overall safety level target for the CAL level in the P&C RBC Formula. Nonetheless, we understand that the prevailing regulatory view is that the implicit safety level has produced satisfactory results.

The indicated MDCs presented in this report are larger than the MDC in the RBC Formula. This suggests that the current RBC Formula incorporates some conservatism in the underwriting risk elements, relative to the 87.5th percentile/runoff time horizon safety level. Thus, even though the Line 4 Factors are calibrated at the 87.5th percentile, the Line 4 Factors combined with the conservative MDCs produced a safety level higher than the 87.5th percentile.

To maintain a satisfactory overall safety level for CAL, adopting a significant change to any element of the RBC Formula should include an assessment, possibly on a judgment basis, of whether the resulting overall impact on the safety level is appropriate, and then to what extent a reduction (or increase) in one area might indicate a corresponding increase (or decrease) in another area to achieve the desired overall level.[31]

[30] More precisely, we measure diversification using CoMaxLine%, but that correlates to the number of LOBs written.

[31] Since the implementation of the RBC Formula there have been changes that have increased the implied safety level (e.g., RCAT set at the 1-in-100 safety level and the addition of the operational risk charge at 3% of RBC). There have also been changes that decreased the implied safety level (e.g., reduced fixed income risk charges for assets and reduced reinsurance credit risk charges).

Specifically, adopting the indicated MDC in the RBC Formula reduces the safety level for R4 and R5, and therefore CAL.

We do not measure the impact of adopting the indicated MDCs on R4, R5, or CAL safety levels, nor do we determine whether the total ACL is appropriate for regulatory purposes. That is beyond the scope of this Report.

4. DATA

For our analysis of the RBC diversification formula, we construct all-lines data points for each available company (pool)/year.[32,33] Each point represents either a premium or a reserve risk observation, i.e., a premium amount and LR or an initial reserve amount and RRR. Following the data treatment in Reports 1 and 2, we combine the data for multiple companies that pool their experience into a single "pooled" data point.

- For premium risk, the all-lines net earned premium (NEP) for each company-AY data point is the sum of the NEP across all LOBs in the risk dataset.

  For each company-AY, the all-lines loss ratio (LR) is the NEP-weighted average of LRs by LOB.

- For reserve risk, the all-lines initial reserve for each company-initial reserve date is the sum of the initial reserves across all LOBs in the reserve risk dataset.

  For each company-initial reserve date, the reserve risk is the all-lines average reserve runoff ratio (RRR) weighted by the initial reserves of each LOB.

There are approximately 50,000 all-lines data points each for premium risk and for reserve risk, totaling roughly 100,000 data points. We classify each data point by company-size and diversification as described below.

Company Size Bands

For each data point, i.e., each company/year, we measure size using either all-lines NEP (for premium risk) or all-lines initial reserve (for reserve risk). We assign each data point to one of five company-size bands, such that 20% of the data points fall into each. We label these company-size bands A (smallest) through E (largest).[34]

Company Diversification Bands

Separately for premium and reserves, for each company/year, we define the diversification index as 1.0-CoMaxLine%.[35] We assign each data point to one of six diversification bands:

[32] Our risk data includes AYs 1988-2017 and initial reserve years 1988-2016. from Annual Statements 1997-2017.

Unlike the data in Reports 1 and 2, our data for this analysis includes Minor Lines, and "new" LOBs, i.e., LOB-age<5. LOB data can be zero or negative, but we exclude data points with negative total premium or initial reserve. Following the RBC Formula, we calculate the CoMaxLine% using zero for negative LOB premium or reserves values.

[33] We assume the reader is familiar with the methods, data, and conclusions presented in the Committee's April 2021 and August 2023 Reports, to the extent that provides the basis for the risk data we use in this analysis.

[34] Band A includes companies with premium/reserves at percentiles greater than or equal to 0% and less than 20%. Band B includes companies with premium/reserves at percentiles greater than or equal to 20% and less than 40%. Similarly for bands C and D. Band E includes companies with premium/reserves at percentiles greater than or equal to 80%, including 100%, the" largest" data point.

[35] A company with 25% of its business in the largest line has a diversification index of 75% (100% - 25%). A monoline company, with 100% of business in the largest (and only) LOB has diversification index of 100% minus 100% or zero.

- Band "0" contains company/years with a zero diversification index, which are considered monoline companies.[36]
- Bands 1-5 are five levels of diversification, each with 20% of the remaining (non-monoline) companies.[37]

Number of All-Lines Data Points by Size and Diversification

Tables 4-1A and 4-1B, below, show the number of data points by company-size and diversification band, for premium risk and reserve risk, respectively.

Table 4-1A
Premium
Number of Data Points by Company Size/Diversification Band

Div	Size Band					
Band	A	B	C	D	E	Total
0	5,067	3,303	2,003	1,393	1,065	12,831
1	1,509	1,728	2,017	1,637	1,013	7,904
2	1,478	1,717	1,804	1,812	1,091	7,902
3	1,318	1,605	1,752	1,801	1,426	7,902
4	878	1,496	1,703	1,789	2,036	7,902
5	219	619	1,189	2,037	3,838	7,902
Total	10,469	10,468	10,468	10,469	10,469	52,343

Table 4-1B
Reserve
Number of Data Points by Company Size/Diversification Band

Div	Size Band					
Band	A	B	C	D	E	Total
0	5,337	3,216	2,520	1,562	1,083	13,718
1	961	1,623	1,809	1,891	1,102	7,386
2	1,201	1,568	1,556	1,530	1,526	7,381
3	1,284	1,568	1,540	1,485	1,507	7,384
4	1,035	1,327	1,471	1,749	1,802	7,384
5	313	822	1,231	1,910	3,108	7,384
Total	10,131	10,124	10,127	10,127	10,128	50,637

[36] For our purpose, monoline means only one LOB has a premium/reserve greater than zero. Thus, band zero includes companies where one or more LOBs have negative premium/reserves and but only one LOB has positive premium/reserves.

[37] We define diversification bands 1-5 in the same way as for size bands, as described in footnote 34.

In these tables, we observe:

- Roughly 13,000 premium and reserve data points are classified as monoline (Div=0), representing 25% of the premium and 27% of the reserve data points.[38] This reflects that data points are individual company/years or pool/years, but not company group/years.
- Monoline companies (Div Band 0) tend to be smaller.
- The most diversified companies, in the row Div Band=5, tend to be larger.
- Nonetheless, even the largest size (band E) includes companies across all diversification levels.
- Almost all size-diversification cells include more than 1,000 data points.

All-Lines Risk Data – Premium/Reserves – by Size and Diversification

Tables 4-2A and 4-2B, below, show NEP and initial reserves by company size/diversification. These tables highlight that both premium and reserve volumes are heavily concentrated in the largest and most diversified segments.

Size Band E

- Over 90% of the premium and reserve volume falls in size band E.
- Over 39%of the total NEP/reserves are in cell E5 (largest size/most diversified)

Size/Diversification Bands C3-E5

- For premium, cells C3-E5 include 34% of companies and 84% of premium.
- For reserves, cells C3-E5 include 31% of companies and 74% of initial reserves.

Table 4-2A
Premium Volume Data[39]
NEP ($millions) by Company Size/Diversification Band

Div	Size Band					
Band	A	B	C	D	E	Total
0	3,205	12,809	26,281	69,325	437,778	549,398
1	1,146	6,944	26,962	77,997	356,626	469,676
2	1,080	6,918	24,826	90,416	714,390	837,630
3	968	6,484	24,603	88,998	1,823,068	1,944,122
4	735	5,937	23,388	87,751	2,174,754	2,292,566
5	211	2,677	16,676	109,209	5,162,054	5,290,827
Total	7,345	41,769	142,736	523,698	10,668,670	11,384,217

[38] 12,831 of 52,343 data points for premium and 13,718 of 50,637 data points for reserves.

[39] This total excludes data points with zero all-lines premium. These totals treats negative premium by LOB as zero premium.

Table 4-2B[40]
Reserve Volume Data
Initial Reserve ($millions) by Company Size/Diversification Band

Div	Size Band					
Band	A	B	C	D	E	Total
0	1,375	8,293	25,860	68,771	1,263,400	1,367,699
1	369	4,535	19,594	86,164	604,874	715,535
2	457	4,122	17,284	71,169	1,469,595	1,562,626
3	473	4,177	17,139	67,627	1,502,865	1,592,280
4	392	3,467	16,424	78,303	3,049,031	3,147,617
5	140	2,308	13,847	93,964	5,559,384	5,669,643
Total	3,205	26,901	110,147	465,999	13,449,149	14,055,402

Dollars of Diversification Credit – by Size and Diversification

Table 4-3A (Premium) and 2-3B (Reserves), below, present the dollar value of diversification credits under the current RBC Formula with the current 30% MDC, before application of the IIA.[41] The data show:

- Companies in cells C3-E5 receive 96% of the total premium diversification credit and 97% of the reserve diversification credit,[42]
- Cell E5 alone accounts for more than 60% of the total diversification credit.[43]

Because the impact is so heavily concentrated in cells C3-E5, we focus on these 9 cells when estimating the indicated MDC.

Table 4-3A
Dollars ($millions) of Diversification Credit (Premium)
Total Premium Diversification Credit by Company Size/Diversification Band

Div	Size					
Band	A	B	C	D	E	Total
0	0	0	0	0	0	0
1	6	34	135	469	1,556	2,199
2	18	122	418	1,611	11,239	13,408
3	23	174	621	2,360	41,441	44,619
4	25	207	807	3,103	74,330	78,472
5	9	116	716	4,858	252,685	258,384
Total	81	652	2,696	12,402	381,251	397,082

[40] This total excludes data points with zero all-lines reserves. This total treat negative reserves by LOB as zero reserves.

[41] This is calculated as Modeled Risk before diversification minus Modeled Risk after diversification, where those values are defined in Section 5.

[42] 380,921/397,082 = 96% for premium and 748,817/773356 = 97% for reserves.

[43] 252,685/397,082 = 64% for premium and 477,306/773356 = 62% for reserves

Table 4-3B
Dollars ($millions) of Diversification Credit (Reserves)
Total Reserve Diversification Credit by Company Size/Diversification Band

Div	Size Band					
Band	A	B	C	D	E	Total
0	0	0	0	0	0	0
1	1	15	66	306	2,333	2,720
2	7	62	255	1,113	19,873	21,309
3	15	136	573	2,403	61,775	64,902
4	19	176	863	4,417	193,565	199,039
5	10	155	1,026	6,889	477,306	485,385
Total	51	544	2,782	15,128	754,851	773,356

5. ANALYSIS OF LCF/PCFS

In this Section, we evaluate the following key assumptions of the RBC diversification approach:

- The 30% MDC
- The assumption that diversification credit is proportional to CoMaxLine%

Part 1 -Indicated MDC

We calculate the indicated MDC for each size/diversification band using the observed and modeled risk ratios and CoMaxLine% values corresponding to those segments. We define these terms below.

Observed Risk Ratio (Diversified)

Premium

For premium risk, for each company/year, we define the Observed AY Underwriting Gain/Loss (Observed AYUL$ in dollars and Observed AYUL%, as a percentage of premium) as the all-lines average LR plus company expense ratio minus 100%.

The LR is the NEP-weighted average LR by LOB for each company/year. The expense ratio is the industry average expense ratio by LOB, weighted by the company/year net earned premium by LOB.

For each size/diversification band or combination of bands, the observed risk ratio is the 87.5th percentile Observed AYUL% across data points within each size/diversification band.[44]

Reserves

For reserves, for each size/diversification band or combination of bands, the observed risk ratio is the 87.5th percentile RRR across data points within each size/diversification band.

Calculation Notes

Note that for each company/year premium or reserve data point, the observed risk ratio inherently reflects diversification across the LOBs.

When calculating observed risk, within a particular size/diversification band, or a combination of bands, we assign each data point equal weight, regardless of premium or reserve volume.

Modeled Risk Ratio Before Diversification

We calculate the Modeled Premium Risk and Modeled Reserve Risk using the RBC Formula applied to the LOB premium and reserve values for each data point.

Premium:

For each company/year, we calculated the Modeled Risk as follows:

[44] The premium and reserve risk factors adopted by the NAIC (Line 4 of the RBC Formula) are based on the 87.5th percentile safety level for the RBC CAL. We calibrate the LCF/PCF to the same safety level. The diversification relationship might be different if the safety level were a different value, e.g., the 90th percentile. We have not calculated the MDC at the 90th percentile safety level.

- The all-lines average premium risk factor is the NEP-weighted average of the LOB-specific premium risk factors.
- The company expense ratio is the average industry expense ratio by LOB, weighted by the company/year net earned premium by LOB.
- The Modeled Risk before diversification is the all-lines average premium risk factor, plus the company expense ratio minus 100%.

The overall Modeled Risk before diversification, as a percentage of premium, is the unweighted average of the company/year Premium Modeled Risk values within each size/diversification band or combination of bands.

Reserve:

Similarly, for each company/year, the all-lines average reserve risk charge is the average of the LOB reserve risk factors weighted by the company/year initial reserve by LOB.

The overall all-lines reserve risk charge before diversification, as a percentage of reserves, is the unweighted average of the company/year Reserve Modeled Risk percentages within each size/diversification band or combination of bands.

Modeled Risk Calculation Simplifications

These modeled risk calculations reflect several simplifications relative to the full RBC Formula.

- First, we evaluate experience on an undiscounted (nominal value, or NV) basis rather than the present value (PV) basis used in Report 2, and, accordingly, we do not apply the investment income offset in the modeled risk calculation.[45]
- Second, we do not apply the own-company adjustment factor, the loss-sensitive contract adjustment factor, or the growth risk charge.[46]
- Third, for company expenses, we use the average of the industry average expense ratio (2017) by LOB, weighted by the company-specific premium by LOB, rather than the company's own all-lines expense ratio.[47]
- Also, we use NEP in place of NWP.

Calculation of MDC – "D5" Companies

Table 5-1, below, presents the calculation of the indicated MDC for companies in Size Band "D" (60th to 80th percentile of size) and Diversification Band "5" (80th to 100th percentile of multi-line diversification).

[45] We discuss the PV/NV treatment in more detail in Section 7.

[46] We have not tested the effect of these simplifications. That said, we note, however, that the effect of including growth risk charge would increase the Modeled Risk and therefore likely increase the indicated MDCs. The effect of the own-company adjustments could be to increase or decrease the Modeled MDCs. In Section 5 we discuss the interaction of the IIA and implementation of the diversification credit.

[47] In the Sensitivity Section, below, we discuss the effect of some of this assumption.

Table 5-1
Sample Calculation of Indicated MDC
Size Band D/Diversification Band 5

	(1)	(2)	(3)
#	Item	Premium	Reserves
1	Observed Risk - 87.5th Percentile	15.8%	25.9%
2	Modeled Risk - 87.5th Percentile before diversification credit	21.0%	38.0%
3	Indicated Diversification Credit[1.0-(1)/(2)]%	25.0%	32.0%
4	Average Diversification Credit(Current Formula)	21.0%	19.2%
5	Indicated Maximum Credit [(3)/(4)]*30%	36%	50%

We display rounded values, but we calculate with unrounded values. Therefore, calculations using the rounded values shown may not exactly reproduce the displayed rounded results.

This applies to all Tables and Exhibits in this Report.

These calculations are as follows:

- Row 1 is the observed risk ratio equal to the 87.5th percentile AYUL% and RRR.
- Row 2 is the modeled risk ratio, before diversification, from the RBC Formula.
- Row 3 is the indicated diversification credit calculated from rows 1 and 2 as shown in row 3.
- Row 4 is the average diversification credit for this size/diversification band produced by the current RBC Formula (which reflects the current 30% MDC).
- Row 5 is the indicated MDC, calculated as shown on row 5.

Because the modeled risk before diversification (row 2) exceeds the observed diversified risk (row 1), some diversification credit is warranted. Row 3 shows indicated diversification credits of 25.0% for premium and 32.0% for reserves. These represent the level of credit that reconciles modeled risk with the observed risk.

Row 4 represents the diversification credit, utilizing the current 30% MDC. Since row 3 exceeds row 4, the indicated MDC is higher than 30%.

Row 5 shows that the indicated MDCs are 36% and 50%, which are higher than the current 30%.

Accordingly, the diversification formulas indicated for this cell would become:

- PCF = 64% plus 36% * CoMaxLine%$_{premium}$
- LCF = 50% plus 50% * CoMaxLine%$_{reserve,}$

where 36% and 50% replace the 30% MDC in the current RBC Formula.

Calculation of MDC – 30 Segments

Tables 5-2A and 5-2B, below, extend the Table 5-1 framework to each of the 30 size/diversification segments and sub-totals.

Table 5-2A Premium
Indicated MDC by Size/Diversification (5x6 Analysis)

Divers Band	Observed Risk (Part 1) Size Band Quintiles					AllSize
Quintiles	A	B	C	D	E	> 20%
0	70%	32%	26%	27%	39%	31%
1	67%	27%	29%	25%	28%	27%
2	48%	26%	22%	18%	18%	20%
3	52%	21%	18%	18%	16%	18%
4	45%	18%	16%	16%	14%	16%
5	83%	24%	15%	16%	14%	15%
All	62%	26%	22%	19%	18%	21%
All ex 0	57%	24%	21%	18%	16%	19%
	C3-E5 Unweighted		16.0%	Weighted	15.7%	

Divers Band	Modeled Risk No Diversification (Part 2) Size Band Quintiles					AllSize
Quintiles	A	B	C	D	E	> 20%
-	31%	32%	36%	46%	63%	40%
1	25%	27%	29%	32%	35%	30%
2	21%	23%	22%	23%	23%	23%
3	19%	21%	20%	21%	22%	21%
4	22%	21%	21%	21%	22%	22%
5	22%	21%	21%	21%	22%	22%
All	26%	26%	25%	27%	28%	26%
All ex 0	22%	23%	23%	23%	24%	23%
	C3-E5 Unweighted		21.3%	Weighted	21.4%	

Divers Band	Indicated Diversification Credit (Part 3) Size Band Quintiles					AllSize
Quintiles	A	B	C	D	E	> 20%
0	-128%	1%	28%	42%	38%	23%
1	-173%	2%	-1%	21%	22%	11%
2	-130%	-16%	1%	23%	23%	9%
3	-168%	1%	11%	14%	28%	15%
4	-109%	15%	23%	24%	37%	27%
5	-277%	-16%	26%	25%	37%	29%
All	-139%	0%	15%	29%	35%	22%
All ex 0	-160%	-2%	11%	24%	34%	20%
	C3-E5 Unweighted		25.0%	Weighted	26.5%	
(Part 3) = 1 - (Part 1)/(Part 2)						

Divers Band	Calculated Diversificaiton Credit (Part 4) Size Band Quintiles					AllSize
Quintiles	A	B	C	D	E	> 20%
0%	0%	0%	0%	0%	0%	0%
1	2%	2%	2%	2%	2%	2%
2	8%	8%	8%	8%	8%	8%
3	12%	12%	12%	13%	13%	13%
4	16%	16%	16%	16%	17%	16%
5	20%	21%	21%	21%	22%	21%
All	5%	7%	9%	11%	14%	10%
All ex 0	9%	10%	11%	12%	15%	12%
	C3-E5 Unweighted		16.6%	Weighted	17.2%	
(Part 4) = Diversification Credit Calculated (Current RBC)						

Divers Band	Indicated Max Diversification Credit (Part 5) Size Band Quintiles					AllSize
Quintiles	A	B	C	D	E	> 20%
0						
1	-2614%	26%	-17%	328%	348%	178%
2	-500%	-63%	2%	86%	87%	35%
3	-405%	3%	28%	33%	68%	35%
4	-206%	28%	42%	44%	67%	50%
5	-413%	-23%	38%	36%	52%	41%
All	-890%	0%	51%	80%	76%	66%
All ex 0	-528%	-5%	30%	58%	66%	48%
	C3-E5 Unweighted		45.1%	Weighted	45.9%	
	StdDev		13.5%	StdDev	12.9%	
(Part 5) = 0.30 * (Part 3)/(Part 4)						

Notes: See Notes to Table 5-2B

Each table includes the following:

- Parts 1-5 in this Table are analogous to rows 1-5 in Table 5-1.
- Part 1 – Each cell is the 87.5th percentile AYUL% or RRR for all data points in that cell. We refer to this as Observed Risk
- Parts 2 and 4 – Each cell is the average of modeled risk (before diversification) and diversification credit, respectively, for all data points in the cell; each point counts equally.
- Parts 3 and 5 – Indicated Diversification Credit and Indicated MDC, calculated using the formulas shown in the Table at the bottom of each of those Parts.
- The label "C3-E5 unweighted" means the simple average of the 9 cells, C3 to E5.

- The label "C3-E5 weighted" means average of the values in the 9 cells, C3 to E5, weighted by the number of company/year data points per cell (see Tables 2-1A and 2-1B for the number of data points by cell).
- StdDev, at the bottom of Part 5, is the standard deviation for the 9 cells C3-E5.
    - Unweighted means each of the 9 cells is weighted equally.
    - Weighted means each of the 9 cells has a weight equal to the number of company/years in that cell.

Table 5-2B Reserves
Indicated MDC by Size/Diversification (5x6 Analysis)

Divers Band Quintiles	Observed Risk (Part 1) Size Band Quintiles A	B	C	D	E	AllSize > 20%
0	58%	41%	28%	25%	18%	29%
1	50%	53%	24%	23%	15%	27%
2	53%	42%	28%	21%	13%	25%
3	57%	41%	31%	25%	18%	28%
4	49%	42%	33%	27%	25%	30%
5	75%	36%	30%	26%	25%	27%
All	56%	43%	28%	25%	21%	28%
All ex 0	54%	43%	29%	25%	21%	27%
	C3-E5 Unweighted		26.7%	Weighted	26.4%	

Divers Band Quintiles	Modeled Risk No Diversification (Part 2) Size Band Quintiles A	B	C	D	E	AllSize > 20%
0	33%	35%	36%	37%	31%	35%
1	29%	29%	29%	30%	31%	29%
2	29%	31%	30%	32%	31%	31%
3	32%	33%	34%	36%	39%	36%
4	34%	35%	37%	38%	42%	38%
5	37%	36%	39%	38%	42%	40%
All	32%	33%	34%	35%	37%	35%
All ex 0	32%	32%	33%	35%	38%	35%
	C3-E5 Unweighted		38.3%	Weighted	38.7%	

Divers Band Quintiles	Indicated Diversification Credit (Part 3) Size Band Quintiles A	B	C	D	E	AllSize > 20%
0	-75%	-16%	22%	34%	44%	17%
1	-74%	-83%	16%	24%	50%	7%
2	-81%	-37%	7%	34%	58%	20%
3	-75%	-24%	8%	31%	53%	22%
4	-42%	-17%	10%	31%	39%	22%
5	-100%	-1%	23%	32%	40%	32%
All	-73%	-28%	17%	30%	44%	21%
All ex 0	-71%	-33%	14%	29%	45%	21%
	C3-E5 Unweighted		29.8%	Weighted	31.2%	
(Part 3) = 1 - (Part 1)/(Part 2)						

Divers Band Quintiles	Calculated Concentration Ratio (Part 4) Size Band Quintiles A	B	C	D	E	AllSize > 20%
0	0%	0%	0%	0%	0%	0%
1	1%	1%	1%	1%	1%	1%
2	5%	5%	5%	5%	5%	5%
3	10%	10%	10%	10%	10%	10%
4	14%	14%	14%	14%	14%	14%
5	18%	19%	19%	19%	20%	19%
All	4%	6%	7%	8%	11%	8%
All ex 0	8%	9%	9%	10%	12%	10%
	C3-E5 Unweighted		14.5%	Weighted	15.0%	
(Part 4) = 1 - Diversification Credit Calculated (Current RBC)						

Divers Band Quintiles	Indicated Max Diversification Credit (Part 5) Size Band Quintiles A	B	C	D	E	AllSize > 20%
0						
1	-1739%	-2109%	394%	628%	1190%	174%
2	-491%	-229%	43%	215%	367%	124%
3	-232%	-73%	26%	96%	160%	67%
4	-91%	-36%	22%	64%	83%	45%
5	-165%	-2%	36%	50%	61%	50%
All	-554%	-145%	73%	107%	121%	78%
All ex 0	-256%	-117%	47%	88%	109%	64%
	C3-E5 Unweighted		66.5%	Weighted	66.3%	
	StdDev		40.5%	StdDev	37.5%	
(Part 5) = 0.30 * (Part 3)/(Part 4)						

Findings from Tables 5-2A and 5-2B

Table 5-3, below, is a copy of Part 5 of Tables 5-2A and 5-2B, which shows the indicated MDCs, by cell.

If the relationship between diversification credit and CoMaxLine% were perfectly linear, then the values in Table 5-3 would show no clear trend as you move across diversification bands. If there were also no random variation, all the values in Part 5 would be identical regardless of company-size and diversification band.

Also, with those assumptions, if the appropriate MDC were 30%, then all the indicated MDC values in Part 5 would be approximately 30%.

Instead, there is substantial variability in the indicated MDC among 30 size/diversification bands, which we discuss below.

Table 5-3
Indicated MDC by Size Diversification Band

Premium

Divers Band Quintiles	Indicated Max Diversification Credit (Part 5) Size Band Quintiles A	B	C	D	E	AllSize > 20%
0						
1	-2614%	26%	-17%	328%	348%	178%
2	-500%	-63%	2%	86%	87%	35%
3	-405%	3%	28%	33%	68%	35%
4	-206%	28%	42%	44%	67%	50%
5	-413%	-23%	38%	36%	52%	41%
All	-890%	0%	51%	80%	76%	66%
All ex 0	-528%	-5%	30%	58%	66%	48%
	C3-E5 Unweighted		45.1%	Weighted	45.9%	
	StdDev		13.5%	StdDev	12.9%	

Reserves

Divers Band Quintiles	Indicated Max Diversification Credit (Part 5) Size Band Quintiles A	B	C	D	E	AllSize > 20%
0						
1	-1739%	-2109%	394%	628%	1190%	174%
2	-491%	-229%	43%	215%	367%	124%
3	-232%	-73%	26%	96%	160%	67%
4	-91%	-36%	22%	64%	83%	45%
5	-165%	-2%	36%	50%	61%	50%
All	-554%	-145%	73%	107%	121%	78%
All ex 0	-256%	-117%	47%	88%	109%	64%
	C3-E5 Unweighted		66.5%	Weighted	66.3%	
	StdDev		40.5%	StdDev	37.5%	

Smaller companies (Size bands A and B)[48]

For these companies, the indicated MDCs are generally negative, implying a diversification surcharge, rather than credit.

We understand this to be because the indicated risk charge for small companies is higher than the Line 4 Factors in the RBC Formula.

In Appendix 1, we examine the relationship between company-size and Line 4 risk factors.

Low Diversification Bands – Diversification Bands 1-2)/Company Sizes C-E

For these companies, the indicated MDCs are generally high.

[48] As we noted, the Modeled Risk before Diversification is based on certain simplifications. In particular, it does not reflect the own-company adjustment or the growth risk adjustment. If Modeled Risk had included those elements of the RBC Formula the differences between companies by size and diversification might have been reduced. That adjustment was outside the scope of our work.

Low diversification, bands 1-2, means the company specializes in a small number of LOBs. The CAS Dependency and Calibration Working Party (DCWP) Report 8, *Differences in Premium Risk charge by Type of Company*,[49] showed that specialist companies[50] have lower than average Line 4 charges for their primary LOBs.

The favorable effect of "specialization" is not reflected in the RBC Line 4 Factors. Therefore, it appears in this analysis as an indicated increase in diversification credit as evidenced by a higher indicated MDC. An examination of the benefit of specialization is outside the scope of this project, and we do not use the experience of the low diversification bands in the indicated MDC.

Larger/more diversified companies – Cells C3-E5

Table 5-3, above, shows the range of values for these cells:

- Premium: Indicated MDCs range from 28% (C3) to 68% (E3); average >45%.
- Reserves: Indicated MDCs range from 22% (C3) to 160% (E3); average >65%.

It also shows the standard deviation across the 9 cells:

- For premium, the standard deviation is 12.9%, compared to the mean of 45.9%, a coefficient of variation of 30%.

  For reserves, the standard deviation is 37.5%, compared to the mean of 66.3%, a coefficient of variation of 57%.

Thus, there is notable variability within that range.

One factor contributing to variability is company-size. In Appendix 1, we calculate the indicated MDCs with risk factors that vary with company-size. The variability after that adjustment is reduced, as follows:

- For premium, the standard deviation is 6.1%, compared to the mean of 42.0%, a coefficient of variation of 15%.
- For reserves, the standard deviation is 25.2%, compared to the mean of 56.2%, a coefficient of variation of 45%.

MDC Indication

The variability, even after the size adjustment, suggests that there are many factors contributing to the differences between companies with increased diversification by LOB.

This makes the selection of the MDC less clear-cut than might be desirable.

[49] Casualty Actuarial Society E-Forum, Spring 2014 1 Risk-Based Capital (RBC) Premium Risk Charges—Differences in Premium Risk Charge by Type of Company.

[50] "Specialist" companies were defined as those with more than 50% of premium in business categories such as "personal," "medical professional," "workers compensation," "reinsurance," etc.

We base our final indicated MDC on the average value in cells C3–E5 (highlighted in yellow). While these nine cells account for only about 34% of premium and 31% of reserve data points, they cover:

- 84% of total premium
- 74% of total reserves
- 95% of total premium diversification credit
- 96% of total reserve diversification credit

Thus, these cells represent the companies with the bulk of policyholders and claims exposure, making them the most relevant for setting diversification parameters.

Most cells in the C3-E5 group imply an MDC higher than the current 30%.

Part 2 – Diversification Credit by Company – Regression Analysis

Tables 5-4 and 5-5, below, use regression through the origin to test the assumption that diversification is linear with respect to CoMaxLine%. This regression analysis also provides a further test of the indicated MDC.

In that regression:

- We use regression through the origin because a diversification formula should yield zero credit when there is zero diversification.
- We apply the regression to data from cells C3-E5, excluding company-sizes A and B and diversifications bands 0-2 for the reasons explained previously.

The regression data in Table 5-4 is as follows:

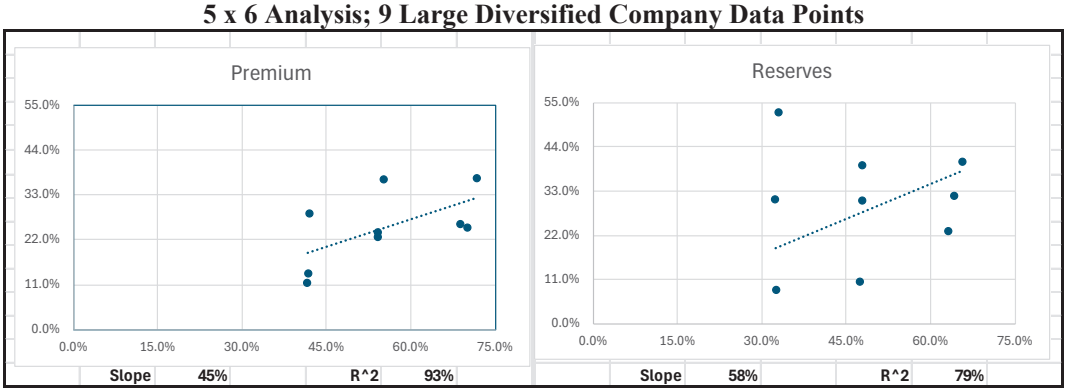
- Columns 1 & 4: Average diversification index for premium and reserve risk, respectively (from Table 5-2A/B, Part 4 divided by 30%).
- Columns 2 & 5: Indicated diversification credit (from Part 3 of Tables 5-2A and 5-2B).
- Columns 3 & 6: Fitted diversification credit, derived from the regression through the origin applied to the prior columns.

Table 5-4
Large Diversified Companies
Graphical Analysis of CoMaxLine% Element of Diversification Formula
5 x 6 Analysis; 9 Large Diversified Company Data Points

		Premium			Reserves		
		(1)	(2)	(3)	(4)	(5)	(6)
Size Band	Div Band	Average Div Index	Indicated Div Credit	Fitted Div Credit	Average Div Index	Indicated Div Credit	Fitted Div Credit
C	3	41.6%	11.5%	18.7%	32.5%	8.3%	18.9%
D	3	41.8%	13.8%	18.8%	32.4%	31.0%	18.8%
E	3	42.0%	28.5%	18.9%	32.9%	52.7%	19.1%
C	4	54.2%	22.6%	24.3%	47.5%	10.5%	27.5%
D	4	54.1%	23.9%	24.3%	47.9%	30.8%	27.8%
E	4	55.1%	36.9%	24.8%	47.7%	39.4%	27.7%
C	5	68.7%	25.9%	30.9%	63.2%	23.0%	36.6%
D	5	70.1%	25.0%	31.5%	64.1%	32.0%	37.2%
E	5	71.7%	37.2%	32.2%	65.7%	40.2%	38.1%

Table 5-5, below, shows Table 5-4 graphically.

Table 5-5
Large Diversified Companies
Graphical Analysis of CoMaxLine% Element of Diversification Formula
5 x 6 Analysis; 9 Large Diversified Company Data Points



In Table 5-5:

- The X-axis represents the average diversification index (Table 5-4 columns 1 and 4).
- The Y-axis represents the indicated diversification credit (Table 5-4 columns 2 and 5)
- The slope of the fitted line is 45% for premiums and 58% for reserves.

The regression "R-squared" values[51] are:

- 93% for premium, and
- 79% for reserves.

This regression analysis evaluates the assumption that diversification is proportional to the CoMaxLine% parameter. The "R-squared" metrics suggest that the proportionality assumption is reasonable, albeit with more variability for reserves than for premiums.

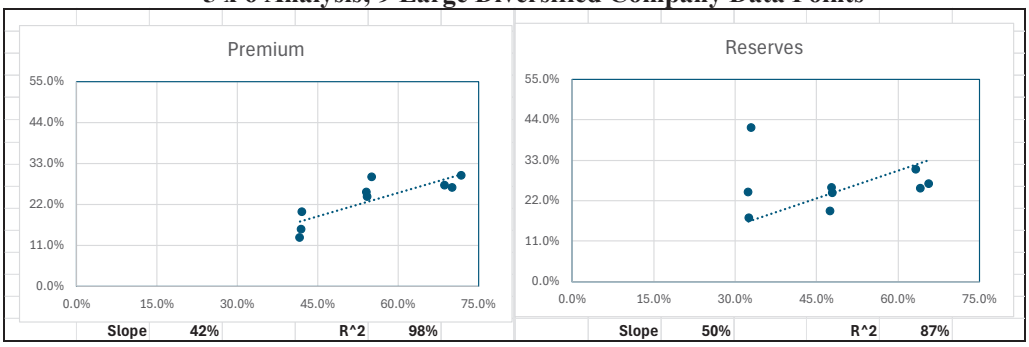
The slopes serve as alternative estimates of the premium and reserve indicated MDCs.

- The premium slope, 45% is essentially the same as the C3-E5 average in Table 5-2A.
- The reserve slope, 58% is not as close to the C3-E5 average, 66%, as the premium slope. In light of the higher variability in the reserve risk regression, our reserve MDC indication is based on the C3-E5 average in Table 5-2B.

Analysis after size adjustment

In Section 6/Sensitivity Analysis, and Appendix 1/Size-Adjusted Indicated MDC, we observe that company-size contributes to both the indicated MDC and the variation in indicated MDC by size/diversification cell. Table 5-6, a copy of Appendix 1-Exhibit A1-4, shows the size-adjusted equivalent of Table 5-5.

Table 5-6
(Copy of Appendix 1 – Exhibit A1-4)
Large Diversified Companies (with Size-Adjusted Risk Factors)
Graphical Analysis of CoMaxLine% Element of Diversification Formula
5 x 6 Analysis; 9 Large Diversified Company Data Points



[51]The R-squared statistic is calculated by Excel regression in Excel data pack. The Excel formula for R-squared for regression through the origin is different from the R-squared formula used for OLS regression. Regression through the Origin by Joseph G Eisenhauer.

Removing the company-size effect improves the quality of the regression. Table 5-6 shows the adjusted regression "R-squared" values:

- 98% for premium and
- 87% for reserves.

This improvement in regression results contributes to the Committee's view that using a linear relationship between CoMaxLine% and diversification credit is reasonable.[52]

[52] There is limited data (nine points) and high variability by size within diversification levels. Therefore, we have not tested the extent to which a non-linear relationship, such as a square or square root relationship between diversification level and diversification credit, might better match the experience.

6. SENSITIVITY ANALYSIS

Alternative Indicated MDCs and Sensitivity Tests

In this Section, we evaluate how changes in assumptions affect the indicated MDC.

Table 6-1, row 1, columns 7 and 8, shows the indicated MDCs that we develop in Section 5, 46% for premium risk and 66% for reserve risk. Rows 2-16, columns 7 and 8, show the indicated MDCs based on the alternative assumptions briefly listed in column 2.

We discuss each of the alternatives in the material following Table 6-1.

Table 6-1 – Alternatives and Sensitivity Analysis
Summary of Indicated Maximum Diversification Charges

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						Indicated MDC	
Row #	Label	Size/Div Cells	Segments	Data-AS/RBC	Expense Data	Premium	Reserves
1	Base indicated MDC	Wtd C3.E5	5x6	AS only	Industry	46%	66%
1.1	Unweighted Indicated MDC	UnWtd C3.E5	5x6	AS only	Industry	45%	66%
2	Size Adjusted Line 4 Factors	Wtd C3.E5	5x6	AS only	Industry	42%	56%
3	AS + RBC	UnWtd E5.J10	10x11	AS+RBC	Industry	56%	59%
4	Sizes D & E/Div 3-5	Wtd D3.E5	5x6	AS only	Industry	50%	80%
4.1	Size C/Div 3-5	Wtd C3.C5	5x6	AS only	Industry	35%	28%
4.2	Size D/Div 3-5	Wtd D3.D5	5x6	AS only	Industry	38%	68%
4.3	Size E/Div 3-5	Wtd E3.E5	5x6	AS only	Industry	59%	90%
5	Div 4 & 5/Size C-E	Wtd C4.E5	5x6	AS only	Industry	48%	55%
5.1	Div 3/Size C-E	Wtd C3.E3	5x6	AS only	Industry	41%	93%
5.2	Div 4/Size C-E	Wtd C4.E4	5x6	AS only	Industry	52%	58%
5.3	Div 5/Size C-E	Wtd C5.E5	5x6	AS only	Industry	45%	53%
6	Div 4&5/Size D&E	Wtd C4.E5	5x6	AS only	Industry	50%	64%
7	Regression Slope	C3.E5	5x6	AS only	Industry	45%	58%
8	Yrs - 1988-2002	Wtd C3.E5	5x6	AS only	Industry	42%	58%
9	Yrs - 2003-2017 (2016)	Wtd C3.E5	5x6	AS only	Industry	64%	85%
10	Yrs - 1995-2017 (2016)	Wtd C3.E5	5x6	AS only	Industry	43%	67%
11	2022 Line 4 factors	Wtd C3.E5	5x6	AS only	Industry	58%	59%
12	110 Segments	UnWtd E5.J10	10x11	AS only	Industry	46%	67%
13	6 Segments	UnWtd Div 3-5; Size >A	5x6	AS only	Industry	42%	54%
14	1 Segment	Ex A/Ex 0	1x1	AS only	Industry	48%	64%
15	Co Expense	Wtd C3.E5	5x6	AS only	Co	46%	NA
16	DCWP 2010 data	UnWtd C3.E5	5x6	AS+RBC	Industry	54%	70%

AS+RBC = Annual Statement data for Ten-Year LOBs and RBC data for Two-Year LOBs, for company/years where RBC data is available.

Row 1.1 – Unweighted Average cells C3-E5

Row 1.1 shows the indicated MDC based on the unweighted average of cells C3-E5, i.e., weighting each cell equally. The differences compared to row 1 are small, 46% versus 45% for premium and 66.3% versus 66.5% for reserves.[53] We use row 1.1 as the base for certain alternatives that we calculated based on the unweighted average of cells C3-E5.

[53] Each of these rounds to 66% in Table 6-1.

Row 2 – Effect of Company-Size

There is an interaction between (a) company-size and (b) risk factors. This interaction affects the indicated MDC, as follows:

Variation in Indicated Risk Charges by Company-Size

First, Appendix 1-Exhibits A1-1A and A1-1B (Part 3), show that, for premium and reserves, respectively, the indicated LOB risk charges are lower for larger companies, even if they have the same level of diversification as smaller companies.

Company Size and Diversification

Second, larger companies tend to have higher levels of diversification, including within the C3-E5 range. For example, for premium, looking at Table 4-1A:

- The number of E3 companies/years (1,426 for premium) is less than the number of C3 or D3 companies/years (1,752 and 1,801 for premium).
- Conversely, the number of E5 company/years (3,838 for premium) is more than the number of C5 or D5 company/years (1,189 and 2,037 for premium).

For reserves, looking at Table 4-1B, the difference in the number of companies by size level for diversification band 3 is small, but for diversification band 5, the number of companies by size is skewed to large companies. For example, there are 3,108 E5 companies but only 1,231 C5 and 1,910 D5 companies.

Interdependency of Risk Charge by Size and Diversification by Size

Because larger companies independently exhibit both greater diversification and lower risk charges, part of the apparent diversification effect is attributable to size. To assess this impact, in Appendix 1, we adjust the modeled premium/reserve risk charges to reflect company-size. The resulting indicated MDCs, shown in row 2, are lower:

- 42% rather than 46%, for premium, and
- 56% rather than 65% for reserves.[54]

Appendix 1 Exhibits A1-2A and A1-2B show the supporting calculations.

Notwithstanding that analysis, we do not "remove" the effect of size from the MDC calibration, as our goal is to produce an MDC reflecting the structure of the RBC Formula, which does not reflect variation in risk charge by company-size.

Row 3 – Using RBC Filing Data ("RBC data")

In the base analysis, we use Annual Statement (AS) data for both Two-Year LOBs[55] and Ten-Year LOBs.

[54] The variation in risk charge by company-size, for size bands C-E is more significant for reserve risk than for premium risk. Hence the impact on MDC is greater for reserve risk than for premium risk.

[55] RBC Filing data and AS data have claims at different valuation dates, for the same AY or initial reserve year. Therefore, the RBC Filing data and AS data may be assigned to pools differently, and will not "match."

Also, companies in runoff will have reserve data in only the "prior" row of Schedule P, and will therefore not have premium or reserve data in the RBC Filings.

For the Line 4 analysis in Reports 1 and 2, we use RBC data for Two-Year LOBs because the RBC Two-Year LOB data has certain advantages relative to AS data.

- First, RBC data includes LRs and RRRs with maturity up to ten years, longer than the two-year maturity of AS data.
- Second, RBC data includes only companies and LOBs that are subject to RBC requirements. Certain health coverages in LOB L-Other are excluded (governed by Health RBC), and single state monoline financial guarantee companies, LOB S- FG/MG, are not included because they are not covered by RBC.

On the other hand, RBC data does not include the development of Prior Year reserves. This is less significant for the Two-Year LOBs than for the Ten-Year LOBs because the Two-Year LOBs are generally shorter-tailed business, with less prior year reserves.

Merging AS and RBC data is more complex in this dependency analysis than with the Line 4 analysis. The Line 4 analysis evaluates each LOB separately. The dependency analysis requires aggregation across Two-Year LOBs and Ten-Year LOBs to produce the all-line total company/year experience.

Working with NAIC personnel, we attempted to match the AS company/years with the RBC company/years, replacing AS Two-Year LOB data points with higher-maturity RBC data points for those LOBs. This match was only partially successful. When there was no matching year, we used the AS values for Two-Year LOBs.

Using the RBC data, to the extent available, increases the premium indicated MDC and reduces the reserve indicated MDC,[56] as shown in Table 6-2, below, extracted from Table 6-1.

Due to limited access to RBC source data, we rely on AS data for our base indications. The NAIC might reasonably make a different choice.

[56] Technically, the RBC+AS indicated MDCs are based on 110 size/diversification segments rather than 30 size/diversification segments and should be compared to the AS indicated MDCs based on 110 size/diversification segments. The AS-only 110 segment analysis produces indicated MDCs essentially the same as the 30 segment indicated MDC, so the display in Table 3-4 is not misleading.

Table 6-2
Effect of Using RBC data for Two-Year LOBs

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						Indicated MDC	
Row #	Label	Size/Div Cells	Segments	Data-AS/RBC	Expense Data	Premium	Reserves
1	Base indicated MDC	Wtd C3.E5	5x6	AS only	Industry	46%	66%
3	AS + RBC	UnWtd E5.J10	10x11	AS+RBC	Industry	56%	59%

The RBC data was evaluated with 110 segments, rather than 30 segments, and an unweighted average of the 110-segment equivalent of 9-segment cells C3-E5.

Nonetheless, we compare the AS+RBC indicated MDC to row 1, because the indicated MDC with the unweighted average, row 12, is essentially the same as the indicated MDC.

Rows 4 through 6 – Size/Diversification Segments

The indicated MDC is based on the nine size/diversification cells C3-E5. Tables 6-3 and 6-4 (extracted from Table 6-1), below, show indicated MDCs for different size and diversification combinations within that overall range.

Table 6-3
By Size Level – Combined Diversification Levels
Focus by Size for Diversification 3-5 Combined

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						Indicated MDC	
Row #	Label	Size/Div Cells	Segments	Data-AS/RBC	Expense Data	Premium	Reserves
1	Base indicated MDC	Wtd C3.E5	5x6	AS only	Industry	46%	66%
4	Sizes D & E/Div 3-5	Wtd D3.E5	5x6	AS only	Industry	50%	80%
4.1	Size C/Div 3-5	Wtd C3.C5	5x6	AS only	Industry	35%	28%
4.2	Size D/Div 3-5	Wtd D3.D5	5x6	AS only	Industry	38%	68%
4.3	Size E/Div 3-5	Wtd E3.E5	5x6	AS only	Industry	59%	90%

Indicated MDC by Company-Size (Diversification bands 3-5 combined)

Table 6-3, above, shows that indicated MDCs increase with size, as follows:

- For premium risk, the indicated MDCs are 35%, 38% and 59% for size bands C, D, and E, respectively, and 50% for D+E, which compares to the overall indicated MDC of 46%.
- For reserve risk the indicated MDCs are 28%, 68% and 90% for size bands C, D and E, respectively, and 80% for D+E, compared with an overall indicated MDC of 66%.

This is consistent with prior observations that, absent a company-size adjustment in risk factors, indicated MDCs will be larger for larger companies.

Indicated MDC by Diversification (Size bands C-E combined)

Table 6-4, below, shows that there is no consistent pattern in indicated MDCs as diversification increases:

- For premium risk, the indicated MDCs are 41%, 52%, and 45%, for diversification bands 3, 4, and 5, respectively, and 48% for diversification bands 4+5, relative to the overall indicated MDC of 46%.
- For reserve risk, the indicated MDCs are 93%, 58%, 53% for diversification bands 3, 4, and 5, respectively, and 55% for diversification bands 4 + 5, relative to the overall indicated MDC of 66%.

Table 6-4
By Diversification Level – Combined Size Levels
Focus by Diversification for Sizes C-E Combined

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						Indicated MDC	
Row #	Label	Size/Div Cells	Segments	Data-AS/RBC	Expense Data	Premium	Reserves
1	Base indicated MDC	Wtd C3.E5	5x6	AS only	Industry	46%	66%
5	Div 4 & 5/Size C-E	Wtd C4.E5	5x6	AS only	Industry	48%	55%
5.1	Div 3/Size C-E	Wtd C3.E3	5x6	AS only	Industry	41%	93%
5.2	Div 4/Size C-E	Wtd C4.E4	5x6	AS only	Industry	52%	58%
5.3	Div 5/Size C-E	Wtd C5.E5	5x6	AS only	Industry	45%	53%
6	Div 4&5/Size D&E	Wtd C4.E5	5x6	AS only	Industry	50%	64%

Row 6 shows the effect of considering the weighted average of the four cells D4-E5. This 4-cell average indicates a somewhat higher MDC for premium and a slightly lower MDC for reserves.

Row 7 – Regression Analysis

We use regression through the origin to test the hypothesis that there is a linear relationship between CoMaxLine% and indicated diversification credit by level of diversification. The slope of the regression curve represents an indicated MDC. Exhibit 5-5 shows that:

- The regression slope for premium is 45%, which is very similar to the average of the 9 cells, 46%.
- The regression slope for reserves is 58%, which is lower than the average of the 9 cells, 66%.

Rows 8-10 – Years Included

The base analysis uses AYs 1988-2017 for premium and initial reserve years 1988-2016 for reserves. Table 6-5, below, from Table 6-1, shows the indicated MDCs based on alternative year ranges.

Table 6-5
Indicated MDC by Year-Range

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						Indicated MDC	
Row #	Label	Size/Div Cells	Segments	Data-AS/RBC	Expense Data	Premium	Reserves
1	Base indicated MDC	Wtd C3.E5	5x6	AS only	Industry	46%	66%
	Early 15 Years vs. Recent 15/14 Years						
8	Yrs - 1988-2002	Wtd C3.E5	5x6	AS only	Industry	42%	58%
9	Yrs - 2003-2017 (2016)	Wtd C3.E5	5x6	AS only	Industry	63%	85%
	Most recent Lastest 22/21 years						
10	Yrs - 1995-2017 (2016)	Wtd C3.E5	5x6	AS only	Industry	43%	67%

Note: The indicated Line 4 Factors will vary for each year-range. Therefore, when examining MDC by year-range, we adjust the all-lines average modeled risk factors to reflect differences in indicated risk charges based on the selected year-range relative to the full dataset.

Rows 8 and 9 split the experience into two approximately equal periods—1988-2002 and 2003-2017 (2016 for reserve risk). The earlier period, from 1988 to 2002, exhibits substantially lower MDCs compared to the more recent period. We have not investigated the factors that cause that difference. This might be a statistical fluctuation due to variability in the indicated MDCs[57] and because the more recent data is less mature than the older data.

However, two other factors might contribute are that (a) the 2003-2017 period includes more catastrophe events than the 1988-2002 period,[58] and (b) there were higher inflation/interest rates in the 1988-2002 period than in the more recent period. We discuss these issues further in Section 7.

Row 10 presents the indicated MDC using a recent time frame, 1995-2017. The indicated MDCs are very similar to those in row 1.

Row 11 – 2022 Line 4 Factors

Row 11 shows the indicated MDC where the modeled risk ratios are based on the 2022 Line 4 risk factors rather than the indicated Line 4 Factors.

[57] Looking across the 9 cells, C3-E5, variability is large. The values for early-year and later-year indicated MDCs are within one standard deviation of the all-year indicated MDC for reserve risk. See Table 5-2 A and B for values of the standard deviation.

[58] For example, as we observed in Report 2, page 108, "Continental United States Hurricane Impacts/Landfalls, 1851-2022," the National Oceanic and Atmospheric Agency reports 1.3 hurricane landfalls per year in 1988-2003 and 1.8 hurricane landfalls per year in 2004-2017. NOAA and other sources show a similar relationship for tropical storm landfalls.

All else equal, if the average Line 4 Factors were higher than indicated by experience, then the indicated MDC would be higher than the otherwise indicated MDC, and vice versa.[59]

For premium risk, the average 2022 Line 4 Factor is higher than the indicated Line 4 Factor (0.950 versus 0.934).[60] Accordingly, the indicated MDC is higher when using the 2022 Line 4 Factors (58% using 2022 Line 4 versus 46% using the indicated).

For reserve risk, the average 2022 Line 4 Factor is lower than the indicated Line 4 Factor (0.365 versus 0.385). Accordingly, the indicated MDC is lower when using the indicated Line 4 Factors (59% using the 2022 Line 4 versus 66% using the indicated).[61]

Table 6-6
2022 Factors

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						Indicated MDC	
Row #	Label	Size/Div Cells	Segments	Data-AS/RBC	Expense Data	Premium	Reserves
1	Base indicated MDC	Wtd C3.E5	5x6	AS only	Industry	46%	66%
11	2022 Line 4 factors	Wtd C3.E5	5x6	AS only	Industry	58%	59%

This highlights that MDCs should be calibrated with experience consistent with the experience used to calibrate Line 4 experience.

Rows 12-14 – Increasing/Decreasing the Number of Size/Diversification Segments.

The base analysis uses 30 size/diversification segments, 5 size bands (A-E) and 6 diversification bands (0-5). Rows 12-14 show the indicated MDC based on alternative segmentations, using more (110) or fewer (6 or 1) segments. The results are summarized below in Table 6-7 (excerpted from Table 6-1).

[59] The modelled risk in the calibration uses the Line 4 risk factors. If the modeled all-lines risk charge increases, the indicated diversification credit will increase to "offset" that. The increase in indicated diversification credit is reflected as an increase in indicated MDC.

[60] In the August 30, 2023, Report 2, Table 1.1A, page 7, we show that the 2022 and indicated average Line 4 Factors are 0.950 and 0.934, respectively, corresponding to risk charges, before IIA, of 22.0% and 20.4%, using industry all-lines average expense ratio of 27.0%.

[61] In the August 30, 2023, Report 2, Table 1.1B, page 8, we show that the 2022 and indicated average Line 4 Factors, before IIAs, are 0.365 and 0.385, respectively.

Table 6-7
Number of Size/Diversification Segments

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						Indicated MDC	
Row #	Label	Size/Div Cells	Segments	Data-AS/RBC	Expense Data	Premium	Reserves
1.1	Unweighted Indicated I	UnWtd C3.E5	5x6	AS only	Industry	45%	66%
12	110 Segments	UnWtd E5.J10	10x11	AS only	Industry	46%	67%
13	6 Segments	UnWtd Div 3-5; Size >A	5x6	AS only	Industry	42%	54%
14	1 Segment	Ex A/Ex 0	1x1	AS only	Industry	48%	64%

Note: We compare rows 12-14 to row 1.1, rather than row 1, because we have the alternative segmented data on an unweighted basis only.

Row 12: 110 Segments

Row 12 shows the indicated MDC using a more detailed set of 110 cells: 10 size bands segments (A-J), each containing 10% of the companies/years, and 11 diversification bands (0-10), including one for monoline company/years and 10 for multi-line company/years, each containing 10% of the multiline companies.

Row 12 is the indicated MDC using the unweighted average of indicated MDCs for the six largest size bands (E through J) and the six most diversified diversification bands (bands 5 through 10), E5-J10, with each band equally weighted. Compared with the indicated MDC from the unweighted 30-segment average in row 2, the differences are small: 46% versus 45% for premium and 66% versus 67% for reserves.

Row 13: Six segments

Row 13 shows the MDC indicated using fewer segments, specifically one size band (including all companies larger than the smallest 20%) and six diversification bands (0-5), one band for monoline companies and 5 additional bands, each containing 20% of the multiline companies.

Row 13 is the indicated MDC based on the unweighted average of indicated MDCs for diversification bands 3-5, each in one size band, B-E combined.

This more aggregated approach results in lower MDCs, 42% versus 45% for premium and 54% versus 66% for reserves. This 6-segment design includes more smaller companies (Size B), one factor contributing to the lower indicated MDC.

Row 14: One segment

Row 14 shows the MDC indicated using a single broad segment: one size band (excluding the smallest 20%), and all multiline companies (i.e., excluding monoline companies). Compared to cells C3-E5 from the 30-segment approach, this segment includes:

- More smaller companies (Size B), which tends to reduce the MDC, and
- More specialized companies (diversification bands 1-2), which tend to increase the indicated MDC.

Compared to the unweighted 30-segment indicated MDC in row 2, this yields 48% versus 45% for premium and 59% versus 66% for reserves.

Row 15 – Company All-Line Expenses (Premium Risk Only)

Row 15 uses company-specific all-lines expense ratios[62] instead of industry LOB expense ratios weighted by each company's NEP by LOB (as in row 1). Using company-specific expenses aligns more closely with how the RBC Formula is applied.

Table 6-8
Indicated MDC with Industry versus Company-Specific Expenses

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						Indicated MDC	
Row #	Label	Size/Div Cells	Segments	Data-AS/RBC	Expense Data	Premium	Reserves
1	Base indicated MDC	Wtd C3.E5	5x6	AS only	Industry	46%	66%
15	Co Expense	Wtd C3.E5	5x6	AS only	Co	46%	NA

Table 6-8 above shows that this simplification did not significantly affect the indicated MDC.

The comparison may understate the true effect of the expense simplification. For some company/years, we were unable to construct pooled company-specific expenses that matched the risk data. In those cases, we defaulted to 2017 industry expense ratio data, weighted by company/year LOB premium.

Row 16 – DCWP Analysis Using Data Through 2010.

Row 16 compares the indicated MDCs to the prior DCWP analysis based on data through 2010.[63]

Table 6-9
Comparison of Indicated MDC to Prior DCWP Analysis with 2010 Data

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						Indicated MDC	
Row #	Label	Size/Div Cells	Segments	Data-AS/RBC	Expense Data	Premium	Reserves
1.1	Unweighted Indicated I	UnWtd C3.E5	5x6	AS only	Industry	45%	66%
16	DCWP 2010 data	UnWtd C3.E5	5x6	AS+RBC	Industry	54%	70%

Note: We compare row 16 to row 1.1, rather than row 1, because the DCWP data is provided on an unweighted basis only.

[62] From company-by-company Insurance Expense Exhibit data.

[63] Report 14 - Calibration of LOB Diversification in Underwriting Risk Charges.

Compared to this analysis, the DCWP analysis:

- Used fewer AYs/reserve years[64]
- Included less mature data for overlapping years
- Excluded LOBs categorized as minor lines, immature AYs/reserve years, and new LOBs that are included in this analysis
- Used a simpler pooling approach.

These data and methodological differences may explain part of the difference in indicated MDCs in this analysis compared to the DCWP analysis.

[64] Considering the years of experience alone, the current analysis using data from 1988-2010 indicated a premium MDC of 39% (versus 54% from the DCWP analysis) and a reserve MDC of 60% (versus 70% from the DCWP analysis).

7. ADDITIONAL CONSIDERATIONS

In addition to the quantitative analysis above, we note the following factors that we do not quantify in this Report:

1. Catastrophe experience and its effect on diversification
2. Apply IIA before or after the diversification credit
3. Effect of Changes in Interest/Inflation Rates
4. Alternative diversification metrics
5. Calibration safety levels

Catastrophe Experience (Premium Risk Only)

Catastrophe Treatment in RBC Formula

In the original RBC Formula, Net Written Premium on PR018 included both catastrophe and non-catastrophe risk. Beginning with year-end 2017 reporting, the RBC Formula introduced a new risk component, R_{CAT}, which covers the earthquake and hurricane components of the total premium risk. The catastrophe risk charge is calculated in RBC form PR027, and companies report their hurricane and earthquake loss experience data in their confidential RBC Filings in forms PR101, PR102, …, and PR122, one form for each LOB.

With the introduction of R_{CAT}, the otherwise applicable Line 4 risk factors in PR018 were reduced to exclude the portion of RBC attributable to those catastrophe risks. For simplicity, we will refer to the remaining premium risk element in PR018 as the non-catastrophe premium risk, although some catastrophe risks, such as wildfires, severe convective storms, and floods, remain in the non-catastrophe data.

Catastrophe Treatment in PCF Calibration

Our analysis of the PCF uses AS data that includes both catastrophe and non-catastrophe experience. Ideally, a diversification analysis would evaluate catastrophe and non-catastrophe experience separately. However, our ability to do so is limited in two respects.

- First, separate catastrophe experience has only been collected in RBC Filings for AYs since 2004[65]— i.e., for only 14 of the 30 years in our analysis.
- Second, the catastrophe experience is available only in confidential RBC Filings, and therefore accessible only to regulators, and not to this Committee, except in a summarized form.

The impact on the indicated MDC of separately considering catastrophe experience and non-catastrophe experience is uncertain. On one hand, catastrophe claims create a correlation between experience across catastrophe-exposed LOBs, which reduces the diversification apparent in our

[65] Accident Year 2004 catastrophe experience in the ten accident years provided in the 2013 RBC filings that contained catastrophe experience on an information basis only.

data and in the indicated MDC. On the other hand, catastrophes may reduce correlation between catastrophe exposed and non-catastrophe exposed LOBs and therefore may increase the diversification apparent in our data and in the indicated MDC.

Moreover, the impact of catastrophes on diversification across catastrophe-exposed LOBs and other LOBs depends on other variables. For example, there may be correlations across LOBs due to market pricing cycles related to catastrophes.

An evaluation of this issue is a matter for future research.

Apply PCF/LCF before or after IIA

The indicated diversification credit is **calibrated** based on LR and RRR data on a **nominal** value (NV) basis, not on a present value (PV) basis.

In the RBC Formula, the diversification credit is implemented through the PCF/LCF, which equals 1.0 – diversification credit. The PCF/LCF credit is **applied** to premium/reserve risk on RBC PR0017and PR0018 risk **after** the IIA discount, i.e., on a **PV basis**.

If the PCF/LCF credit were applied to the risk charge **before** the IIA, the effect of the diversification credit would be larger.

Table 7-1 Part A, below, shows the risk charge calculation with the current method.

Table 7-1A – IIA applied before PCF/LCF – Current Method

Part A -Diversification - Current Method				
Row	Item	Premium	Reserve	Notes
1	Line 4	0.934	0.385	Industry all-line-weighted average
2	IIA	0.927	0.872	Industry all-line-weighted average
3	Expense Ratio	0.270	NA	Industry all-line-weighted average
4	Diversification Credit	0.150	0.150	Industry all-line weighted average
5	PCF/LCF	0.850	0.850	1.0-(4)
6	Risk Charge Before IIA Before Div	0.204	0.385	Note 1
7	Risk Charge After IIA Before Div	0.136	0.208	Note 2
8	Risk Charge After IIA and After Div	0.115	0.177	(6)*(5)
9	Div Credit-% Rsv/Prem	0.020	0.031	(6)-(7)

Values in the Premium and Reserve columns are factors to apply to premium or reserves, respectively.

Note 1: Premium Risk row (5)=(1)+(3) -1.0; Reserve Risk: (5)=row 1.

Note 2: Premium Risk row (5)=(1)*(2)+(3)-1.0; Reserve Risk: (6)=(1.0+(1))*(2)-1.0.

We display rounded values, but we calculate with unrounded values. Therefore, calculations using the rounded values shown may not exactly reproduce the displayed rounded results.

This rounding feature applies to all Tables and Exhibits in this Report.

Table 7-1 Part B, below, shows the risk charge calculation with the alternative method.

Table 7-1B – IIA applied after Diversification – Alternative Method

Part B -Diversification - Apply Diversification Before IIA				
Row	Item	Premium	Reserve	Notes
1	Line 4	0.934	0.385	Industry all-line-weighted average
2	IIA	0.927	0.872	Industry all-line-weighted average
3	Expense Ratio	0.270	NA	Industry all-line-weighted average
4	Diversification Credit	0.150	0.150	Industry all-line weighted average
5	PCF/LCF	0.850	0.850	1.0-(4)
6	Risk Charge Before IIA Before Div	0.204	0.385	Note 1
7	Risk Charge Before IIA After Div	0.173	0.327	(4)*(5)
8	Risk Charge After IIA and After Div	0.107	0.157	Note 2
9	Div Credit as % Rsv/Prem	0.028	0.050	Part A Row 6 - (8)

Values in the Premium and Reserve columns are factors to apply to premium or reserves, respectively.

Note 1: Premium Risk row (5)=(1)+(3) -1.0; Reserve Risk: (5)=row 1.

Note 2: Premium Risk row (5)=(1)*(2)+(3)-1.0; Reserve Risk: (6)=(1.0+(1))*(2)-1.0.

Rows 1-6 in Part B are the same as in Part A. In row 7, we apply the PCF/LCF credit to the risk charge before applying the IIA (shown in row 6). This differs from Part A, the current method, where the PCF/LCF credit is applied after the IIA. Row 8 shows the risk charge after applying both the IIA and the diversification credit with the alternative method.

In row 9, we show the diversification credit as the difference between:

- The risk charge after IIA and before diversification – Part A row 6, and
- The risk charge after IIA and after diversification, alternative method – Part B row 8.

Table 7-1 Part C, below, compares parts A and B. It shows that with the alternative method, the diversification credit is significantly larger, e.g., 39% larger, for premium risk and 62% larger for reserve risk. As a result, the risk charge is 6.9% lower for premium risk and 10.9% lower for reserve risk, expressed as percentages of the risk charge.

Table 7-1C – Comparison IIA applied before or after Diversification

Part C- Change in RBC UW Risk Value - Alternative Methods				
Row	Item	Premium	Reserve	Notes
1	% Diversification Credit	39%	62%	Part B row 9 / Part A row 9
2	% Risk Charge	-6.9%	-10.9%	Part B row 8 / Part A row 8
3	% Reserve/Premium	-0.8%	-1.9%	Part B row 8 - Part A row 8

Appendix 2 analyzes the details that explain why the order of operations produces this difference.

Effect of Changes in Interest Rate/Inflation Environment

Report 2 showed that there is an interaction between Line 4 risk factors and interest rates. It evaluated the indicated risk factors on a present value (PV) basis, and in that way, it produced the indicated Line 4 and IIAs that consider this interaction.

In this Report, we calibrate the diversification credit using LR and RRRs on a nominal value (NV) basis, rather than a present value (PV) basis.

On one hand,

- The Modeled Risk calculation in the MDC calibration uses the Line 4 Factors, NV factors, reflecting the changes in interest/inflation rates over the 1988-2017 (2016) time period, and
- We observe that the indicated MDCs are lower in the earlier periods when interest/inflation rates are higher, and the indicated MDCs are higher in the current periods when interest/inflation rates are lower. The indicated MDC represents experience across both periods.[66]

From that perspective, there is reason to expect that the NV calculation of MDC is reasonable.

On the other hand,

- More complex relationships might exist between MDC and interest/inflation rates, and the current analysis might not reflect those relationships. An analysis of MDC on PV value could explore that possibility.
- The PV analysis would reduce the proportion of risk from long-tail LOBs, compared to shorter-tail LOBs, which might affect the indicated MDC.

We have not done a PV analysis for this Report, and it remains a matter for future research.

Diversification Metrics

In this report:

- We calculate the indicated MDC to produce a total LOB diversification credit that is consistent with the loss experience.
- We test the extent to which the CoMaxLine% allocation of diversification credit by company is consistent with loss experience.

[66] Specifically, the inflation and interest rates in the earlier 1988-2002 time period were higher than in the more recent years, 2003-2017 (2016). Higher interest rates produce higher LRs and higher RRRs, and therefore higher indicated risk charges. The indicated MDCs adjust for that by increasing the average Line 4 Factor in Modeled Risk in the earlier periods, compared to the overall average. The MDC reflects the difference in Observed Risk by size/diversification after removing this difference in overall risk level.

We did not test alternatives to the CoMaxLine% approach, because:

- Our calibration of the indicated MDC established the appropriate total level of LOB diversification credit in the RBC Formula, which is largely independent of the diversification formula.
- Based on our review of DCWP Reports 13 and 14,[67] we conclude that:
    - The company-by-company impact of alternative formulas is not generally large.
    - The potential additional accuracy of a revision is not large compared to the effect of the overall change indicated by this report.
    - The theoretical case for making a change is not compelling, especially in light of the two points above.

Appendix 3 presents our review of the DCWP findings.

Nonetheless, a review of the dependency formula is appropriate for the future.

Calibration Safety Level

There is no explicit overall safety level target for the CAL level in the P&C RBC Formula. Nonetheless, we understand that the prevailing regulatory view is that the implicit safety level has produced satisfactory results.

Impact on Safety Level-Revised MDC

Within the overall CAL, the Line 4 premium and reserve risk factors and the MDC are calibrated to a safety level of 87.5% with a runoff time horizon. This 87.5th percentile/runoff time frame safety level for premium and reserve risk is implicit in the original calibration[68] and has been retained for reasons including the regulatory view that the premium and reserve risk components and the overall effect of the RBC Formula are satisfactory.

The indicated MDCs presented in this report are larger than the MDC in the RBC Formula. This implies that the current RBC Formula incorporates some conservatism in the underwriting risk elements, relative to the 87.5th percentile safety level. Thus, even though the Line 4 Factors are calibrated at the 87.5th percentile, the Line 4 Factors combined with the conservative MDCs produced a safety level higher than the 87.5th percentile.

Adopting the indicated MDC in the RBC Formula reduces the safety level for R4 and R5, and therefore CAL.

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[67] DCWP Report 13 - RBC LOB Diversification: Current RBC Approach vs. Correlation Matrix Approach, DCWP Report 14 - Calibration of LOB Diversification in Underwriting Risk Charges

DCWP work was based on data through December 2010.

[68] American Academy of Actuaries, Property and Casualty Risk-Based Capital Underwriting Factors and Investment Income Adjustment Factors, Pages 57-58.

Impact on Safety Level-Past Formula Changes

Since the implementation of the RBC Formula, several changes have been made that increased the implied safety level (e.g., R_{CAT} set at the 1-in-100 safety level and the addition of the operational risk charge at 3% of RBC).

There have also been changes that have decreased it (e.g., reduced fixed income risk charges for assets and reduced reinsurance credit risk charges).

Each of these changes may make the RBC Formula more accurate in assessing a particular risk. However, any significant change to any element of the RBC Formula implies a potential change in the implied safety level.

Observation

Any change in the RBC Formula implies a judgment that the resulting overall impact on the CAL safety level is appropriate, and whether a reduction (or increase) in one area requires a corresponding increase (or decrease) in another area to achieve the desired overall level.

We do not measure the safety level impact of adopting the indicated MDCs on R4, R5, or CAL, nor do we determine whether the total ACL is appropriate for regulatory purposes. That is beyond the scope of this Report.

8. SUMMARY OF FINDINGS

The scope of this Report is to examine the CoMaxLine% approach as applied in the RBC Formula. In that context, the committee findings are:

Finding 1:
Based on the above analysis, the committee believes that MDCs of 45% for premium and 65% for reserves are reasonable selections and are better supported by the data than the current 30% MDC. We refer to these as the indicated MDCs.

There are reasonable alternative MDC selections, which we discuss in Section 3 and Section 6/Sensitivity Analysis.

Finding 2:
While the linear relationship between diversification credit and CoMaxLine% is not exact, considering the alternatives, the Committee believes it is a reasonable approximation, especially for more diversified companies.

Finding 3:
We recommend further research on alternatives to the current RBC diversification approach, particularly the method we refer to as CoMaxLine%-Risk, which measures diversification by risk by LOB rather than dollars of premium/reserve.

Finding 4:
The treatment of the IIA/Diversification interaction and the effect of a fully PV analysis are matters for future research.

Finding 5:
Other areas of future research for dependency analyses that we identify in this Report are the following:

Calibration net of cats covered by R-Cat
Resolving issues in combining RBC and AS data
Within the CoMaxLine% approach, or any alternative, test square, square root, or other relationships between diversification index and diversification credit, rather than the current linear relationship.

9. Appendix 1 – Size-adjusted Indicated MDC Calculations

In Section 6, Sensitivity Analysis, Table 6-1, row 2, we present the indicated MDCs that would result if the risk factors in Line 4 varied by company-size, specifically 42% and 56% for premium and reserve risk, respectively.

This Appendix presents the derivation of those results.

Variation in Risk by Company-size

In Exhibits A1-1A and A1-1B, below, we calculate adjustments to the all-lines premium and reserve risk factors that reflect company-size.

Part 1 of Appendix 1- Exhibit A1-1A, below, is a copy of Table 5-2A, Part 1.[69] It shows the 87.5th percentile AYUL for each size and diversification cell. We refer to this as the observed risk. The values in the column "All ex A" are the observed risk values for all company-sizes larger than A (i.e., company-sizes B-E), for each diversification level.[70]

Part 2 shows the ratio of each cell to the value in the column "labeled "All ex A," in the corresponding row. For example:

- The value 2.273 in the cell with diversification 0 and size A equals 0.700/0.308. The value 2.273 means that the observed risk for cell A/0 is 2.273 times larger than the observed risk for size cells B-E.
- The value 0.910 in the cell with diversification 5 and size E equals 0.139/0.153. The value 0.910 means that the observed risk for cell E5 is 0.910 times (9% less than) the observed risk for size cells B-E.

Looking across columns, in any row, these ratios generally decline (indicating lower risk) as company-size increases. This is consistent with our expectation that the risk level decreases with increasing company-size, while holding the diversification level constant.

Part 3 shows the unweighted average observed risk in Part 2 for diversification bands 3-5[71] (down each column), for each size level, A-E.

We use these ratios to create size-adjusted all-line average Line 4 Factors.

[69] Tables 5-2A and B show the values as rounded percentages. This table shows the values as three-decimal ratios.

[70] We exclude company-size A, which consists of the data points with the smallest 20th percentile of company-size because that corresponds, approximately, to the Line 4 calibration that excludes the smallest 15th percentile of LOB-size, for the reasons we discuss in Section 5.

[71] We use diversification 3-5 because, as we discussion in Section 5, those are the diversification bands we use in the MDC calibration.

Appendix 1 – Exhibit A1-1A
Premium Risk
(Corresponding to Table 5-2A-Part 1)

Part 1 - Observed AYUL (87.5th percentile)							
Div/Size	A	B	C	D	E	All	All ex A
0	0.700	0.316	0.259	0.270	0.388	0.400	0.308
1	0.675	0.269	0.294	0.255	0.277	0.312	0.271
2	0.477	0.264	0.215	0.178	0.177	0.236	0.204
3	0.521	0.212	0.181	0.178	0.160	0.213	0.181
4	0.450	0.182	0.165	0.163	0.139	0.175	0.157
5	0.833	0.243	0.154	0.158	0.139	0.159	0.153
All	0.623	0.259	0.216	0.189	0.179	0.251	0.206
All ex 0	0.565	0.235	0.205	0.179	0.156	0.213	0.187

Part 2 - Observed AYUL (87.5th percentile) / All ex A							
Div/Size	A	B	C	D	E	All	All ex A
0	2.273	1.027	0.841	0.877	1.259	1.299	1.000
1	2.490	0.992	1.086	0.939	1.023	1.152	1.000
2	2.333	1.290	1.053	0.870	0.863	1.156	1.000
3	2.883	1.172	1.000	0.987	0.887	1.180	1.000
4	2.857	1.155	1.045	1.037	0.884	1.112	1.000
5	5.453	1.591	1.007	1.032	0.910	1.041	1.000
All	3.031	1.262	1.050	0.920	0.870	1.218	1.000
All ex 0	3.022	1.257	1.096	0.957	0.835	1.136	1.000

Part 3 - Size Adjustment for Premium Risk					
SizeBand	A	B	C	D	E
Div 3-5	3.731	1.306	1.017	1.019	0.893

We apply the same method to reserve risk.

Appendix 1 – Exhibit A1-1B
Reserve Risk
(Corresponding to Table 5-2B-Part 1)

Part 1 - Observed Reserve Development (87.5th percentile)							
Div/Size	A	B	C	D	E	All	All ex A
0	0.582	0.411	0.278	0.245	0.177	0.371	0.291
1	0.500	0.529	0.241	0.227	0.154	0.298	0.274
2	0.531	0.422	0.281	0.208	0.128	0.277	0.247
3	0.566	0.412	0.312	0.246	0.185	0.310	0.278
4	0.490	0.415	0.329	0.266	0.254	0.323	0.301
5	0.750	0.362	0.297	0.259	0.251	0.280	0.269
All	0.561	0.428	0.282	0.245	0.209	0.315	0.277
All ex 0	0.542	0.432	0.285	0.245	0.212	0.298	0.274

Part 2 - Observed Reserve Development (87.5th percentile) / All ex A							
Div/Size	A	B	C	D	E	All	All ex A
0	2.001	1.412	0.957	0.843	0.608	1.275	1.000
1	1.822	1.929	0.879	0.826	0.563	1.087	1.000
2	2.144	1.704	1.134	0.842	0.517	1.119	1.000
3	2.034	1.483	1.123	0.886	0.663	1.113	1.000
4	1.628	1.378	1.093	0.881	0.843	1.071	1.000
5	2.791	1.347	1.106	0.963	0.934	1.042	1.000
All	2.024	1.544	1.019	0.885	0.755	1.138	1.000
All ex 0	1.977	1.576	1.041	0.895	0.773	1.087	1.000

Part 3 - Size Adjustment for Reserve Risk					
SizeBand	A	B	C	D	E
Div 3-5	2.151	1.402	1.107	0.910	0.813

Size-Adjusted Indicated MDC

Appendix 1, Exhibit A1-2A and A1-2B, below, corresponds to Tables 5-2A and 5-2B.

- Part 1 Observed Risk and Part 4 Calculated Diversification have values equal to those in Tables 5-2A and 5-2B, Parts 1 and 4.
- Part 2 Modeled Risk values equal the Part 2 values from Tables 5-2A and 5-2B times the size adjustment factors in Exhibit A1-1A and A1-1B Part 3.[72]
- Parts 3 and 5 are calculated with the formulas shown at the bottom of those sections.

[72] More precisely, for premium risk we multiply the Line 4 risk factor by the Part 3 value and combine that with the company expense ratio to produce the adjusted modeled risk. For reserve risk we multiply the Line 4 risk factor by the Part 3 value.

Appendix 1 – Exhibit A1-2A – Premium Risk
Size-adjusted
Indicated MDC by Size/Diversification (5x6 Analysis)
(Corresponding to Table 5-2A-Parts 1-5)

Divers Band Quintiles	Observed Risk (Part 1) Size Band Quintiles (adj B-E) A	B	C	D	E	AllSize > 20%
0	70%	32%	26%	27%	39%	31%
1	67%	27%	29%	25%	28%	27%
2	48%	26%	22%	18%	18%	20%
3	52%	21%	18%	18%	16%	18%
4	45%	18%	16%	16%	14%	16%
5	83%	24%	15%	16%	14%	15%
All	62%	26%	22%	19%	18%	21%
All ex 0	57%	24%	21%	18%	16%	19%
	C3-E5 Unweighted	16.0%	Weighted	15.7%		

Divers Band Quintiles	Modeled Risk No Diversification (Part 2) Size Band Quintiles (adj B-E) A	B	C	D	E	AllSize > 20%
0%	114%	42%	36%	47%	56%	40%
100%	92%	36%	30%	33%	32%	30%
200%	78%	30%	22%	23%	21%	23%
3	73%	28%	21%	21%	20%	21%
4	80%	28%	22%	22%	20%	22%
5	82%	27%	21%	21%	20%	22%
All	97%	34%	26%	27%	25%	26%
All ex 0	81%	30%	23%	24%	21%	23%
	C3-E5 Unweighted	20.8%	Weighted	20.7%		

Divers Band Quintiles	Indicated Diversification Credit (Part 3) Size Band Quintiles (adj B-E) A	B	C	D	E	AllSize > 20%
0	39%	25%	29%	43%	31%	23%
1	27%	25%	1%	23%	12%	11%
2	38%	11%	2%	24%	14%	9%
3	28%	25%	13%	15%	20%	15%
4	44%	35%	24%	25%	29%	27%
5	-1%	11%	27%	26%	30%	29%
All	36%	23%	16%	30%	28%	22%
All ex 0	30%	22%	12%	25%	26%	20%
	C3-E5 Unweighted	23.3%	Weighted	24.2%		

(Part 3) = 1 - (Part 1)/(Part 2)

Divers Band Quintiles	Calculated Diversification Credit (Part 4) Size Band Quintiles A	B	C	D	E	AllSize > 20%
0%	0%	0%	0%	0%	0%	0%
100%	2%	2%	2%	2%	2%	2%
2	8%	8%	8%	8%	8%	8%
3	12%	12%	12%	13%	13%	13%
4	16%	16%	16%	16%	17%	16%
5	20%	21%	21%	21%	22%	21%
All	5%	7%	9%	11%	14%	10%
All ex 0	9%	10%	11%	12%	15%	12%
	C3-E5 Unweighted	16.6%	Weighted	17.2%		

(Part 4) = 1 - Diversification Credit Calculated (Current RBC)

Divers Band Quintiles	Indicated Max Diversification Credit (Part 5) Size Band Quintiles A	B	C	D	E	AllSize > 20%
0						
1	405%	404%	12%	351%	197%	178%
2	148%	42%	9%	91%	53%	35%
3	68%	59%	31%	37%	47%	35%
4	83%	65%	44%	47%	53%	50%
5	-1%	16%	39%	38%	41%	41%
All	229%	100%	56%	84%	60%	66%
All ex 0	100%	65%	34%	61%	51%	48%
	C3-E5 Unweighted	42.0%	Weighted	42.0%		
	StdDev	6.3%	StdDev	6.1%		

(Part 5) = 0.30 * (Part 3)/(Part 4)

Appendix 1 – Exhibit A1-2B – Reserve Risk
Size-adjusted
Indicated MDC by Size/Diversification (5x6 Analysis)
(Corresponding to Table 5-2B-Parts 1-5)

Divers Band Quintiles	Observed Risk (Part 1) Size Band Quintiles (adj B-E) A	B	C	D	E	AllSize > 20%
0	58%	41%	28%	25%	18%	29%
1	50%	53%	24%	23%	15%	27%
2	53%	42%	28%	21%	13%	25%
3	57%	41%	31%	25%	18%	28%
4	49%	42%	33%	27%	25%	30%
5	75%	36%	30%	26%	25%	27%
All	56%	43%	28%	25%	21%	28%
All ex 0	54%	43%	29%	25%	21%	27%
	C3-E5 Unweighted	26.7%	Weighted	26.4%		

Divers Band Quintiles	Modeled Risk No Diversification (Part 2) Size Band Quintiles (adj B-E) A	B	C	D	E	AllSize > 20%
0%	71%	50%	39%	34%	26%	40%
100%	62%	41%	32%	27%	25%	30%
200%	63%	43%	33%	29%	25%	23%
3	70%	47%	38%	33%	32%	21%
4	74%	50%	41%	35%	34%	22%
5	81%	50%	43%	35%	34%	22%
All	70%	47%	37%	32%	30%	26%
All ex 0	68%	45%	37%	32%	31%	23%
	C3-E5 Unweighted	35.9%	Weighted	35.5%		

Divers Band Quintiles	Indicated Diversification Credit (Part 3) Size Band Quintiles (adj B-E) A	B	C	D	E	AllSize > 20%
0	19%	17%	29%	27%	31%	27%
1	19%	-31%	24%	17%	39%	10%
2	16%	3%	16%	28%	49%	-10%
3	19%	12%	17%	24%	42%	-31%
4	34%	17%	19%	24%	26%	-40%
5	7%	28%	30%	25%	26%	-25%
All	20%	9%	25%	23%	31%	-5%
All ex 0	20%	5%	22%	23%	32%	-17%
	C3-E5 Unweighted	26.0%	Weighted	25.9%		

(Part 3) = 1 - (Part 1)/(Part 2)

Divers Band Quintiles	Calculated Concentration Ratio (Part 4) Size Band Quintiles A	B	C	D	E	AllSize > 20%
0%	0%	0%	0%	0%	0%	0%
100%	1%	1%	1%	1%	1%	1%
200%	5%	5%	5%	5%	5%	5%
3	10%	10%	10%	10%	10%	10%
4	14%	14%	14%	14%	14%	14%
5	18%	19%	19%	19%	20%	19%
All	4%	6%	7%	8%	11%	8%
All ex 0	8%	9%	9%	10%	12%	10%
	C3-E5 Unweighted	14.5%	Weighted	15.0%		

(Part 4) = 1 - Diversification Credit Calculated (Current RBC)

Divers Band Quintiles	Indicated Max Diversification Credit (Part 5) Size Band Quintiles A	B	C	D	E	AllSize > 20%
0						
1	452%	-776%	598%	434%	919%	248%
2	98%	17%	100%	174%	307%	-62%
3	57%	36%	53%	75%	127%	-97%
4	72%	35%	40%	50%	53%	-83%
5	11%	45%	48%	39%	40%	-39%
All	151%	45%	108%	82%	86%	-19%
All ex 0	74%	18%	74%	67%	78%	-52%
	C3-E5 Unweighted	58.5%	Weighted	56.2%		
	StdDev	26.4%	StdDev	25.2%		

(Part 5) = 0.30 * (Part 3)/(Part 4)

Appendix 1- Exhibit A1-3, below, shows the size-adjusted indicated MDCs from Exhibit A1-2A and 2B, and compares them to the unadjusted results in Table 5-2A and 5-2B.

Appendix 1 – Exhibit A1-3
Indicated MDCs

Size Adjustment = NO	Premium	Reserves
C3-E5 Wtd Average	45.9%	66.3%
C3-E5 Standard Deviation	12.9%	37.5%
Size Adjustment = YES	**Premium**	**Reserves**
C3-E5 Wtd Average	42.0%	56.2%
C3-E5 Standard Deviation	6.1%	25.2%

The size-adjustment reduces the indicated MDCs, and it also decreases variability among the C3—E5 MDC indications, as measured by the standard deviation. It also narrows the difference between the premium risk indicated MDC and the reserve risk indicated MDC.

The size-adjusted indications still suggest MDCs larger than the current 30%.

Regression Analysis

In Appendix 1, Exhibits A1-4 and A1-5 below, we repeat the regression analysis from Section 5, applied to size-adjusted risk data in Exhibit A1-2A and 2B.

Appendix 1 – Exhibit A1-4
Large Diversified Companies (with Size-Adjusted Risk Factors)
Graphical Analysis of CoMaxLine% Element of Diversification Formula
5 x 6 Analysis; 9 Large Diversified Company Data Points
(Corresponding to Table 5-4, no size adjustment)

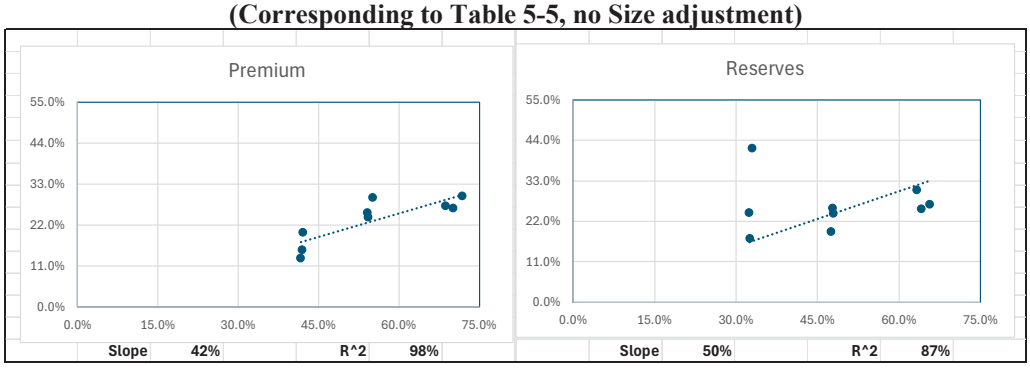
		Premium			Reserves		
		(1)	(2)	(3)	(4)	(5)	(6)
Size Band	Div Band	Average Div Level	Indicated Divers	Fitted Divers	Average Div Level	Indicated Divers	Fitted Divers
C	3	41.6%	13.0%	17.5%	32.5%	17.2%	16.4%
D	3	41.8%	15.4%	17.6%	32.4%	24.2%	16.3%
E	3	42.0%	19.9%	17.6%	32.9%	41.8%	16.5%
C	4	54.2%	23.9%	22.8%	47.5%	19.1%	23.9%
D	4	54.1%	25.3%	22.7%	47.9%	23.9%	24.1%
E	4	55.1%	29.4%	23.1%	47.7%	25.5%	24.0%
C	5	68.7%	27.1%	28.9%	63.2%	30.5%	31.8%
D	5	70.1%	26.4%	29.4%	64.1%	25.3%	32.2%
E	5	71.7%	29.7%	30.1%	65.7%	26.5%	26.5%

The regression data in Exhibit A1-4 is as follows:

- Columns 1 & 4: Average diversification index for premium and reserve risk, respectively (from Exhibits A1-2A and A1-2B, Part 4 divided by 30%).

- Columns 2 & 5: Indicated diversification credit (from Exhibit A1-2A/B, Part 3).
- Columns 3 & 6: Fitted diversification credit, derived from the regression through the origin applied to the prior columns.

Appendix 1 – Exhibit A1-5
Large Diversified Companies (with Size Adjustment)
Graphical Analysis of CoMaxLine% Element of Diversification Formula
5 x 6 Analysis; 9 Large Diversified Company Data Points
(Corresponding to Table 5-5, no Size adjustment)



In Appendix 1 – Exhibit A1-5

- The X-axis represents the average diversification index (Appendix 1-Exhibit A1-4 columns 1 and 4).
- The Y-axis represents the indicated diversification credit (Appendix 1-Exhibit A1-4 columns 2 and 5)
- The slope of the fitted line is 42% for premium risk and 50% for reserve risk.

The regression "R-squared" values[73] are:

- 98% for premium and
- 87% for reserves.
- These indicate a 'better fit' than with the data before size-adjustment.

The slopes serve as alternate estimates of the size-adjusted indicted MDCs shown in Exhibit A1-3, above.

- The premium slope, 42%, is the same as the slope from the C3-E5 cell average, 42%.
- The reserve slope of 50% is not as close to the C3-E5 cell average, 56%.

[73]See footnote 51.

Appendix 2 – Diversification and IIAs

In Section 7, we showed that the risk value depends on the order in which we apply diversification credit and IIA. In this Appendix, we explain how the operation of the IIA produces that effect.

The IIA can be viewed in three parts:

- Part 1 - The investment income credit on the premium less expense[74] /initial carried reserves,
- Part 2 - The investment income credit on the premium/reserve risk charge, and
- Part 3 - The reduction in investment income credit related to the diversification credit.

Part 1 is the investment income on loss reserves and on the expense portion of the premium, before considering risk charges. Parts 2 and 3 are the elements of investment income on the risk charge.

In the current RBC Formula, the investment income adjustment on the diversification credit, Part 3, is, in effect, the average of the investment income credits on parts 1 and 2, as follows:

Assume, for example, for reserves, that the IIA is 0.872 (a 12.8% discount) and the risk charge is 0.385. Then, the first two parts of the investment income credit would be:

- Part 1 – 12.8% of reserves (or premium less expense), and
- Part 2 – 12.8% of the risk charge, 0.385 times reserves 4.9%.

Therefore,

- Part 1 and Part 2 investment income credit combined is 12.8% of the total reserves plus 12.8% of the reserve risk charge.
- That equals 46.0% of the risk charge before IIA (12.8% + 4.9%)/0.385.
- The total investment income credit, 46% of risk charge, is ‘large’ compared to 12.8% because Part 1 of the investment income credit is large compared to the risk charge.

[74] The loss portion of premium, i.e., premium less expenses

Thus, the diversification credit is applied to the risk charge after the 46% reduction for the investment income credit, and therefore, the diversification credit is implicitly reduced by 46%.

The alternative treatment is to reduce the diversification credit by the marginal investment income attributable to the diversification credit alone, i.e., 12.8%, rather than 46%. Using the 12.8% investment income adjustment increases the diversification credit and reduces the risk charge for multi-line companies.

The section below provides a detailed comparison of the alternatives.

Exhibit A2-1/Part A – Current Method – Apply IIA before Diversification Credit

Exhibit A2-1 uses sample values for the Line 4 Factor, the IIA Factor, and the diversification credit to show the investment income treatment under the current and alternative calculations in detail.

Part A, rows 1-4, shows the values for RBC Formula inputs.

Rows 5-7 use the current RBC Formula to calculate risk charges:
(a) Row 5: before IIA and Diversification,
(b) Row 6: after IIA, before diversification, and then
(c) Row 7: after IIA and diversification.

Row 8 displays the diversification credit as a percentage of premium/reserve, calculated as row 6 minus row 7.

Appendix 2 – Exhibit A2-1 – Part A – Current Method
(Values are % of Premium or Reserves)

Part A -Diversification - Current Method				
Row	Item	Premium	Reserve	Notes
1	Line 4	0.934	0.385	Industry all-line-weighted average
2	IIA	0.927	0.872	Industry all-line-weighted average
3	Expense Ratio	0.270	NA	Industry all-line-weighted average
4	Diversification Credit	0.150	0.150	Industry all-line weighted average
5	Risk Charge-Before IIA Before Div	0.204	0.385	Note 1
6	Risk Charge-After IIA Before Div	0.136	0.208	Note 2
7	Risk Charge-After IIA and After Div	0.115	0.177	(6)*(1.0-(4))
8	Div Credit-% Rsv/Prem	0.020	0.031	(6)-(7)

Note 1: Premium Risk row (5)=(1)+(3) -1.0; Reserve Risk: (5)=row 1.

Note 2: Premium Risk row (5)=(1)*(2)+(3)-1.0; Reserve Risk: (6)=(1.0+(1))*(2)-1.0.

We display rounded values, but we calculate with unrounded values. Therefore, calculations using the rounded values shown may not exactly reproduce the displayed rounded results.

This applies to all Tables and Exhibits in this Report.

Exhibit A2-1/Part B – Current Method – Apply IIA Before Diversification Credit

In Part B, we rearrange Part A to explicitly show the interaction between the IIA and diversification credit.

Appendix 2 – Exhibit A2-1 – Part B – Current Method-Details of IIA
(Values are % of Premium or Reserves)

Part B -Diversification - Re-Arrange -Current Method				
Row	Item	Premium	Reserve	Notes
9	Risk Charge-Before IIA or Div	0.204	0.385	(5)
10	IIA Credit Before Div	0.068	0.177	(5)-(6)
11	Div credit before IIA	0.031	0.058	(4)*(9)
12	IIA credit on Div	0.010	0.027	**(4)*(10)**
13	Div credit after IIA	0.020	0.031	(11)-(12)
14	Risk charge-after IIA and Div credits	0.115	0.177	(9)-(10)-(13)

Relative to $100 of reserves, this shows:

Row 9-Reserve risk before IIA or diversification credit is $38.50, row 5.

Row 10-Investment income credit is $17.70 ($38.50 – $20.70, row 5 – row 6).

Row 11-Diversification credit before investment income is $5.80 (15% of $38.50).

Row 12-Investment income credit on diversification credit is 2.70 (15% of 17.70).

$17.70 is based on Part 1 and Part 2 investment income, so this calculation is equivalent to applying the average investment income credit to the diversification portion of the risk charge.

Row 13-Diversification credit net of investment income is $3.10 ($5.80 – $2.70).

Row 14-Risk Charge after IIA and diversification credit is **$17.70**
($38.50 – $17.70 – $3.10).

Exhibit A2-1/Part C – Alternative Method – Apply Diversification Credit Before IIA

Part C shows the alternative treatment of investment income offset:

Appendix 2 – Exhibit A2-1 – Part C – Alternative Method
(Values are % of Premium or Reserves)

Part C -Diversification - Alternative Method				
Row	Item	Premium	Reserve	Notes
15	Risk Charge-Before IIA or Div	0.204	0.385	(5) or (9)
16	IIA Credit Before Div	0.068	0.177	(10) or (5)-(6)
17	Div credit before IIA	0.031	0.058	(11) or (4)*(9)
18	IIA credit on Div	0.002	0.007	**(1-(2)*(17)**
19	Div credit after IIA	0.028	0.050	(17)-(18)
20	Risk charge-after IIA and Div credits	0.107	0.157	(15)-(16)-(19)

Relative to $100 of reserves, this shows:

Row 15-Reserve risk before IIA or diversification credit is $38.50, row 1.
Row 16-Investment income credit is $17.70 (38.50 – 20.70, row 5 – row 6).
Row 17-Diversification credit before investment income is $5.80 (15% of 38.5).
Row 18-Investment income credit on diversification credit is $0.70 (0.128 * $5.8, where 0.128 =1.0 -0.872).
Row 19-Diversification credit net of investment income is $5.10 (5.80 – 0.70)
(5.00 shown on row 19 is calculated from values before rounding.)
Row 20-Risk Charge after IIA and diversification credit is **$15.70** (38.50 – 17.70 – $5.10).

The difference between the methods is presented in the two bold lines, rows 12 and 18.

Row 12, the current method: The diversification credit is reduced by the average investment income effect on the risk charge, yielding an investment income credit of **$2.70**.

Row 18, the alternative method: The diversification credit is reduced by the marginal investment income loss on the diversification credit, which is **$0.70** = (1.0 - 0.872) * $5.80.

- The **$2.00** difference per $100 reserve, $2.70 - $0.70, is a reduction of over 10% of the $17.70 risk charge under the current method.

Exhibit A2-1/Part D – Comparison of the Effect of the Alternative Method

Part D of Exhibit A2-1, below, shows the difference in the methods as percentages of the diversification credit, the risk charge, and the reserve/premium volume.

- Row 21 shows that diversification credit is much larger with the alternative method, 39% larger for premium and 62% larger for reserves.
- Row 22 shows that the effect of the larger diversification credits on the risk charges is a decrease of 6.9% for premium risk and 10.9% for reserve risk.

- Row 23 expresses those effects as a percentage of reserves or premium, a decrease of 0.8% of premium and 1.9% for reserves.

Appendix 2 – Exhibit A2-1 – Part D – Effect of Alternative Method

Part D- Change in RBC UW Risk Value - Alternative Methods				
Row	Item	Premium	Reserve	Notes
21	% Diversification Credit	39%	62%	(19)/(13)
22	% Risk Charge	-6.9%	-10.9%	(20)/(14)-1.0
23	% Reserve/Premium	-0.8%	-1.9%	(20)-(14)

Effect of Alternative Method – Varying Line 4, IIA, and Diversification Credits

Part D, above, illustrates the impact on a specific set of risk factors and diversification levels. The effect of the alternative method depends on the level of diversification, the IIA Factor, and the Line 4 Factor. Exhibits A2-2A and 2B below show further examples for premium risk and reserve risk, respectively.

1. Vary Diversification Credit –with Fixed Line 4 and IIA-Reserve Risk

The first section in Exhibits A2-2A and A2-2B, "Div Credit," illustrates the extent to which the alternative method reduces the risk charge at different levels of diversification credit, for fixed Line 4 and IIA Factors.

The example uses typical Line 4 and IIA Factors, e.g., 0.385 and 0.872 for reserves. We observe that:

- For reserve risk, the impact on the diversification is an increase of 62% regardless of the diversification level.
- Even though the impact on the diversification credit is constant as a percentage of the diversification credit, the impact increases with diversification as a percentage of risk or reserve level. At a high level of diversification, e.g., 25%, the risk charge decreases by 21% with the alternative method.

2. Vary Line 4 Factor - with Fixed IIA and Diversification Credit-Reserve Risk

The "Line 4" section of Exhibit A2-2A illustrates the extent to which the risk charge changes with varied Line 4 Factors and constant IIA and diversification credit:

- The impact is constant as a percentage of premium/reserves, regardless of the Line 4 Factor, 1.1% in this example, for premium.
- The impact is lower with higher Line 4 Factors as a percentage of diversification credit and risk charge.

3. Vary IIA - with Fixed Line 4 and Diversification Credit-Reserve Risk

The "IIA" section of the Exhibit shows that lower IIAs, equivalent to higher investment income, means that the alternative method will have a greater impact, given fixed L4 and diversification credit.

Appendix 2 – Exhibit A2-2A – Premium Risk Impact

Test Variable	Inputs			Impact		
	Line 4	IIA	Div. Credit	% Div Credit	% Risk	% Premium
Div Credit	0.934	0.927	0%	NA	0%	0.0%
	0.934	0.927	5%	39%	-2%	-0.3%
	0.934	0.927	10%	39%	-4%	-0.5%
	0.934	0.927	15%	39%	-7%	-0.8%
	0.934	0.927	25%	39%	-13%	-1.3%
Line 4	0.900	0.900	0.15	91%	-16%	-1.1%
	0.950	0.900	0.15	58%	-10%	-1.1%
	1.000	0.900	0.15	43%	-8%	-1.1%
	1.100	0.900	0.15	28%	-5%	-1.1%
	1.200	0.900	0.15	21%	-4%	-1.1%
IIA	0.934	0.975	0.15	10%	-2%	-0.3%
	0.934	0.872	0.15	111%	-20%	-1.4%

Exhibit A2-2B shows similar examples for reserve risk.

Appendix 2 – Exhibit A2-2B – Reserve Risk Impact

Test Variable	Inputs			Impact		
	Line 4	IIA	Div. Credit	% Div Credit	% Risk	% Reserve
Div Credit	0.385	0.872	0%	NA	0%	0.0%
	0.385	0.872	5%	62%	-3%	-0.6%
	0.385	0.872	10%	62%	-7%	-1.3%
	0.385	0.872	15%	62%	-11%	-1.9%
	0.385	0.872	25%	62%	-21%	-3.2%
Line 4	0.385	0.800	0.15	185%	-33%	-3.0%
	0.400	0.800	0.15	167%	-29%	-3.0%
	0.500	0.800	0.15	100%	-18%	-3.0%
	0.700	0.800	0.15	56%	-10%	-3.0%
	0.900	0.800	0.15	38%	-7%	-3.0%
IIA	0.385	0.950	0.15	16%	-3%	-0.7%
	0.385	0.800	0.15	185%	-33%	-3.0%

Appendix 3 – Alternatives to the CoMaxLine% Approach

In this report, we evaluate the MDC based on the existing CoMaxLine% approach. As part of that work, we reviewed the two 2019 Casualty Actuarial Society (CAS) Dependency and Calibration Working Party (DCWP) reports on alternative diversification formulas.[75]

This Appendix presents our review of the DCWP work.

DCWP evaluated three questions:

1. Meaningful differences – To what extent do different formulas impact the indicated diversification credit by company?

2. Improved accuracy – To what extent is the CoMaxLine% approach a better or worse predictor of indicated diversification credit effects than other formulas?

3. Theoretical considerations – What are the theoretical considerations in selecting among the diversification formulas?

In the next four subsections, we identify the alternative formulas that DCWP considered and discuss DCWP's analysis of those three questions.

Alternative Formulas

Looking at the treatment of diversification in regulatory capital formulas outside the RBC framework, the UK Individual Capital Adequacy Standard[76] (UK ICAS) can be thought of as the simplest. The UK ICAS required capital is called the Enhanced Capital Requirement (ECR).[77] Under the ECR, there is no premium or reserve risk diversification adjustment. Instead, LOB risk factors were selected to represent the LOB risk when combined with a typical LOB distribution.[78]

The CoMaxLine% approach can be viewed as one step more complex than the UK ICAS in that it recognizes different levels of diversification.

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[75]Report 13 - RBC LOB Diversification: Current RBC Approach vs. Correlation Matrix Approach, https://www.casact.org/sites/default/files/2021-02/01_cas-working-party_dependency.pdf, CAS E-Forum Winter 2019

Report 14 - Calibration of LOB Diversification in Underwriting Risk Charges, https://www.casact.org/pubs/forum/19spforum/01_DCWP_Rpt14.pdf, CAS E-Forum Spring 2019

DCWP work was based on data through December 2010.

There were no company-size adjustments in the DCWP work.

[76] Implemented in the UK in the early 2000's before Solvency II.

[77] "Enhanced" because it increase the capital required compared to the EU "Solvency I" regime.

[78] ECR is discussed in https://www.casact.org/sites/default/files/presentation/affiliates_cae_1205_indiv-capital-assessments.pdf, and

https://www.abi.org.uk/globalassets/sitecore/files/documents/consultation-papers/2003/11/cp190.pdf, and

Models, Assessment and Regulation, Arne Sandström, 2006, Taylor & Francis Group, LLC, p 161-164, (no active link)

Correlation Factor Method

Individual company capital models (called 'internal models' in Solvency II) often combine risk charges by LOB using correlation.[79] factors between each pair of LOBs. The Solvency II Standard Formula[80] uses this pairwise Correlation Factor approach.[81]

The Correlation Factor approach, if applied to the RBC Formula, would require 171 parameters, as there are 19 LOBs. By contrast, the CoMaxLine% approach in RBC is simpler--perhaps overly so--and perhaps somewhat ad hoc.

CoMaxLine%-Risk Method

One difference between the CoMaxLine% approach and the Correlation Factor approach is that the degree of diversification in the Correlation Factor approach is based on risk by LOB. In contrast, the degree of diversification in the CoMaxLine% approach is based on volume (premium or reserve amount) by LOB.

Therefore, another alternative to the CoMaxLine% approach is the CoMaxLine%-Risk approach, which applies the CoMaxLine% framework to LOB risk rather than LOB volume, when calculating the LCF and PCF for a company.[82] For clarity, as needed, we refer to the current implementation as CoMaxLine%-Volume and the alternative as CoMaxLine%-Risk.

HHI Method

Finally, the Herfindahl-Hirschman Index (HHI), widely used by economists to measure concentration, considers the relative proportions of all LOBs—not just the largest.[83] HHI is more

[79] We use the term correlation factor approach to describe a factor method or copula method for computing total risk by combining several individual risks. In using the term, we do not intend to imply that the assumptions related to linear correlation are appropriate.

[80] The "Standard Formula" in Solvency II regime is analogous to RBC in that it is a formula that applies to all companies.

[81] Solvency II uses a CoMaxLine% approach to reflect geographic diversification.
DCWP Report 3, CAS E-Forum 2012. "Solvency II Standard Formula and NAIC Risk-Based Capital (RBC)"
https://www.casact.org/sites/default/files/database/forum_12fforumpt2_rbc-dcwprpt3.pdf

[82] For this purpose, LOB reserve risk equals reserve value times reserve risk factor. LOB premium risk equals premium value times premium risk factor plus expenses minus 100%. The PCF and LCF are calculated using LOB-risk rather than LOB-volume. For premium risk, implementation of this method requires expense information by LOB.

[83] HHI equals the sum of the squares of the LOB shares of total. For example, if there is only one LOB, HHI is 1.0, as is the case for the CoMaxLine%. With two lines split 25% and 75% HHI is 0.25^2 plus 0.75^2 or 0.625 compared to the CoMaxLine% of 0.750, i.e., HHI shows more diversification. With three lines split 50%, 25% and 25% HHI is 0.50^2 plus 0.25^2 plus 0.25^2 or 0.375, more diversification than the CoMaxLine% of 0.5. With two lines split 50% and 50% HHI and the CoMaxLine% are both 0.5.

complex than the CoMaxLine% because it reflects diversification across the 2nd, 3rd, 4th, etc., largest LOBs.[84]

Alternatives Considered by DCWP

Thus, the DCWP Reports considered the following alternatives to the CoMaxLine%-Volume approach:

- the Correlation Factor approach,
- the CoMaxLine%-Risk approach, and
- the HHI approaches: HHI-Volume and HHI-Risk.

Meaningful Differences?

For each company filing a 2010 Annual Statement, DCWP calculated the all-lines premium and reserve risk values, using the 2010 RBC Formula, for each company and for each of the five diversification approaches.[85] From these, DCWP computed the combined RBC UW Risk Value for each company.[86]

In the following discussion, we categorize changes in UW Risk Values as:

- Small (<5%)
- Other (≥5% and ≤ 10%)
- Moderate (10-25%)
- Large (>25%)

In comparing any two methods, we select the parameters so that the industry total diversification is the same for both methods.[87]

In our discussion, we focus on the differences we call Small, Moderate and Large.

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[84] The HHI is sometimes applied to only the n-th largest segments, e.g., the degree of diversification among the top ten LOBs. The HHI index applied to the single largest segment would be very similar to the CoMaxLine%. HHI can be written as p_1^2+p_2^2+p_3^2…+p_n^2. The truncated HHI limited to one element would be p_1^2. CoMaxLine% is p_1. HHI is always less than or equal to CoMaxLine%.

While HHI can CoMaxLine% may distribute the diversification credit differently among companies, the total diversification credit depends on MDC-HHI and MDC-CoMaxLine%. Those can be selected to achieve the same total diversification credit.

[85] DCWP Report 13 Appendix 1 describes how DCWP approximated the RBC UW Risk Value using public data.

[86] The RBC UW Risk Value for this purpose equals the square root of (a) the reserve risk value squared plus (b) the premium risk value squared. The reserve risk does not include the portion of reinsurance credit risk that is included in R4.

[87] Using the same total diversification for all methods is appropriate because the indicated total diversification is the ratio of modeled risk value before diversification compared to observed risk value. Those two are the same regardless of the diversification model, to the extent that different methods produce similar size/diversification bands, as the DCWP works showed in plausible. This is the indicated diversification we show in Box 3 of Tables 5-2A and B of this Report.

CoMaxLine% versus Correlation Factor

Applying the correlation approach requires a set of pairwise correlation factors. Calibrating those factors based on experience is a major undertaking, perhaps beyond the limits of available data.

In 2010, Solvency II Standard Formula addressed this problem in calibrating Correlation Factors as follows:[88]

- There were 12 LOBs and, therefore, 66 correlation factors.
- Each of the 66 correlation factors was selected to be either 0.25 or 0.50, based on expert judgment on whether each pair was more or less correlated.

The objective of DCWP work was to compare the CoMaxLine% to the Correlation Factor approach, as applied in a standard formula such as RBC. Therefore, regardless of the limitations of the Solvency II correlation factor calibration, DCWP followed that approach and constructed a set of pairwise correlation factors,[89] selecting values of 25% or 50% for most of the 171 LOB-pairs.

Appendix 3-Exhibit A3-1, below, shows the difference in diversification credit and UW RBC Values identified by DCWP.[90] We discuss the main differences below.

% Change in Diversification Credit (A. Div Credit Impact)

- There are large changes in diversification credit for 48% of companies, but those are concentrated in the least diversified bands.[91] For example, 81% of companies in the least diversified 20% showed large changes, but only 6% of the most diversified 20% did.

% Change in RBC UW Risk Value (B. RBC UW Risk Impact)

- Since companies receiving the large changes in diversification credit had low diversification credit levels, the overall effect on RBC UW Risk Value is small.
    - No companies experienced large changes in RBC UW Risk Value.
    - Only 10% experienced moderate changes—mostly companies in the 40th to 80th percentile diversification bands.

[88] The Solvency II approach to selecting is described in Groupe Consultatif Actuariel Europeen, Diversification, Technical paper, 31 October 2005, pg. 11, and shown in "Advice for Band 2 Implementing Measures on Solvency II: SCR Standard Formula Article 111(d) Correlations," (former Consultation Paper 74), January 2010, pp 39-44, pg. 26.

[89] DCWP modified select pairwise correlations for LOBS possibly highly correlated: 100% between claims-made and occurrence medical malpractice and between general liability, special liability, and products liability; and 75% between special property and homeowners, between private passenger automobile liability and automobile physical damage and between commercial automobile liability and automobile physical damage.

See DCWP Report 13, Appendix 1 for further details on the construction of the DCWP Correlation Matrix.

[90] In comparing CoMaxLine%-Volume to the Correlation Factor method, DCWP used a CoMaxLine%-Volume MDC of 39.1% to produce the same total diversification credit as produced by the selected correlation factors.

[91] The fact that larger differences arise for companies with low diversification is important.

For example, if the diversification credit is 1% of risk, and if the differences between the two methods are 100%, the impact on risk is only 1%.

On the other hand, if the diversification credit is 10% of risk, and if the difference between the two methods is 100% the impact on risk is 10%, 10 times larger.

- Only 3% of the most diversified 20% had changes in the moderate category.
- Across all companies, 69% had changes below 5%.

Appendix 3 – Exhibit A3-1
CoMaxLine%-Volume versus Correlation
% of Multi-Line Companies with Large, Moderate, or Small change in Diversification Credit or UW Risk RBC Value

% Change		A. Div Credit Impact				B. RBC UW Risk Impact				
		All Div band	Least Div 0-20%	Most Div 80-100%		All Div band	Least Div 0-20%	Div 20%-40%	Div 40%-80%	Most Div 80-100%
>25%	Large	48%	81%	6%		0%	0%	0%	0%	0%
>10%	Moderate	71%	90%	28%		10%	2%	6%	20%	3%
<5%	Small	14%	3%	34%		69%	96%	59%	57%	78%

Yellow highlight on the values noted in the discussion above.

CoMaxLine%-Risk versus Correlation Factor[92]

One of the differences between CoMaxLine%-volume and Correlation is the use of premium by LOB versus risk by LOB. To test the extent to which that difference affected the comparison of CoMaxLine% to correlation, DCWP repeated the analysis for CoMaxLine%-Risk versus the Correlation Factor method. Appendix 3-Exhibit A3-2, below, shows the results.

The values in Exhibit A3-2 are lower than the corresponding values in Exhibit A3-1, indicating the CoMaxLine%-Risk is a step "towards" the Correlation Factor method.

Appendix 3 – Exhibit A3-2
CoMaxLine%-Risk versus Correlation
% of Multi-Line Companies with Large, Moderate, or Small change in Diversification Credit or UW Risk RBC Value

% Change		A. Div Credit Impact				B. RBC UW Risk Impact				
		All Div band	Least Div 0-20%	Most Div 80-100%		All Div band	Least Div 0-20%	Div 20%-40%	Div 40%-80%	Most Div 80-100%
>25%	Large	42%	74%	2%		0%	0%	0%	1%	0%
>10%	Moderate	65%	84%	21%		7%	0%	4%	15%	2%
<5%	Small	21%	4%	51%		76%	98%	67%	65%	84%

Yellow highlight on the values noted in the discussion above.

CoMaxLine%-Volume versus HHI-Volume[93]

DCWP found only small differences in RBC UW Risk Value between CoMaxLine%-Volume and HHI-Volume. For more than 97% of companies, the effect is less than 5%. The effect is below 10% for all companies.

[92] In comparing CoMaxLine%-Risk to correlation factor, DCWP used a CoMaxLine%-Risk MDC of 44.4% to produce the same total diversification credit as produced by the selected correlation factors.

[93] In comparing the CoMaxLine% approach to the HHI approach, DCWP used a CoMaxLine% MDC of 37.7% to produce the same total diversification credit as the HHI approach with MDC of 30%.

Accuracy

Subject to random variation, a perfect diversification model would result in a uniform indicated total diversification credit,[94] across the 9 cells (C3-E5) in Table 5-3.[95]

To measure accuracy, DCWP calculated the standard deviation and the absolute difference ("absolute error") in MDC values across the 9 cells, around the average for those 9 cells, for each of four methods. Appendix 3-Exhibit A3-2, below, shows these absolute error results.

For premium risk, CoMaxLine%-Risk has the lowest error. For reserve risk, the Correlation Factor approach has the lowest error. The differences in error measures between the "best" and worst" methods are as follows:

- 0.7% of premium between the best and worst approaches for premium risk,
  (0.9% CoMaxLine%-Risk best versus 1.6% Correlation Factor worst)
- 1.0% of reserves between the best and worst approaches for reserve risk.
  (1.9% for Correlation Factor, the best, versus 2.9% for CoMaxLine%-Volume, the worst)

Appendix 3 – Exhibit A3-3[96]
Absolute Error as a Percentage of Reserves or Premium (C3-E5)

Dependency Method	Premium	Reserves
CoMaxLine%-Volume	1.1%	2.9%
Correlation	1.6%	1.9%
HHI-volume	1.1%	2.1%
CoMaxLine%-Risk	0.9%	2.3%

Yellow highlight for the smallest absolute error among these methods.

These differences are approximately 5% of premium and reserve risk,[97] which is not large considering that:

- The errors represent a reallocation of the overall diversification credit rather than a change in the overall diversification level; and
- The effect is smaller than the impact of adopting the indicated MDCs, which would reduce premium risk values by 10% and reserve risk values by 20%.

Theoretical Considerations – Correlation Factor Approach

The Correlation Factor approach is commonly applied in individual company economic capital models. However, the underlying assumptions do not translate well to standard formulas such as the RBC Formula, as we explain below.

[94] Represented as a constant indicated MDC for CoMaxLine% approaches. Represented as a constant indicated change in the average level in the Correlation Factor approach.

[95] Table 5-3 is a copy of Part 5 of Tables A5-2A and A5-2B.

[96] DCWP Report 14, Table 4-2. Highlight added for emphasis.

[97] Average indicated risk charges, after IIA, before diversification and before growth risk or loss-sensitive contracts is 13.5% for premium and 20.2% for reserves (from Report 2, Table 1-1).

Individual Company Capital Model Calibration: Grounded in Risk Theory

In an individual company capital model (ICCM), each LOB has a company-specific risk distribution, reflecting its underwriting, claims, reinsurance, and other practices. To produce the all-lines risk distribution, these company-specific LOB risk distributions are aggregated using empirically-derived or expert judgment-based correlations.

RBC Calibration: Grounded in Risk Classification

Unlike the ICCM, the RBC Formula is calibrated from, and applies to, a heterogeneous population of insurers. The ICCM risk correlation assumptions do not apply.

Variation in Risk within LOB

Consider Company 1A (writing LOB A), Company 1B (writing LOB B), and Company 2 (writing LOBs A and B). Company 2 is more diversified than either Company 1A or Company 1B. Risk theory suggests that the risk charge for Company 2 should be lower than the sum of the risk charges for Company 1A plus Company 1B, depending on the degree of correlation between the LOBs.

However, that expectation assumes that the risk distributions for LOBs A and B in Companies 1A and 1B are the same as the risk distributions for LOBs A and B in Company 2, respectively.

That assumption is not routinely valid.

Variation in Risk within LOB by Type of Company

Specifically, DCWP[98] examined premium risk distributions by type of company and found variation in risk distributions for any given LOB by Type of Company.[99] For example:

- Personal Lines specialists[100] had "lower" risk[101] for PPA or HO than did more diversified insurers writing the same LOBs.

  Therefore, an insurer writing multiple LOBs may have a diversification benefit, but that benefit may be offset by the higher LOB risks (for the same LOBs) for the non-specialized (diversified) insurer compared to the "specialist."[102]

[98] Report 8 - Risk-Based Capital (RBC) Premium Risk Charges—Differences in Premium Risk Charge by Type of Company.

[99] Type of Company is defined in footnote 12.

[100] A company is a Personal Lines specialist if more than 50% of written premium is in the HO, PPA and Auto Physical Damage LOBs.

[101] We use the phrase 'lower/higher risk to mean that the 87.5th percentile LR or RRR is lower/higher for one distribution compared to another. (Note: Note that higher or lower risk does not mean higher or lower profitability.)

[102] The higher risk distribution for companies writing multiple LOBs can have various causes. These possible causes include: (a) a benefit from specialization; (b) 'specialists' write a different type of business within a single LOBs, e.g., personal use automobiles in a specialist Personal Lines writing and vehicles used for business in a multiline insurer; and (c) possible higher policy limits and higher reinsurance retention in a diversified insurer than in a specialist insurer.

- Reinsurers often have diversified portfolios. This includes the proportional business that is reported in the LOBs based on the underlying ceded business and the non-proportional business reported in LOBs N, O, or P.[103]

  However, the reinsurer's proportional business is 'riskier' than 'average' business in those LOBs. Hence, some of the diversification benefit is offset by the higher-than-average risk level of that additional business.

Thus, the effect of 'risk theory' diversification, while real, can be offset by the higher LOB-specific risk levels of that additional business.

Variation in Risk within LOB – A general feature of UW Risk

These are two high-level examples that can be identified from Annual Statement data. The issue is deeper, in that within each of the publicly reported LOBs, there are many UW sub-segments. A company that appears "diversified" between LOBs may be diversified into sub-segments that have higher or lower than average risk. Thus, companies that look 'diversified' may or may not warrant a credit for that diversification, depending on the areas of focus within their LOBs.

Risk Classification Provides a Better Conceptual Framework

We explained above that, given the risk distribution for average LOB A business and the risk distribution for average LOB B business, we cannot necessarily use a correlation approach to calculate the risk distribution for a company writing LOBs A and B.

Therefore, framing the analysis as a risk theory question is problematic. As an alternative, we frame the analysis in the context of risk classification and manual ratemaking.

Specifically, in the risk classification framework, calibrating dependency means measuring the extent to which companies writing more LOBs[104] have different indicated risk charges than companies writing fewer LOBs, after considering the risk by LOB (Line 4 Factors) and other factors considered in the RBC Formula.

In this Report, diversification calibration means:

- The total credit for diversification is empirically measured using the methods we show in Tables 5-2A and 5-2B. This measurement is analogous to calculating the statewide indicated rate levels in manual ratemaking.
- Diversification is a "risk characteristic" that can be used to classify companies by diversification level and then allocate diversification credits across companies using approaches such as CoMaxLine%, CoMaxLine%-Risk, and Correlation Factor. This is analogous to setting territorial boundaries and rate differentials.
- Not all risk characteristics are used in a particular risk classification system.

[103] In Schedule P, reinsurers are expected to allocate premiums, losses, and reserves for proportional business to LOBs based on the underlying LOB ceded by the primary insurer, LOBs other than N, O or P. LOBs N, O and P are used if the business cannot be allocated that way, i.e., for non-proportional business.

[104] More precisely, we measure diversification using CoMaxLine%, but that correlates to the number of LOBs written.

  - The RBC Formula does not consider risk characteristics like company-size, Type of Company, or variations in LOB sub-segments of the Schedule P LOBs that are used in the RBC Formula.
  - Instead, the calibration considers aggregates across the risk characteristics not included in the risk classification system, i.e., the RBC Formula.
- The Formula is intended to be reasonable enough overall, but will not be "exact" for any particular insurer.

Data Adequacy and Proportionality Considerations

Finally, as a practical matter, there will not be enough data for a data-driven calibration of the 87.5th percentile level for every one of the 171 correlation factors (for 19 LOBs), separately for premium risk and reserve risk.

Moreover, 171 parameters is a disproportionate number of parameters compared to the number of parameters used for other aspects of the RBC Formula.

DCWP Conclusions

Based on the DCWP analysis of the impact of alternative formulas, the relative accuracy of the formulas, and the theoretical considerations, DCWP concluded:

- The CoMaxLine%-Risk approach may be better than the CoMaxLine% approach.
- Neither the Correlation Factor approach nor the HHI approach represents the data significantly better than the CoMaxLine% approach, for both reserve risk and premium risk.

Given the prior DCWP findings and this Committee's analysis of current data, this Committee prioritized the MDC calibration over further analysis of alternatives to the CoMaxLine% approach.

4. GLOSSARY

Glossary – Part 1

Term	Definition/Description
10x11 size/diversification bands	Company data reflecting 10 size deciles and 11 diversification (monoline plus 10 multiline) deciles
1x1 size/diversification band	Aggregate company data for size bands B through E and multiline diversification bands 1 through 5 (excluding monoline)
1x6 size/diversification bands	Aggregate company data for size bands B through E and each diversification band (monoline plus 5 multiline)
5x6 size/diversification bands	Company data reflecting 5 size quintiles and 6 diversification (monoline plus 5 multiline) quintiles
ACL	Authorized Control Level required capital from the RBC Formula: 50% of CAL.
AYUL	Accident Year Underwriting Loss, in dollars
AYUL%	Accident Year Underwriting Loss as a percentage of premium
CAL	Company Action Level: required capital value from the RBC Formula.
CoMaxLine%-Risk	Method of Measuring LOB Concentration reflecting Volume of Premium Risk or Reserve Risk Charges
CoMaxLine%	Company Maximum Line Percentage of Business
CoMaxLine% Approach	Method of Measuring LOB Concentration reflecting the Company's Maximum Line Percentage of Business
CoMaxLine%-Volume	Method of Measuring LOB Concentration reflecting Volume of Premiums or Reserves
Committee	American Academy of Actuaries Property and Casualty Risk-Based Capital Committee
Concentration Ratio or concentration index	LOB Concentration used in determining the company diversification grouping
Correlation Factor	Measure of "pairwise" LOB correlation (100% if two LOBs are fully correlated with each other)
Correlation Matrix	Matrix of all "pairwise" LOB correlations used to determine aggregate risk in Solvency II
DCWP or CAS DCWP	Casualty Actuarial Society (CAS) Dependency and Calibration Working Party
Diversification Credit	One minus Premium Concentration Factor or Loss Concentration Factor (for premiums and reserves, respectively)
Diversification index	One minus Concentration Ratio
Expense Ratio	2017 industry net expenses divided by net earned premium, from the 2017 Insurance Expense Exhibit, by LOB.
HHI	Herfindal-Hirschman Index of concentration reflecting relative volumes of all LOB Premiums or Reserves
HHI-Risk	Method of Measuring LOB Concentration reflecting Relative Volumes of all LOB Premium or Reserve Risk Charges

Term	Definition/Description
HHI-Volume	Method of Measuring LOB Concentration reflecting Relative Volumes of all LOB Premiums or Reserves
IIA	Investment Income Adjustment; Also referred to as Line 7/8.
Initial reserve	The reserve at the selected valuation date.
Initial Reserve Year	The year ending at the selected valuation date. This is usually the year of the least mature AY in the reserve, i.e., the initial reserve year for the reserves as of December 31, 1995, is 1995.
LCF	Loss Concentration Factor is measured as the largest of 19 RBC LOB reserves divided by total reserves.
Line 4 Factor	Risk factor, line in RBC Formula PR017, PR018.
Line 7/8 Factor	IIA, row in RBC Formula, PR017 (Line 8) and PR018 (Line 7).
LOB	Line of Business
LR	Loss Ratio, loss and all loss adjustment expenses divided by earned premium, net of reinsurance.
MDC	Maximum Diversification Credit included in the RBC Formula (currently 30%)
NOC	"NOC," standing for Not Otherwise Classified, means companies for which the portion of net written premium plus loss reserves is greatest for the sum of the following LOBs: G-SL, K-Fid/Sur, L-Other, M-Intl, or S-FG/MG. See definitions in Part 2 of this Glossary.
PCF	The Premium Concentration Factor is measured as the largest of 19 RBC LOB premiums divided by total premiums.
PR017	Page of the P&C RBC Formula that contains the main calculations for the reserve risk component of R4 UW Risk—Reserves.
PR018	Page of the P&C RBC Formula that contains the main calculations for the premium risk component of R5 UW Risk—Net Written Premium.
Premium IIA	Investment Income Adjustment for premium risk. Line 7 on page PR018.
Premium risk charge	Premium risk charge for LOBs generally.
Premium risk charge $_{LOB}$	Our analysis uses the simplified formula: Premium Risk Factor $_{LOB}$ * IIA $_{LOB}$ + Industry Average Expense Ratio $_{LOB}$ - 100%
Premium risk factor	Line 4 in RBC Formula PR018
R0	Part of the RBC Formula for Affiliated Insurance Companies and Misc. Other Amounts.
R2	Part of the RBC Formula for Equity Assets.
R4 or R4- UW Risk—Reserves	Part of the RBC Formula for UW Risk—Reserves RBC mainly using page PR017.
R5 or R5 - UW Risk—Net Written Premium	Part of the RBC Formula for UW Risk—Net Written Premium RBC, mainly using page PR018.
RBC	Risk-Based Capital

Term	Definition/Description
RBC Formula	Risk-Based Capital Formula promulgated by the NAIC for use in solvency monitoring of company Annual Statements.
R_{CAT}	Part of the RBC Formula that accounts for earthquake and hurricane premium risk.[105]
Reserve IIA	Investment Income Adjustment for reserve risk. Line 8 on page PR017.
Reserve Risk Charge	Reserve risk charge for LOBs generally.
Reserve Risk Charge $_{LOB}$	Our analysis uses the simplified formula: (1.0 + Reserve Risk Factor $_{LOB}$) * IIA $_{LOB}$ - 100%
Reserve Risk Factor	Line 4 in RBC Formula PR017
RRR	Reserve Runoff Ratio
TAC	Total Adjusted Capital as defined in the RBC Formula.
Ten-Year LOBs	LOBs for which Schedule P contains information on the most recent 10 AYs.
Two-Year LOBs	LOBs for which Schedule P (prior to 2024 AS) contains information on the most recent 2 AYs.
Working Group or NAIC Working Group	National Association of Insurance Commissioners' Property and Casualty Risk-Based Capital Working Group

[105] The NAIC P&C RBC Committee Catastrophe Risk (E) Subgroup annually publishes a catastrophe event list on its website to guide companies as to which events from the most recent 10 years should be included in their catastrophe experience disclosed in PR101, PR102, etc. These events include US and non-US earthquakes, hurricanes, and tropical storms, consistent with the perils modeled for R_{CAT} (August 2017 CIPR Newsletter).

Glossary Part 2 – LOB descriptions

(1)	(2)	(3)	(4)
Schedule P LOB Name	**RBC LOB Name (PR017 and PR018)**	**Schedule P Letter Code**	**Short Label**
Homeowners & Farmowners	H/F	A	HO
Private Passenger Auto Liability	PPA	B	PPA
Commercial Auto Liability	CA	C	CA
Workers' Compensation	WC	D	WC
Commercial Multiple Peril	CMP	E	CMP
Medical Professional Liability (Occurrence)	MPL OCCURRENCE	F1	MPL-O
Medical Professional Liability (Claims Made)	MPL CLMS MADE	F2	MPL-C
Special Liability (Note 1)	SL	G	SL
Other Liability: Claims Made and Other Liability: Occurrence	OL	H	OL
Special Property (Note 2)	SPECIAL PROPERTY	I	SP
Auto Physical Damage	AUTO PHYSICAL DAMAGE	J	APD
Fidelity & Surety	FIDELITY/SURETY	K	Fid/Sur
Other (Inc Credit, Accident & Health) (Note 3)	OTHER (INCLUDE CREDIT, A&H)	L	Other
International (Note 4)	INTL	M	Intl
Reinsurance: Nonproportional Assumed Financial and Reinsurance: Nonproportional Assumed Property	REIN PROPERTY & FINANCIAL LINES	N	Re-Prop
Reinsurance: Nonproportional Assumed Liability	REIN LIABILITY	O	Re-Liab
Product Liability: Claims Made and Product Liability: Occurrence	PL	R	PL
Financial & Mortgage Guaranty	FINANCIAL/MORTGAGE GUARANTY	S	FG/MG
Warranty	WARRANTY	T	Wrnty

The 19 RBC LOBs are a subset of the 22 Schedule P LOBs, which are a subset of the 45 Statutory Page 14 LOBs, plus write-in LOBs in the "Underwriting and Investment Exhibit Part 1 Premium Earned" section of the Annual Statement.

Note 1: Special Liability consists of Statutory Page 14 LOBs: Ocean Marine, Aircraft (all perils), and Boiler and Machinery (Statutory Page 14 LOBs 8, 22, and 27).

Note 2: Special Property consists of Statutory Page 14 LOBs: Fire, Allied Lines, Inland Marine, Earthquake, and Burglary and Theft (Statutory Page 14 LOBs 1, 2, 9,12, and 26).

Note 3: Other (Inc Credit, Accident & Health) consists of Statutory Page 14 LOBs: Group A&H, Credit A&H (group and individual), Other A&H, and Credit (Statutory Page 14 LOBs 13, 14, 15, and 28)

Note 4: LOB International consists of non-US business that cannot be identified by Statutory Page 14 LOB in the 2017 Annual Statement.

Draft: 11/10/25

Risk-Based Capital Investment Risk and Evaluation (E) Working Group
Virtual Meeting
November 4, 2025

The Risk-Based Capital Investment Risk and Evaluation (E) Working Group of the Capital Adequacy (E) Task Force met Nov. 4, 2025. The following Working Group members participated: Philip Barlow, Chair (DC); Thomas Reedy, Vice Chair (CA); Wanchin Chou (CT); Carolyn Morgan (FL); Carrie Mears and Kevin Clark (IA); Matt Cheung (IL); Roy Eft (IN); Fred Andersen (MN); Danielle Smith (MO); Andrea Johnson (NE); Jennifer Li (NH); Bob Kasinow (NY); Dale Bruggeman and Tom Botsko (OH); Aaron Hodges (TX); Doug Stolte (VA); Steve Drutz and Katy Bardsley (WA); and Michael Erdman (WI).

1. Adopted its Sept. 8 Minutes

The Working Group met Sept. 8 and took the following action: 1) adopted its June 23 minutes; and 2) heard an update from the American Academy of Actuaries (Academy) on the structured securities risk-based capital (RBC) project.

Botsko made a motion, seconded by Chou, to adopt the Working Group's Sept. 8 minutes (Attachment Four-A). The motion passed unanimously.

2. Discussed Comments Received on Proposal 2025-12-IRE (Securities Valuation Office [SVO] Funds Alignment Project)

Barlow started the discussion with a reminder of the original goal of the project, namely, to align RBC treatment for three types of bond funds. Barlow observed that there are inherent differences in the accounting and reporting of these three types of funds, which made the alignment project less of a priority. He wondered if any analysis had been done to substantiate the need to move forward with the alignment project and encouraged the commenters to address the analysis component of the project (Attachment Four-B).

Marc Altschull (American Council of Life Insurers—ACLI) spoke on the ACLI's comment letter and reiterated the ACLI's support of the Securities Valuation Office (SVO) bond funds alignment project. He then recapped the ACLI's suggested refinements to the proposal. First, instead of including SVO bond funds in the preferred stock section, which is mapped to the C-1o risk component, the ACLI suggested treating the SVO bond funds as unaffiliated common stock, which is mapped to the C1-cs risk component. He said the proposed refinement will avoid operational complexity and the potential confusion that arises from grouping preferred stocks and bond funds together. Altschull said an alternative to the proposal is to create six new lines within the unaffiliated common stock section, one for each NAIC designation, to avoid making changes to the asset valuation reserve (AVR) schedule. The ACLI also suggested updates to the Schedule D, Part 2, Section 2 instructions to clearly specify categories and subcategories of bond funds. Lastly, Altschull stated that the ACLI supports the clarifying edits proposed to the LR010 and LR011 asset concentration instructions.

No representative spoke on the comment letters submitted by the BCS Insurance Company or the TDC Group. Chou pointed out that the two comment letters were very similar; therefore, they should be counted as one.

Ralph Blanchard (Interested Party) said that due to bond asset durations, accounting conventions and RBC calculations differ materially between life and non-life (i.e., health and property/casualty [PC]) companies. He cautioned against extending the proposal to non-life RBC. Chou concurred and acknowledged that the bond fund

alignment project was referred to the P/C and health RBC working groups. He gave an update on the work done by the Property and Casualty Risk-Based Capital (E) Working Group thus far, including an attempt to perform cost and benefit analysis.

Barlow said he had reservations about the alignment project, specifically regarding the accounting and reporting differences observed. Altschull referred Barlow to the ACLI's presentation from earlier this year and laid out the supporting arguments for alignment.

Maggie Chang (NAIC) clarified that the ACLI's recommendation to map SVO bond funds to C1-cs presented an unprecedented scenario in the life RBC framework. Currently, no other asset types receive bond C-1 charges and map to C-1cs risk components simultaneously. Altschull said the ACLI is not necessarily in opposition to C-1o mapping, but after considering operational efficiency, C-1cs mapping is preferred. Ann Delaney (John Hancock) said her company also has no opposition to C-1o treatment as originally proposed.

Mears said the Working Group has previously established some principles, including that RBC should be based on statutory accounting. She sought clarification as to whether Barlow's reservation stemmed solely from accounting and recognition divergences or broader differences (e.g., actual investment loss exposures). Barlow stated that the accounting and reporting differences, as well as the ACLI's recommendation, made him question whether the alignment project is warranted. He also pointed out that these asset types are not likely to be material within insurers' portfolios. Barlow said he felt that the alignment project should be broader than just RBC alignment.

Clark agreed with Barlow about the scope of alignment. He said the bond factors were developed with an assumption of an amortized cost accounting framework, and none of these three asset classes are accounted for at amortized costs.

Chou asked if an analysis had been performed on the historical default and recovery rates for each type of fund class in order to make comparisons. Mears responded that, from what she understood, the real issue is not the underlying risk exposures but the accounting convention. She said that setting aside the accounting convention and use of bond factors is intuitive, especially when the SVO has performed an analysis and is able to designate. Clark concurred. He clarified that he did not suggest bond funds, and their underlying bonds have different risk exposures. He said, however, that the measurement conventions (amortized cost versus fair value) impact the surplus, and therefore, justify different RBC factors and/or treatment.

Barlow concluded that due to the number of discussions during this meeting, the Working Group is not ready to move forward with the proposal. He asked Altschull if he could take away the feedback gathered/discussed and provide further suggestions. Altschull said he would.

Botsko and Drutz reported the status of the alignment project within the Property and Casualty Risk-Based Capital (E) Working Group and Health Risk-Based Capital (E) Working Group, respectively. Both agreed that the Working Groups are working in parallel and not contingent on the work of one another.

3. Adopted its Revised Working Agenda

Barlow said several changes have been made to the Working Group's draft working agenda. First, the item regarding structured notes is proposed to be removed. The rationale was that structured notes are supposed to be classified as derivatives– other under *Statement of Statutory Accounting Principles (SSAP) No. 86—Derivatives,* and therefore would be deemed non-admitted assets. This asset type is not expected to be material among insurers. Secondly, the item on RBC treatment of asset-backed securities (ABS) has merged with the item on tail risk of privately structured securities due to their similarity. Finally, the item on RBC treatment of residual tranches

was expanded to document the adoption of a proposal to affect a 45% RBC charge for residual tranches/interests for life insurers only.

Reedy made a motion, seconded by Chou, to adopt the Working Group's revised working agenda (Attachment Six). The motion passed unanimously.

4. Discussed its Future Meeting Plans

Barlow said the Working Group does not plan to meet in person at the Fall National Meeting. The Working Group plans to meet during the week of Dec. 15 to receive updates from the Academy on the topic of collateralized loan obligation (CLO) RBC.

Having no further business, the Risk-Based Capital Investment Risk and Evaluation (E) Working Group adjourned.

SharePoint/NAIC Support Staff Hub/Committees/E CMTE/CADTF/2025-3-Fall/IRE/RBCIREWG 11-04-25 Minutes TPR'd.docx

Draft: 9/12/25

Risk-Based Capital Investment Risk and Evaluation (E) Working Group
Virtual Meeting
September 8, 2025

The Risk-Based Capital Investment Risk and Evaluation (E) Working Group of the Capital Adequacy (E) Task Force met Sept. 8, 2025. The following Working Group members participated: Philip Barlow, Chair (DC); Thomas Reedy, Vice Chair (CA); Wanchin Chou (CT); Jane Nelson (FL); Carrie Mears and Kevin Clark (IA); Matt Cheung (IL); Roy Eft (IN); Fred Andersen (MN); William Leung and Danielle Smith (MO); Tadd Wegner (NE); Jennifer Li (NH); Bob Kasinow and William B. Carmello (NY); Dale Bruggeman and Tom Botsko (OH); Rachel Hemphill (TX); Doug Stolte (VA); Katy Bardsley (WA); and Amy Malm (WI).

1. Adopted its June 23 Minutes

The Working Group met June 23 and took the following action: 1) adopted its Spring National Meeting minutes; 2) discussed comment letters received on the American Council of Life Insurers' (ACLI's) risk-based capital (RBC) principles for bond funds presentation and the NAIC's memorandum of bond funds reported in 2023 annual statement filings; and 3) exposed proposal 2025-12-IRE (SVO Fund Alignment Project) for a 30-day public comment period ending July 23.

Botsko made a motion, seconded by Leung, to adopt the Working Group's June 23 minutes (*see NAIC Proceedings – Summer 2025, Capital Adequacy (E) Task Force*). The motion passed unanimously.

2. Heard an Update from the Academy on the Structured Securities RBC Project

Stephen Smith (American Academy of Actuaries—Academy) presented a collateralized loan obligation (CLO) C-1 factors modelling update (Attachment Four-A1). Smith started with a progress update. He said that in collaboration with the NAIC's Structured Securities Group (SSG), a working CLO C-1 factor model was built. The purpose of the meeting was to walk through the methodology and various key modeling decisions, which are still subject to future deliberations. As such, any C-1 factors, as output, generated by this work-in-progress model are labeled as "hypothetical" and are also subject to change. Another reason factors illustrated in the presentation are "hypothetical" is that they are generated at the individual assets/Committee on Uniform Security Identification Procedures (CUSIP) level, using just six CLO deals. Smith said this is not the project's ultimate goal. He then walked through the methodology summary page. With the use of visual aids on the C-1 modeling framework flowchart page and the overview of the C-1 CLO factors approach page, Smith gave a step-by-step depiction of the Academy's work plan to arrive at the ultimate goal, which is to define several risk buckets for CLOs according to comparable attributes and then assign a C-1 factor to each bucket. Currently, the Academy is operating under the assumption that comparable attributes can be identified.

Smith also emphasized that a key feature of the methodology is striving for consistency with C-1 corporate bond modeling and the SSG's modeling, where possible. Any deviations from those modeling methodologies were summarized in the presentations. Smith highlighted another caveat of the "hypothetical" C-1 CLO factors. Although residual tranches of CLOs are within the scope of the project, the factors for residual tranches are not included in the presentation. Smith said the distinctively different statutory accounting treatment of residual tranches, when compared to debt tranches, necessitated a distinctively different methodology for modeling residual tranches. The Academy is working on that methodology but cautioned that no one should conclude that residual tranches should be afforded extremely high charges by extrapolating the "hypothetical" C-1 CLO factors. The relatively conservative accounting principles for residual tranches make the extrapolation impossible.

Barlow asked whether the hypothetical C-1 CLO factors were modeled as new issues. Smith clarified that the factors are modeled as of Sept. 30, 2024.

Smith then presented the anticipated project timeline page. Smith reiterated that the "hypothetical" factors presented herein are not the proposed factors. He said he anticipates that the Academy will have proposed factors by January. Smith said the timeline in mind has a 2026 implementation date, and he emphasized that a lot of work needs to be done by the Academy and SSG to make this implementation plan possible. Smith walked through the acknowledgement page to give credit to parties who helped with the project.

Smith continued his presentation by taking a deeper dive into the approach (overview of C-1 CLO factors approach page). Carmello asked whether the analysis would come out differently if the loans that feed into the loan collateral model are private loans instead of bank loans. Smith said that while middle market (MM) CLOs are also in scope of the project, data are relatively limited, and the Academy will not have a better sense of the difference (or lack thereof) between bank loan CLOs and MM CLOs until the comparable attribute work is completed. He said the Academy will report to the Working Group if data limitation precludes it from drawing a conclusion.

Issac Lowenbraun (Guardian Life) pointed out that CLOs are actively managed, and residual tranches owners have a prepayment option, both of which might alter the collateral's default and recoveries. He asked how the dynamic nature of CLO collaterals is taken into consideration in the Academy's model. Smith responded that while the CLO cashflow model accounted for reinvestments, the Working Group's members had concluded in a prior meeting that no credit should be given to the potential value/benefit of active management.

Smith moved on to the conditional tail expectation (CTE)90 tail metric for C-1 CLO factors page. He noted a key distinction between the Academy's and SSG's modeling. The Academy uses 10,000 defaults and recovery scenarios to be consistent with the C-1 bond model, whereas the SSG uses 10 scenarios. Furthermore, the SSG's 10 scenarios are probability-weighted with an ultimate goal to solve for the no-RBC-arbitrage concept, whereas the Academy's 10,000 scenarios are equally weighted with no explicit goal to solve for no-RBC-arbitrage. Smith said that while his current model opted for CTE90, the Academy has no view on the appropriateness of the level of this risk measure and defers the issue to the regulators to decide on the magnitude (i.e., 90).

Smith walked through the scenario compression for the CTE90 estimation page. The scenario compression methodology is necessitated by computational limitations in running through 10,000 scenarios through the CLO waterfall structure. In this methodology, 17 scenarios that are past the 90th percentile were picked. In order to come up with a CTE measure, scenarios deep into the tail are picked as they better represent the severity of the losses. He briefly walked through the scope of the sample of CLO deals page, emphasizing the availability of data for the six CLOs selected. He said he believed the work could be replicated by anyone interested.

Smith then focused on the targeted modifications and loan collateral model parameters page. He said the "time step" model parameter differs between the C-1 bond and the loan collateral model. The Academy increased the frequency from "annual" to "monthly" to facilitate production of inputs into CDOnet. The Academy believes this does not bias the credit results up or down. Another key modification from the bond model, which used the 96th percentile only, was the use of 17 different percentiles of risk metrics for modeling CLO collateral. In addition, the Academy made a change to the recovery rates assumption, tailoring to the fact that collateral of CLOs, unlike bonds, which are senior unsecured, have a different priority of payment. Instead of using Moody's Ratings (Moody's) data for the recovery rate, the Academy used S&P Global Ratings' (S&P Global's) recovery data for the CLO collateral model. This is largely because S&P Global's data illustrated tail and distributional recoveries, not average recoveries as published by Moody's.

Smith said he believes the Academy needs to do more work to ensure alignment of S&P Global's recovery data with Moody's default rate data. While "% variance explained by systematic error" is not a model assumption that diverged between C-1 bond and C-1 CLO models, Smith explained what it measured. He said a high percentage (e.g., 10%) represented that broad market conditions primarily drive variance in credit results, whereas a low percentage (e.g., 5%) attributed the swing to idiosyncratic risks. The Academy sees a potential modification to its existing model as CLO collaterals are mostly below investment grade (BIG), and idiosyncratic risks are more pertinent to BIG investments.

Smith said a modification was made to the reinvestment assumption. The slides regarding reinvestments in the loan collateral model and reinvestment methodologies attempted to capture the complications and the methodologies considered by the Academy. Smith said that while the current model selected the second approach, the Academy is looking for alternatives because the selected approach tends to overstate tail losses.

Smith moved on to the step-by-step description of the loan collateral model. He said that, besides consistency with the C-1 bond model, another key aspect the Academy strived to achieve was prioritization of portfolio-level risk. To achieve this, the Academy treated the collateral within the six selected CLOs as one collateral pool in deriving default rates. The Academy believes the performance of the overall pool of loans is a better proxy for insurers' portfolio performance, not to mention that this method also simplifies computations.

Once the loan collateral defaults and recoveries are generated upon completion of the loan collateral modeling step, the data are ready to be input into the CLO cashflow model. Smith referred to the CLO cashflow model assumptions and parameters page and highlighted the key similarities and differences between the SSG and Academy in terms of how the two groups parameterize the cashflow model. The first two items Smith singled out were "collateral prepayment" and "collateral reinvestment price" assumptions. There is no divergence between the SSG and the Academy in those assumptions, but the Academy noted that the assumptions may not be realistic. For one, bank loans have relatively higher prepayment rates. Upon prepayment or default recoveries, it is common to reinvest the proceeds in other loans at a discount, especially during stressed circumstances. Despite these observations, the Academy opted to assume no prepayment and reinvestment at par, so as to achieve alignment with C-1 bond model assumptions. Smith said the biggest difference between the SSG and the Academy is in parameterizing the default vectors (i.e., 10 versus 10,000 scenarios, respectively).

Once the CLO cash flows are generated through the waterfall structure in the cashflow model, the last step is summarized in the page on converting CLO cash flows into C-1 factors. Among the five areas consistent with C-1 bond methodology, Smith explained the concept of risk premium and Greatest Present Value of Accumulated Deficiency (GPVAD). The former is the level of asset defaults that has already been reserved for within policy reserves. The latter describes the Academy's methodology of checking and using the worst possible quarterly outcomes (PV deficiency) within the 10-year projection period. On the area of statutory losses, Smith pivoted to the details page regarding simplified *Statement of Statutory Accounting Principle (SSAP) No. 43—Asset-Backed Securities* impairment modeling to illustrate the nuances of CLOs in terms of statutory losses. For CLOs, both defaults and impairments generate statutory losses, and the Academy opted for a simplistic approach to check for impairment, namely, to check for impairment when there is a missed interest payment (paid in kind (PIK)).

Smith then walked through the selected model decisions to be reconsidered page, including a summary of assumptions/parameters that the Academy is soliciting feedback on, should changes be made to certain assumptions as suggested in the "Potential Change" column. The "Potential Impact" column within the page gives a directional impact on C-1 factors without actual quantification of the magnitude of impact. Smith said the projection horizon assumption is an important consideration. The Academy is looking into an alternative methodology to set the effective tenor across the CLO senior and junior tranches level, thereby reducing the differences in modeled risks among the senior and junior tranches. Reedy asked about the materiality and impact

of such a change. Smith responded that since the Academy is still looking into how to level set the tenor, a materiality assessment could not be performed just yet.

Smith said there is empirical evidence of a positive correlation between defaults and severities; therefore, the Academy is looking for a potential change to the model to capture this correlation. That said, when Lowenbraun inquired whether the correlation would be differentiated by where the loan is in the capital structure, Smith responded that the availability of data to effectuate such a differentiation may be slim. Barlow asked if the model gives diversification credit, as CLO collateral tends to be diversified across industry/sector and geography. Smith responded negatively, as no such credit was explicitly given in the C-1 bond model. Smith said the reinvestments/aligning with the reinvestment period is an area of the model that the Academy is working to correct, mainly to better align the collateral reinvestment period with the CLO reinvestment period. He said he expects a marginal increase in the C-1 factor because of the correction. Smith then described an area of model refinement: identifying the pattern of default timing that results in greater CLO losses. Smith said the current methodology of rank ordering scenarios based on the present value of losses may not necessarily be a good reflection of CLO debt tranches' losses. He said the Academy expects an increase in the C-1 factor should refinement be introduced. Smith concluded the presentation of this page by stating that there is no intention for the Academy to implement every change on this page. This is just a way to memorialize the potential changes to facilitate discussion.

During the question-and-answer (Q&A) session, Felix Lurye (Guardian Life) commented that the assumption of "reinvestment at par" is punitive. He also said he is not surprised by the hypothetical C-1 factors, which portrayed the cliff risk inherent in a CLO securitization, brought about by the design of the capital stack. Smith concurred and said that the appendix of the presentation deck titled "Hypothetical Results for XXX Deal" provides a visual illustration of the cliff risk.

Mears asked if there is a list of open questions for regulators to weigh in on. Smith responded that there is a key conceptual question to run by the regulators: How and to what extent should the Academy strike a balance between prioritizing consistency with C-1 bond methodology versus striving for accuracy and precision for CLO in the model? Smith said that if the regulators favor precision and accuracy over consistency with the bond model, the Academy will refine its assumption on collateral reinvestment price to less than par. Mears stated that the availability of information, such as materiality, sensitivity analysis, and the complexity of modeling changes, will help her make a decision. She said that as long as deviations from the C-1 bond model are justifiable and documented, they are acceptable. Clark said understanding the rationale and context of C-1 bond modeling assumptions would also be helpful.

Frank Tallerico (Structured Finance Association—SFA) sought clarification on how the Academy's work on CLO RBC factors interplays with the CLO modeling work performed by the SSG. Barlow emphasized that RBC determination is under the purview of the Capital Adequacy (E) Task Force and its Working Groups.

Andersen asked whether A-rated CLOs tend to have higher gross yields than A-rated bonds. Smith responded that they do, despite the spread having compressed over time. Andersen asked if the higher yield could be attributable to higher risk. Smith was hoping the Academy's work, upon completion, could shed light on this question. Lurye said the call risk and prepayment optionality offered to CLO investors, coupled with the complexity of the investments, may account for the excess spread.

Lurye asked whether the Academy's CLO model has taken into account CLOs' historical performance. Smith said CLOs evolved over time, and their more than 25-year history may not be a good proxy for current CLO structures. That said, the Academy will investigate if the modeling results meaningfully contradict the historical losses.

Barlow discussed a path forward. Smith said he heard the regulators' desire to see impact analysis, and the Academy will pick out a few key modelling decisions and perform sensitivity and/or impact analysis. Barlow said that if any Working Group members, interested regulators, or interested parties have comments to help the Academy prioritize the sensitivity/impact analysis, they could be directed to the NAIC staff.

3. Discussed Other Matters

Barlow said the Working Group is not planning to meet in person at the Fall National Meeting. The Working Group plans to schedule a meeting in the future to receive updates from Smith.

Having no further business, the Risk-Based Capital Investment Risk and Evaluation (E) Working Group adjourned.

SharePoint/NAIC Support Staff Hub/Committees/E CMTE/CADTF/2025-3-Fall/IRE/RBCIREWG 09-08-25 Minutes TPR'd.docx

C1SC Update on CLO C-1 Factors Modeling

September 8, 2025

Stephen Smith, MAAA, FSA, CFA
Chairperson, Academy C-1 Subcommittee

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C1CS Update on CLO C-1 Factors Modeling
September 8, 2025

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Introduction

- The C1 Subcommittee & the NAIC's Structured Securities Group (SSG) have collaborated to build a working model for CLO C-1.
- CUSIP-level *hypothetical* C-1 factors are shown, but these are only generated as an intermediate step—the ultimate goal is to produce factors based on comparable attributes, not to model each individual CLO on an ongoing basis.
- These early results are broadly consistent with work done by SSG in the CLO Ad Hoc group, showing low risk for senior tranches but potential cliff risk for junior tranches.
- Key modeling decisions are still under review, and we are showing six deals—results are likely to evolve as the model is refined and applied to the broader universe of CLOs owned by life insurers.

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Methodology Summary

- Objective: define several risk buckets for CLOs according to comparable attributes and then assign a C-1 factor to each bucket.
- CLO collateral credit modeling is largely consistent with C-1 corporate bond modeling.
- Projection of CLO cash flows is largely consistent with SSG modeling in the CLO Ad Hoc group, with the primary exception being the CLO collateral credit modeling.
- Conversion of CLO cash flows into C-1 factors is consistent with C-1 corporate bond methodology where possible, with additional modeling to address the fact that missed payments on CLOs do not necessarily trigger defaults.

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DRAFT/PRELIMINARY RESULTS, SUBJECT TO CHANGE

Summary of Results* for 6 Sample CLOs

After-Tax C-1 / Tranche Rating	Average	Minimum	Maximum
AAA	0.00%	0.00%	0.00%
AA	0.00%	0.00%	0.00%
A	0.12%	0.00%	0.26%
BBB-	2.09%	0.47%	3.50%
BB-	25.93%	14.61%	35.17%

*Results are preliminary and subject to change. This presentation discusses modeling choices that are being reviewed. This is only 6 deals—results may change when all CLOs held by life insurers are included.

C1CS Update on CLO C-1 Factors Modeling
September 8, 2025

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Anticipated Project Timeline

- Sept. 8, 2025—initial presentation of model
- Late 2025/Early 2026—presentation of portfolio adjustment factor, model refinements, identification of potential comparable attributes, and resulting factors
- Q1 2026—incorporation of modifications requested by regulators, if any
  - Expectation is that any structural RBC changes required would be known at the time that comparable attributes are identified (Late 2025/Early 2026)
- Q2 2026—If significant changes are not requested by regulators, expectation is for final factors to be available for exposure by April 30, 2026

Acknowledgments

- ACLI—use of C-1 corporate bond model developed by Moody's for ACLI
- Moody’s—access to CLO deal data, collateral data, historical default rate data, and CDOnet
- S&P—historical recovery data and frequent discussions with structured finance analytical professionals
- Bridgeway Analytics—frequent discussions on credit modeling, structured finance, and help in understanding the ACLI & Moody's corporate bond model
- SSG—modeling advice and running CDOnet
- NAIC accounting staff—guidance on CLO statutory accounting

Overview of Modeling Framework

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September 8, 2025

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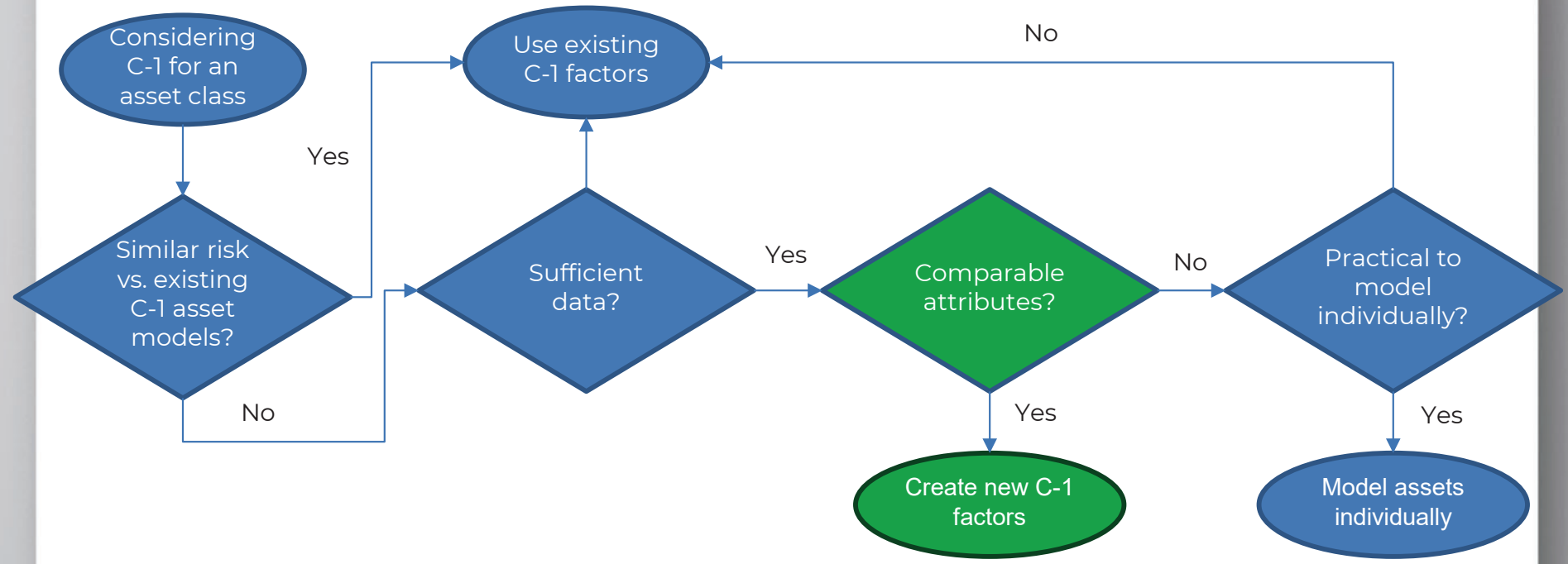
C-1 Modeling Framework Flowchart



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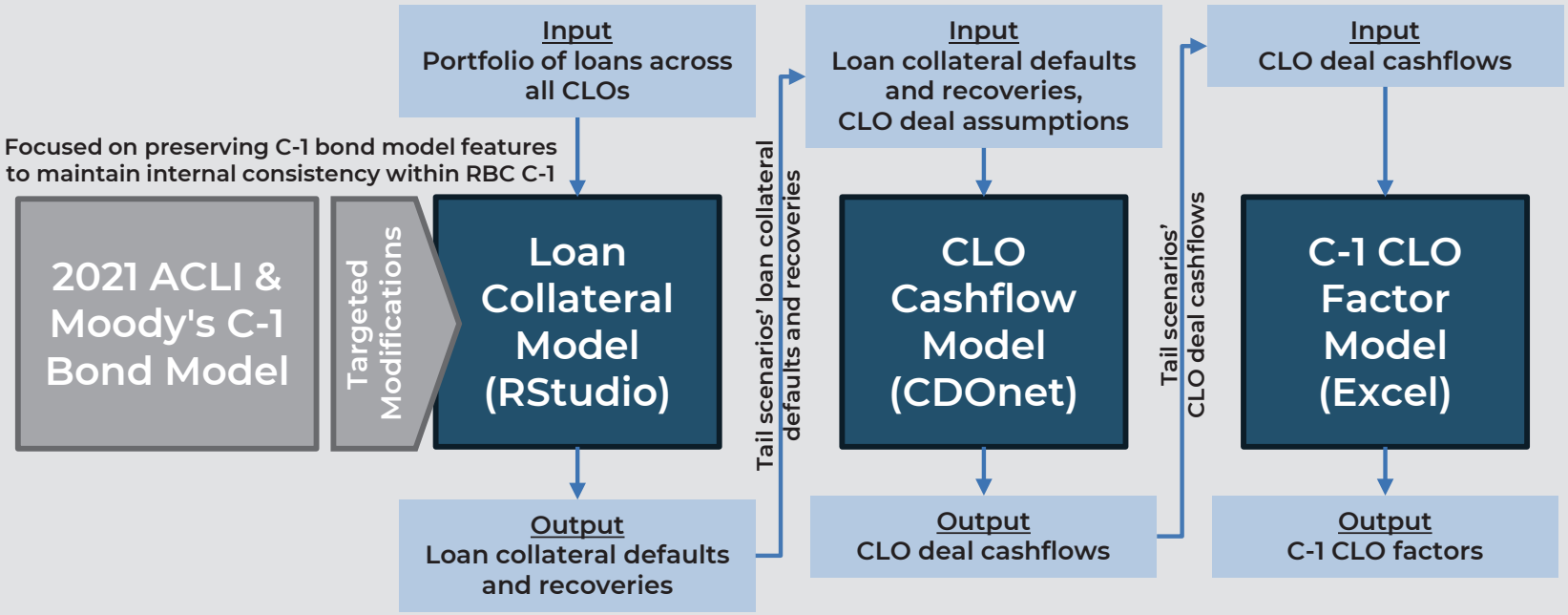
Overview of C-1 CLO Factors Approach

Create new C-1 factors



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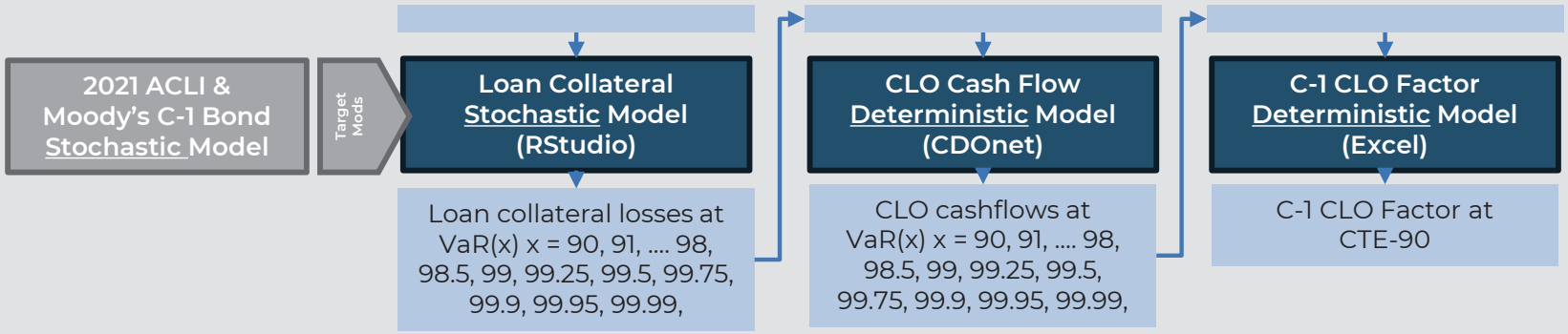
CTE-90 Tail Metric for C-1 CLO Factors

Create new C-1 factors



The CLO cash flow and the C-1 CLO Factor Models use deterministic inputs; CTE is estimated from VaR metrics selected using a scenario compression method to manage computational time

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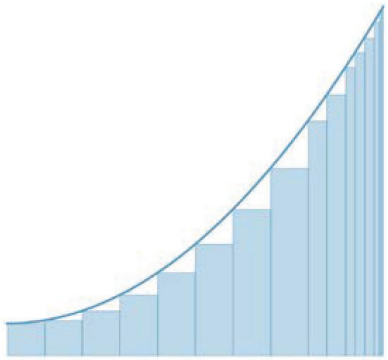
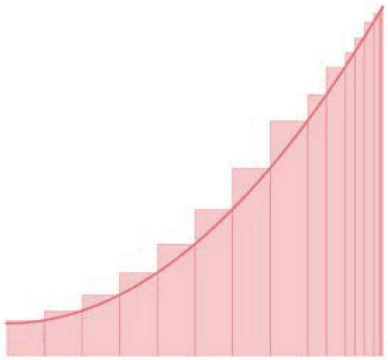
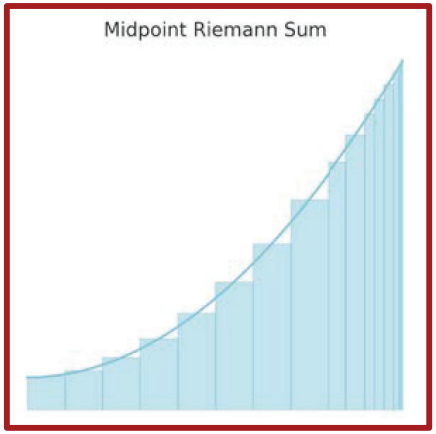
Scenario Compression for CTE-90 Estimation

- Breaks percentiles into 16 buckets
- Percentiles get closer together at the right tail as the RBC charges increase more steeply







Approach used

	Weights		
Percentile	Left	Right	Midpoint
99.99	0.5%		0.3%
99.95	0.5%	0.5%	0.5%
99.90	1.5%	0.5%	1.0%
99.75	2.5%	1.5%	2.0%
99.50	2.5%	2.5%	2.5%
99.25	2.5%	2.5%	2.5%
99.00	5.0%	5.0%	3.8%
98.50	5.0%	5.0%	5.0%
98.00	10.0%	10.0%	7.5%
97.00	10.0%	10.0%	10.0%
96.00	10.0%	10.0%	10.0%
95.00	10.0%	10.0%	10.0%
94.00	10.0%	10.0%	10.0%
93.00	10.0%	10.0%	10.0%
92.00	10.0%	10.0%	10.0%
91.00	10.0%	10.0%	10.0%
90.00		10.0%	5.0%

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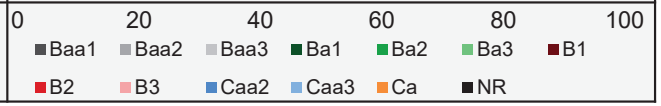
Scope of Sample CLO Deals

As of 9/30/24	Balance ($mn)	Loans (#)	Unique Issuers (#)	Issuer* Rating Distribution
867331201	496.9	474	381	
867578342	598.6	499	435	
867567170	436.8	307	268	
830960738	684.3	365	329	
830871594	424.7	348	295	
867931338	389.6	171	153	
Sample Deals	3,030.9	1,660	933	
Total Moody's CLO Universe	**744,181.3**	**27,802**	**2,021**	



*Issuer rating shown. When comparing issuer and loan rating, S&P ratings are the same for 98% of the balance. Moody's ratings are the same for 57% and within 1 notch for 94% of the loan balance.

C1CS Update on CLO C-1 Factors Modeling
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Loan Collateral Model (RStudio)

Targeted Modifications—Loan Collateral Model Parameters

Model Parameter	ACLI & Moody's C-1 Bond Model	Loan Collateral Model
Simulations	10,000	Kept the same
Projection Years	10 years	Kept the same
Time Step	Annual	Monthly
Target Risk Metric	VaR(96), selected based on the greatest PV of losses in excess of accumulated risk premium	VaR(x) where x =90, 91, …. 98, 98.5, 99, 99.25, 99.5, 99.75, 99.9, 99.95, 99.99, selected based on the PV of losses*
Discounting	Discount Rate = 3.47% (pre-tax) 2.74% (post-tax)	Kept the same pre-tax*
Output	C1 bond factors = PV of losses in excess of risk premium / Amount exposed	Undiscounted defaults and recoveries by deal and by credit rating

*Discounting only used to identify the scenario at the Target Risk Metric.

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Loan Collateral Model (RStudio)

Targeted Modifications—Loan Collateral Model Assumptions

Model Assumption	ACLI & Moody's C1 Bond Model	Loan Collateral Model
Default Rates	Empirical distribution by issuer rating based on Moody's data	Kept the same
Recovery Rates	Empirical distribution by economic state based on Moody's data for senior unsecured bonds	Empirical distribution by payment priority (sr. unsecured, sr. secured, 2nd lien) based on S&P data
Economic State Transition Matrix	Based on original Academy's work	Not used
% Variance Explained by Systematic Error	10%	Kept the same, results in implicit diversification benefit
Tax Adjustment	Tax Rate = 21% Recovery Rate = 80%	Not used*
Reinvestment	Surplus used to purchase identical bond after default	Modeled to align with reinvestments in CLO cash flow Model (CDOnet)

*Tax Adjustment used in a downstream step of the overall CLO model process

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Loan Collateral Model (RStudio)

Reinvestments in Loan Collateral Model

Reinvestment modeling
is a key methodological choice that impacts credit losses

- Credit losses may occur from existing loans or from future reinvestments.
- The tail scenarios are selected in the loan collateral model (RStudio), before modeling the CLO cash flows.
- To maximize alignment between collateral modeling and CLO cash flow modeling, loan collateral losses are modeled consistent with CDOnet assumptions:
    a) Only maturities and recoveries from default are reinvested (i.e., no prepayments)
    b) Reinvestment distributions are
        30% B1 | 30% B2 | 40% B3
        92.5% Sr. Secured | 7.5% Sr. Unsecured

Loan Collateral Model (RStudio)

Reinvestment Methodologies Considered

Approach used

	Reinvestment Amount at t	Loss from Reinvestment	Modeled Loan Universe	Pros	Cons
1	Deterministic	Deterministic empirical distribution	[933 x 3] existing loans at t=0	• Simple	• Understates tail risk, loss curve is an average scenario, not Xth percentile • The systematic error is not captured in the reinvestments
2	Based on stochastic scenario	Deterministic average of stochastic simulations, staggered to start at time t	[933 x 3] existing loans at t=0	• Simple	• Overestimates tail risk by compounding of Xth percentile on top of Xth percentile • Misalignment of systematic error, which should follow time from projection t • Exacerbates misalignment in VaR(X) for deal A vs. VaR(X) for deal B
3	Based on stochastic scenario	Stochastic simulation	[933 x 3] existing loans at t=0 + [933 x 3 x 120] hypothetical loans for t=0 through 120	• Most mathematically accurate	• Most computationally expensive • Creates an open-ended universe of loans and issuers, which may introduce unwarranted diversification benefits

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Loan Collateral Model (RStudio)

Reinvestment Methodologies Considered

	Reinvestment Amount at t	Loss from Reinvestment	Modeled Loan Universe	Pros	Cons
4	Based on stochastic scenario	Deterministic, average of stochastic simulations, aligned by projection year, based on original credit rating at t=0	[933 x 3] existing loans at t=0	• Computationally feasible • Alignment of systematic error • Closed-ended universe of loans and issuers	• Does not account for credit migration that happens between t=0 and reinvestment time t • Reinvestments limited to existing pool of loans and issuers that have not defaulted at time t
5	Based on stochastic scenario	Deterministic, average of stochastic simulations, aligned by projection year, based on simulated credit rating at t=t	[933 x 3] existing loans at t=0, each with a simulated credit rating at each time step t	• Same as approach 4 • Addresses credit migration limitation in approach 4	• Introduces model risk by modeling credit migration from complexity and reliance of credit migration data • Same as above, reinvestments limited to existing pool of loans and issuers that have not defaulted at time t

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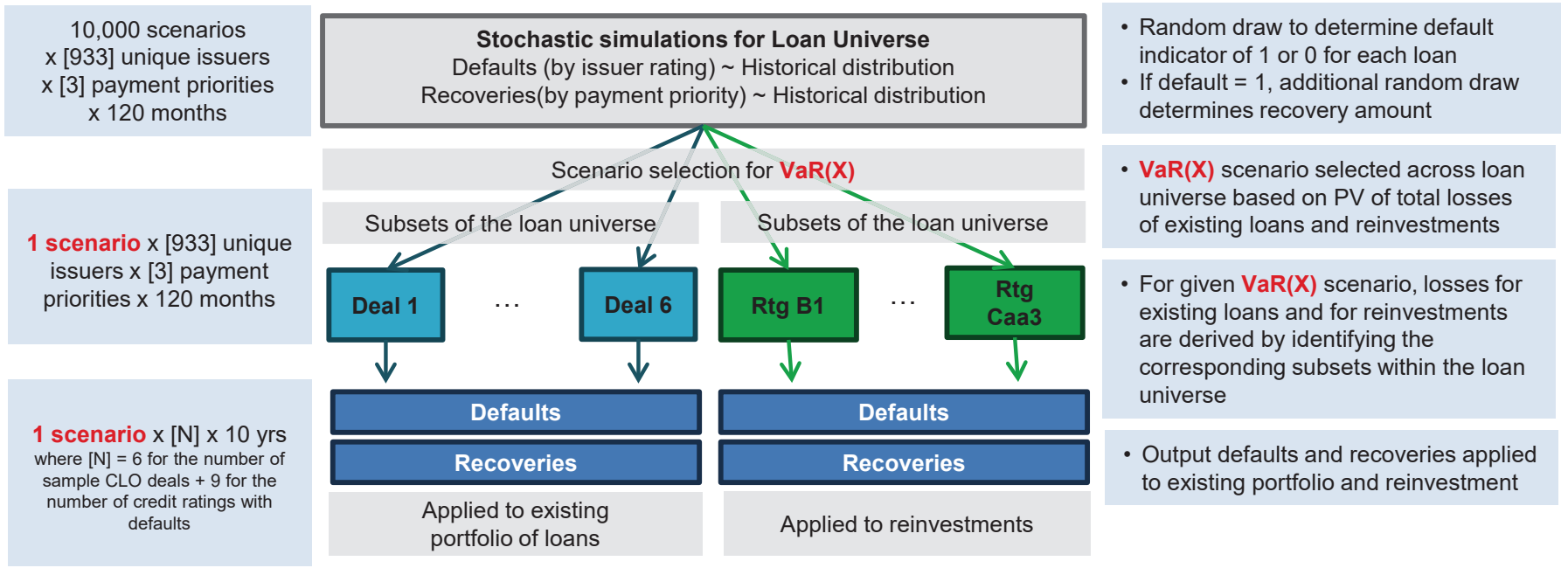
Loan Collateral Model (RStudio)

Step-by-Step Description of Loan Collateral Model



C1CS Update on CLO C-1 Factors Modeling
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CLO Cashflow Model (CDOnet)

CLO Cashflow Model Assumptions & Parameters

Model Assumption/Parameter	SSG Approach in CLO Ad Hoc Group	Academy Approach
Collateral Prepayment	No prepay, consistent with rating agencies	Kept the same
Collateral Reinvestment Price	At par, consistent with rating agencies	Kept the same
Reinvestment Timing & Quality	Reinvestments are made into existing collateral pool specific to each deal	Reinvestments made into newly issued loans, quality not deal-specific
Recovery Lag	6 months	Immediate recovery, consistent with S&P recovery data
Default Vectors	10 default & recovery scenarios, weighted to minimize difference between CLO C-1 and collateral C-1 across deals	17 tail scenarios drawn from loan collateral model (10,000 total scenarios) to inform an estimation of CTE-90; CLO/collateral C-1 equivalence not enforced
All Other CDOnet Parameters	Various less impactful modeling choices that need to be made	Kept the same

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C-1 CLO Factor Model (Excel)

Converting CLO Cash Flows Into C-1 Factors

Objectives	Approach	
	Consistency with C-1 Bond Factors	Prioritizing Estimation of Portfolio Tail Events
• Consistency with C-1 bond factors approach except for risk measure (CTE-90 vs. VaR-96) • Prioritize estimating risk consistent with a portfolio tail event instead of estimating each security's specific tail risk	• 10-year projection • Risk premium by CLO tranche rating equal to C-1 bond factor risk premium • Statutory losses (simplified SSAP 43 impairment modeling used for CLOs) • Greatest present value of accumulated deficiency (GPVAD) • Difference: tax loss occurs at the earlier of a full impairment or a tranche defaulting at maturity (in bond model, tax loss always occurs at time of default)	• Rank order of scenarios determined based on PV of losses on the combined collateral pool instead of being reordered for each CLO or each CLO tranche • Leads to greater dispersion of modeled C-1 factors across CLOs, but averages across deals will represent risk of a diversified CLO portfolio • Updates to Portfolio Adjustment factor for CLOs will be considered in next steps

C1CS Update on CLO C-1 Factors Modeling
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Simplified SSAP 43 Impairment Modeling—Details

- Per previously identified principles, capital is downstream from accounting
- C-1 corporate bond model assumes statutory losses occur only upon default
- For most CLOs, default only occurs at maturity when the final payment cannot be made
- However, in many cases it is clear years before that a default will occur—in this case, a statutory loss may result from an impairment prior to default
- This model's simplistic approach is to check for an impairment any time an interest payment is missed (in other words, any time the CLO PIKs)
- At that time, the model assumes the insurer has full knowledge of future cash flows and performs a perfectly accurate impairment analysis (in the tail scenarios that drive C-1 results, this effectively pulls statutory losses forward in time in the model)
- If a security's book yield is significantly higher than the C-1 discount rate and the C-1 risk premium is low, this approach could underestimate C-1. If book yield is low relative to risk premium, this approach could overestimate C-1
- This is all a practical expedient—the Academy has been unable to identify a more realistic way of conducting an "inner loop" impairment analysis, and we estimate the effect of this simplification to be minor

Selected Model Decisions to be Reconsidered

Model Assumption/Parameter	Potential Change	Potential Impact
% Variance Explained by Systematic Error	May reduce from 10% to reflect below-IG nature of collateral (e.g., 5%)	Reduce C-1 factors
Collateral Reinvestment Price & Prepay	Allow for prepayment and reinvestment at less than par	Reduce C-1 factors
Projection Horizon	Adjust results for tranches that pay off in less than 10 years (senior tranches)	Reduce the difference between C-1 factors for senior and junior tranches (less slope)
Statistical Safety Level	Showing results for CTE-90, but the level is for regulators to decide	Depends on direction of change, if any
Relationship between default rates and severities	Change correlation between defaults and severities from zero to positive	Increase C-1 factors
Reinvestments—General Approach	Detailed earlier in the presentation	Reduce C-1 factors (for most alternatives considered)
Reinvestments—Aligning with Reinvestment Period	Stop reinvesting recovered principal after 2-3 years when generating default vector	Increase C-1 factors (by better aligning rank order of collateral scenarios with CLO losses, per below)
Rank Order of Collateral Scenarios	Identify patterns of default timing that result in greater CLO losses	Increase C-1 factors
Risk Premium	Derive risk premia from CLO loss distribution instead of from bond factors	Increase C-1 factors (if based on VaR or standard deviation)

Questions

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C1CS Update on CLO C-1 Factors Modeling
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Appendix A
Loan Collateral Model

C1CS Update on CLO C-1 Factors Modeling
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Moody's C1 Bond Model Summary

Inputs	Calculations	
	Stochastic Simulations	C1 Bond Factors
• Default rates by rating and tenor, from Moody's historical study 1983-2020 • Recovery rates by economic state, from Moody's historical study 1987-2020 • Economic states transition matrices with starting state of contraction	For simulation *i*, year *t*: • 1 of 4 discrete economic states sampled from Markov-Chains • Default indicator sampled from a distribution by issuer rating and tenor, with a Gaussian Copula function where 90% of the variance is idiosyncratic and 10% is systematic • Loss rate = 1 – recovery rate, sampled from a discrete distribution by economic state	• C1 bond factor = VaR(96) PV of simulated C1 losses • PV of simulated C1 losses = NPV of simulated C1 losses over 10 yrs discounted at a flat 2.74% post-tax rate • Simulated C1 loss for year *t* = simulated post-tax loss – risk premium where risk premium = expected loss + 0.5*std dev by issuer rating, representing losses covered in reserves Losses expressed as a % of t=0 book value

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Moody's C1 Bond Model Validation

	C1 Bond Model Rerun												Original C1
	Seed 1	**Seed 2**	**Seed 3**	**Seed 4**	**Seed 5**	**Seed 6**	**Seed 7**	**Seed 8**	**Seed 9**	**Seed 10**	**Avg**	**Std Dev**	**Model Output**
Aaa	**0.158%**	0.163%	0.149%	0.148%	0.152%	0.170%	0.159%	0.158%	0.158%	0.152%	0.157%	0.007%	**0.158%**
Aa1	**0.271%**	0.274%	0.271%	0.256%	0.271%	0.280%	0.261%	0.272%	0.269%	0.266%	0.269%	0.007%	**0.271%**
Aa2	**0.419%**	0.439%	0.435%	0.431%	0.440%	0.440%	0.425%	0.434%	0.429%	0.430%	0.432%	0.007%	**0.419%**
Aa3	**0.545%**	0.539%	0.520%	0.521%	0.530%	0.537%	0.531%	0.537%	0.516%	0.540%	0.532%	0.010%	**0.523%**
A1	**0.683%**	0.670%	0.659%	0.669%	0.675%	0.643%	0.649%	0.677%	0.651%	0.649%	0.663%	0.014%	**0.657%**
A2	**0.800%**	0.824%	0.815%	0.833%	0.806%	0.815%	0.816%	0.823%	0.807%	0.818%	0.816%	0.010%	**0.816%**
A3	**1.023%**	1.007%	0.999%	0.997%	1.004%	1.005%	1.026%	1.012%	0.993%	0.997%	1.006%	0.011%	**1.016%**
Baa1	**1.226%**	1.242%	1.241%	1.237%	1.222%	1.217%	1.235%	1.220%	1.213%	1.201%	1.225%	0.014%	**1.261%**
Baa2	**1.553%**	1.527%	1.512%	1.556%	1.558%	1.529%	1.544%	1.540%	1.549%	1.580%	1.545%	0.019%	**1.523%**
Baa3	**2.186%**	2.183%	2.172%	2.174%	2.173%	2.136%	2.168%	2.112%	2.182%	2.209%	2.170%	0.027%	**2.168%**
Ba1	**3.168%**	3.181%	3.187%	3.154%	3.143%	3.136%	3.206%	3.143%	3.177%	3.179%	3.167%	0.023%	**3.151%**
Ba2	**4.619%**	4.651%	4.614%	4.630%	4.562%	4.741%	4.613%	4.571%	4.640%	4.652%	4.629%	0.050%	**4.537%**
Ba3	**5.680%**	5.874%	5.864%	5.862%	5.853%	5.871%	5.799%	5.868%	5.853%	5.882%	5.841%	0.061%	**6.017%**
B1	**7.268%**	7.352%	7.453%	7.389%	7.337%	7.400%	7.409%	7.373%	7.380%	7.275%	7.364%	0.058%	**7.386%**
B2	**9.290%**	9.497%	9.688%	9.361%	9.198%	9.543%	9.512%	9.221%	9.365%	9.274%	9.395%	0.159%	**9.535%**
B3	**12.307%**	12.509%	12.290%	12.612%	12.471%	12.423%	12.358%	12.372%	12.315%	12.606%	12.426%	0.120%	**12.428%**
Caa1	**16.360%**	16.804%	16.562%	16.771%	17.181%	16.815%	16.855%	16.785%	16.647%	16.707%	16.749%	0.212%	**16.933%**
Caa2	**23.458%**	23.451%	23.822%	23.355%	23.535%	23.333%	23.648%	23.524%	23.838%	23.404%	23.537%	0.180%	**23.798%**
Caa3	**32.762%**	32.490%	32.605%	33.417%	33.069%	33.056%	32.883%	33.030%	33.289%	32.927%	32.953%	0.286%	**32.975%**

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Moody's C1 Bond Model Validation

	C1 Bond Model Rerun – Original C1 Model Output											Original C1
	Seed 1	**Seed 2**	**Seed 3**	**Seed 4**	**Seed 5**	**Seed 6**	**Seed 7**	**Seed 8**	**Seed 9**	**Seed 10**	**Avg**	**Model Output**
Aaa	**0.000%**	0.005%	-0.009%	-0.010%	-0.006%	0.012%	0.001%	0.000%	0.000%	-0.006%	-0.001%	**0.158%**
Aa1	**0.000%**	0.003%	0.000%	-0.015%	0.000%	0.009%	-0.010%	0.001%	-0.002%	-0.005%	-0.002%	**0.271%**
Aa2	**0.000%**	0.020%	0.016%	0.012%	0.021%	0.021%	0.006%	0.015%	0.010%	0.011%	0.013%	**0.419%**
Aa3	**0.022%**	0.016%	-0.003%	-0.002%	0.007%	0.014%	0.008%	0.014%	-0.007%	0.017%	0.009%	**0.523%**
A1	**0.026%**	0.013%	0.002%	0.012%	0.018%	-0.014%	-0.008%	0.020%	-0.006%	-0.008%	0.006%	**0.657%**
A2	**-0.016%**	0.008%	-0.001%	0.017%	-0.010%	-0.001%	0.000%	0.007%	-0.009%	0.002%	0.000%	**0.816%**
A3	**0.007%**	-0.009%	-0.017%	-0.019%	-0.012%	-0.011%	0.010%	-0.004%	-0.023%	-0.019%	-0.010%	**1.016%**
Baa1	**-0.035%**	-0.019%	-0.020%	-0.024%	-0.039%	-0.044%	-0.026%	-0.041%	-0.048%	-0.060%	-0.036%	**1.261%**
Baa2	**0.030%**	0.004%	-0.011%	0.033%	0.035%	0.006%	0.021%	0.017%	0.026%	0.057%	0.022%	**1.523%**
Baa3	**0.018%**	0.015%	0.004%	0.006%	0.005%	-0.032%	0.000%	-0.056%	0.014%	0.041%	0.002%	**2.168%**
Ba1	**0.017%**	0.030%	0.036%	0.003%	-0.008%	-0.015%	0.055%	-0.008%	0.026%	0.028%	0.016%	**3.151%**
Ba2	**0.082%**	0.114%	0.077%	0.093%	0.025%	0.204%	0.076%	0.034%	0.103%	0.115%	0.092%	**4.537%**
Ba3	**-0.337%**	-0.143%	-0.153%	-0.155%	-0.164%	-0.146%	-0.218%	-0.149%	-0.164%	-0.135%	-0.176%	**6.017%**
B1	**-0.118%**	-0.034%	0.067%	0.003%	-0.049%	0.014%	0.023%	-0.013%	-0.006%	-0.111%	-0.022%	**7.386%**
B2	**-0.245%**	-0.038%	0.153%	-0.174%	-0.337%	0.008%	-0.023%	-0.314%	-0.170%	-0.261%	-0.140%	**9.535%**
B3	**-0.121%**	0.081%	-0.138%	0.184%	0.043%	-0.005%	-0.070%	-0.056%	-0.113%	0.178%	-0.002%	**12.428%**
Caa1	**-0.582%**	-0.138%	-0.380%	-0.171%	0.239%	-0.127%	-0.087%	-0.157%	-0.295%	-0.235%	-0.193%	**16.933%**
Caa2	**-0.340%**	-0.347%	0.024%	-0.443%	-0.263%	-0.465%	-0.150%	-0.274%	0.040%	-0.394%	-0.261%	**23.798%**
Caa3	**-0.213%**	-0.485%	-0.370%	0.442%	0.094%	0.081%	-0.092%	0.055%	0.314%	-0.048%	-0.022%	**32.975%**

C1CS Update on CLO C-1 Factors Modeling
September 8, 2025

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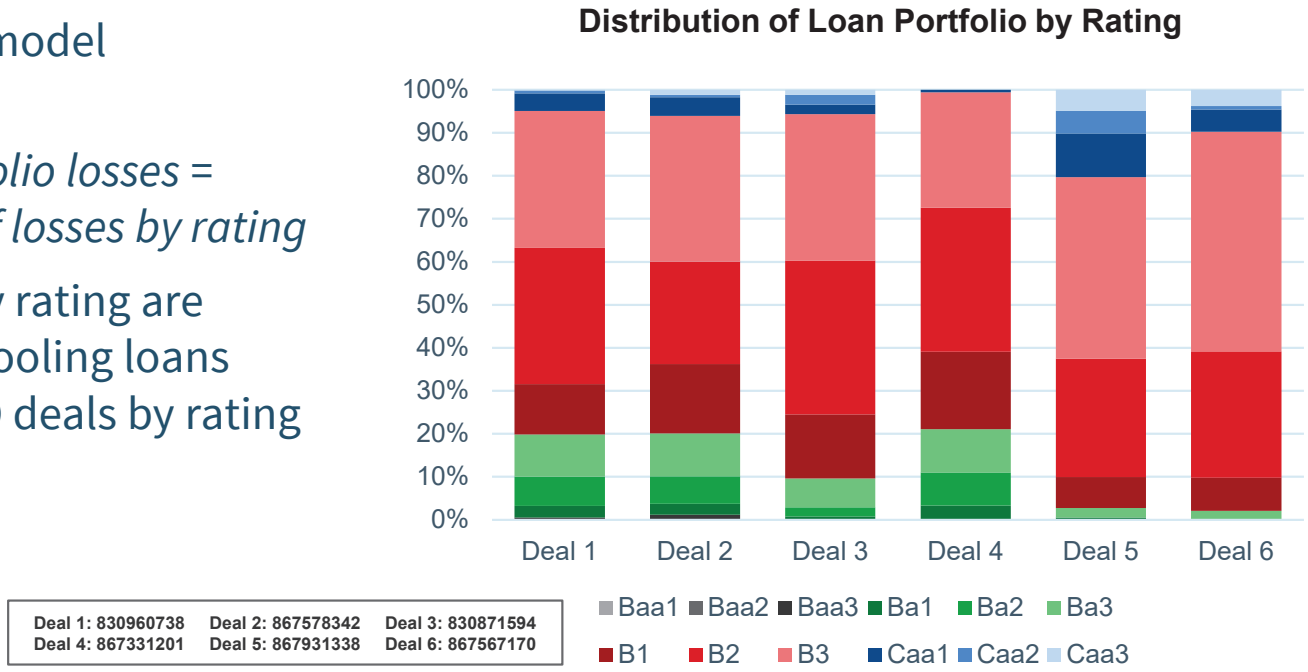
Potential Model Simplification—Average by Rating

We explored a model simplification:

simplified portfolio losses = weighted avg of losses by rating

where losses by rating are generated by pooling loans across all 6 CLO deals by rating



Deal 1: 830960738 Deal 2: 867578342 Deal 3: 830871594
Deal 4: 867331201 Deal 5: 867931338 Deal 6: 867567170

Potential Model Simplification—Average by Rating

Comparison Explicit Model vs. Model Simplification
Difference in First Year Aggregate Losses % of Principal

Pct	Deal 1	Deal 2	Deal 3	Deal 4	Deal 5	Deal 6
25%	-0.01%	-0.10%	-0.07%	0.04%	-0.16%	0.00%
50%	-0.04%	-0.07%	-0.04%	-0.04%	-0.15%	-0.03%
75%	-0.07%	0.02%	0.03%	-0.07%	-0.06%	0.02%
90%	-0.13%	0.11%	0.11%	-0.10%	0.01%	-0.08%
96%	-0.13%	0.27%	0.11%	0.00%	0.14%	0.03%
99%	0.03%	0.70%	0.37%	0.10%	0.43%	-0.22%

Explicit Model of Full Loan Portfolio
First Year Aggregate Losses % of Principal

Pct	Deal 1	Deal 2	Deal 3	Deal 4	Deal 5	Deal 6
25th	0.88%	1.07%	1.12%	0.65%	1.99%	1.55%
50th	1.67%	1.85%	2.01%	1.36%	3.43%	2.76%
75th	2.86%	3.00%	3.28%	2.40%	5.31%	4.32%
90th	4.38%	4.43%	4.82%	3.72%	7.50%	6.31%
96th	5.86%	5.77%	6.36%	4.95%	9.44%	7.98%
99th	7.98%	7.70%	8.49%	6.94%	12.17%	10.91%

The model simplification overestimates tail losses in most cases

Model Simplification Weighted Avg by Rating
First Year Aggregate Losses % of Principal

Pct	Deal 1	Deal 2	Deal 3	Deal 4	Deal 5	Deal 6
25th	0.86%	0.96%	1.06%	0.68%	1.82%	1.55%
50th	1.63%	1.79%	1.97%	1.32%	3.29%	2.73%
75th	2.79%	3.02%	3.31%	2.33%	5.24%	4.33%
90th	4.26%	4.54%	4.92%	3.62%	7.50%	6.23%
96th	5.72%	6.04%	6.48%	4.95%	9.58%	8.01%
99th	8.01%	8.40%	8.86%	7.04%	12.60%	10.69%

Deal 1: 830960738 Deal 2: 867578342 Deal 3: 830871594
Deal 4: 867331201 Deal 5: 867931338 Deal 6: 867567170

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Potential Model Simplification—Average by Rating

Comparison Explicit Model vs. Model Simplification
Difference in 10-Year Aggregate Losses % of Principal

Pct	Deal 1	Deal 2	Deal 3	Deal 4	Deal 5	Deal 6
25%	-0.10%	-0.39%	-0.15%	-0.09%	-0.05%	0.21%
50%	-0.04%	-0.08%	-0.03%	-0.01%	-0.04%	0.07%
75%	0.18%	0.27%	0.16%	0.07%	-0.02%	0.06%
90%	0.35%	0.76%	0.30%	0.10%	0.08%	-0.04%
96%	0.47%	1.07%	0.40%	0.14%	0.14%	-0.15%
99%	0.69%	1.41%	0.42%	-0.10%	-0.10%	-0.46%

The model simplification overestimates tail losses in most cases

Deal 1: 830960738 Deal 2: 867578342 Deal 3: 830871594
Deal 4: 867331201 Deal 5: 867931338 Deal 6: 867567170

Explicit Model of Full Loan Portfolio
10-Year Aggregate Losses % of Principal

Pct	Deal 1	Deal 2	Deal 3	Deal 4	Deal 5	Deal 6
25th	15.76%	16.13%	17.12%	14.74%	20.14%	19.11%
50th	18.41%	18.55%	19.80%	17.30%	23.32%	22.16%
75th	21.17%	21.23%	22.63%	20.10%	26.70%	25.28%
90th	23.87%	23.67%	25.31%	22.83%	29.72%	28.22%
96th	26.02%	25.71%	27.44%	25.01%	32.10%	30.55%
99th	28.56%	28.22%	30.09%	27.96%	35.16%	33.46%

Model Simplification Weighted Avg by Rating
10-Year Aggregate Losses % of Principal

Pct	Deal 1	Deal 2	Deal 3	Deal 4	Deal 5	Deal 6
25th	15.66%	15.74%	16.97%	14.65%	20.09%	19.32%
50th	18.38%	18.47%	19.77%	17.29%	23.28%	22.23%
75th	21.35%	21.50%	22.79%	20.17%	26.68%	25.34%
90th	24.22%	24.43%	25.61%	22.93%	29.80%	28.18%
96th	26.50%	26.78%	27.84%	25.15%	32.23%	30.40%
99th	29.26%	29.63%	30.51%	27.86%	35.07%	33.00%

C1CS Update on CLO C-1 Factors Modeling
September 8, 2025

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Appendix B
CLO Cash Flow Model

C1CS Update on CLO C-1 Factors Modeling
September 8, 2025

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Further Details on CLO Cashflow Modeling in CDOnet

Except where otherwise noted in this presentation, CDOnet parameters and assumptions are set according to the methodology described on the SSG CLO webpage:

https://content.naic.org/industry/structured-securities/collateralized-loan-obligations

Appendix C
Detailed Results for 6 Sample CLOs

C1CS Update on CLO C-1 Factors Modeling
September 8, 2025

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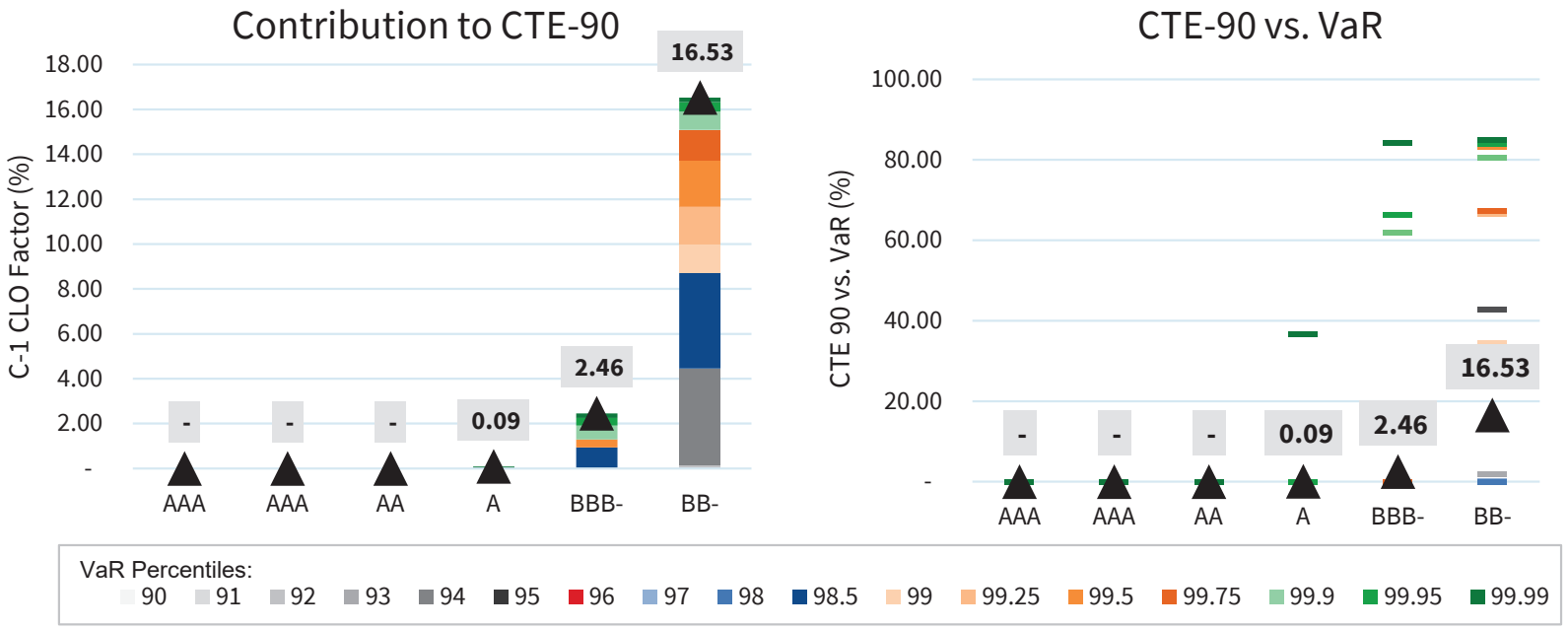
Hypothetical Results for Strata II, Deal ID#867931338



C1CS Update on CLO C-1 Factors Modeling
September 8, 2025

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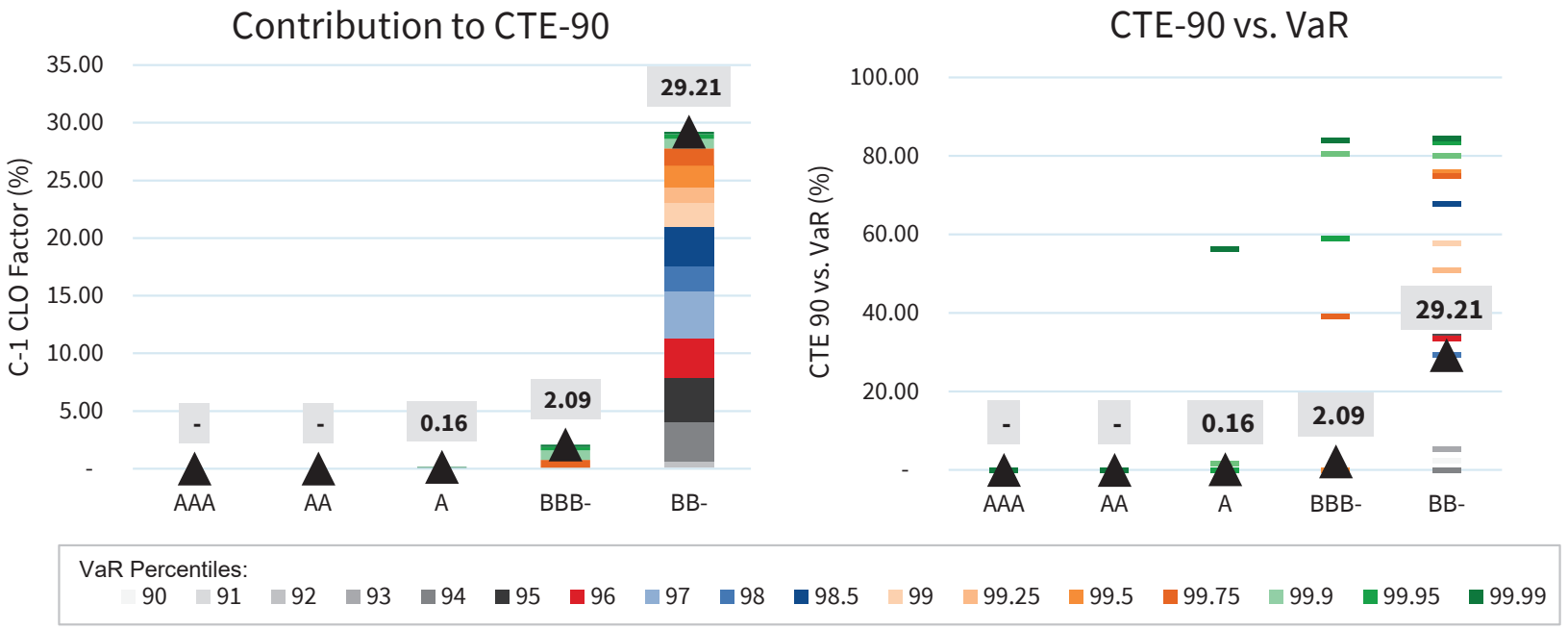
Hypothetical Results for Magnetite 27, Deal ID#867331201 36



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September 8, 2025

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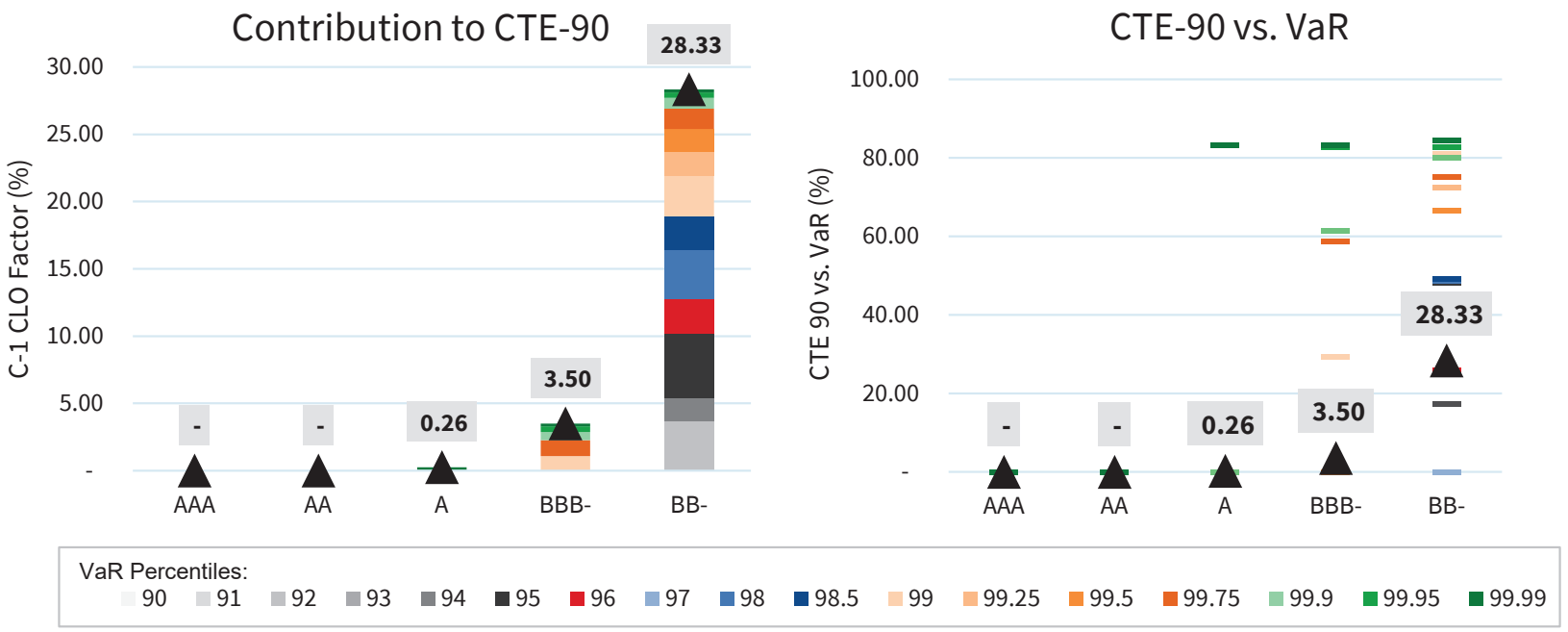
Hypothetical Results for OHA 3, Deal #830960738



C1CS Update on CLO C-1 Factors Modeling
September 8, 2025

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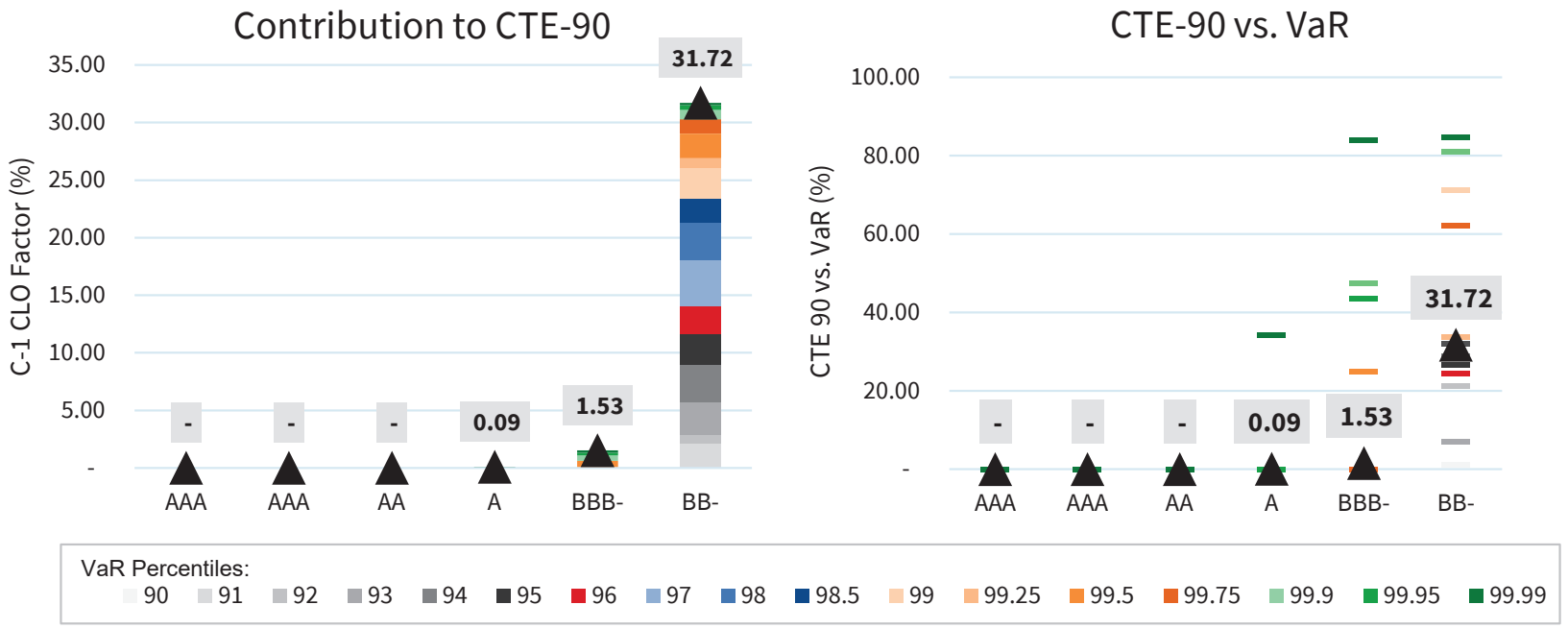
Hypothetical Results for Anchorage 17, Deal ID #867567170[38]



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September 8, 2025

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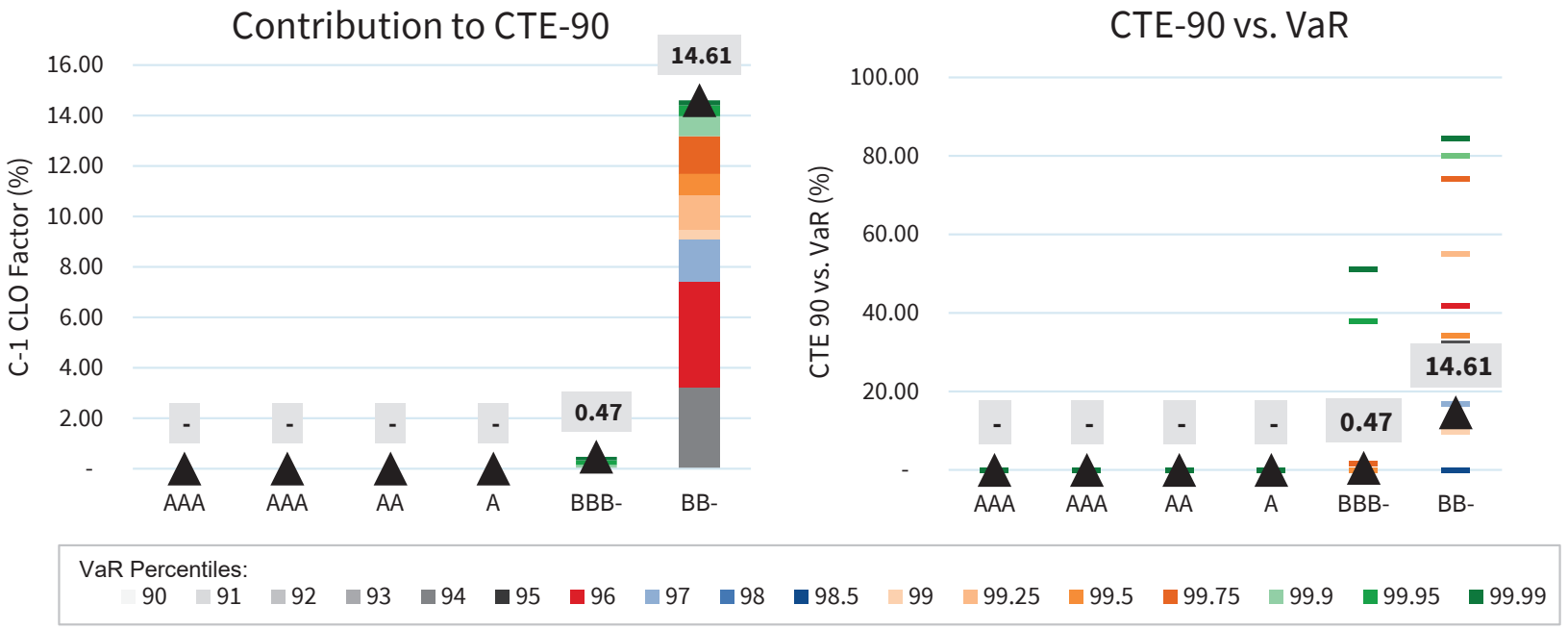
Hypothetical Results for Ares 52, Deal ID#830871594



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September 8, 2025

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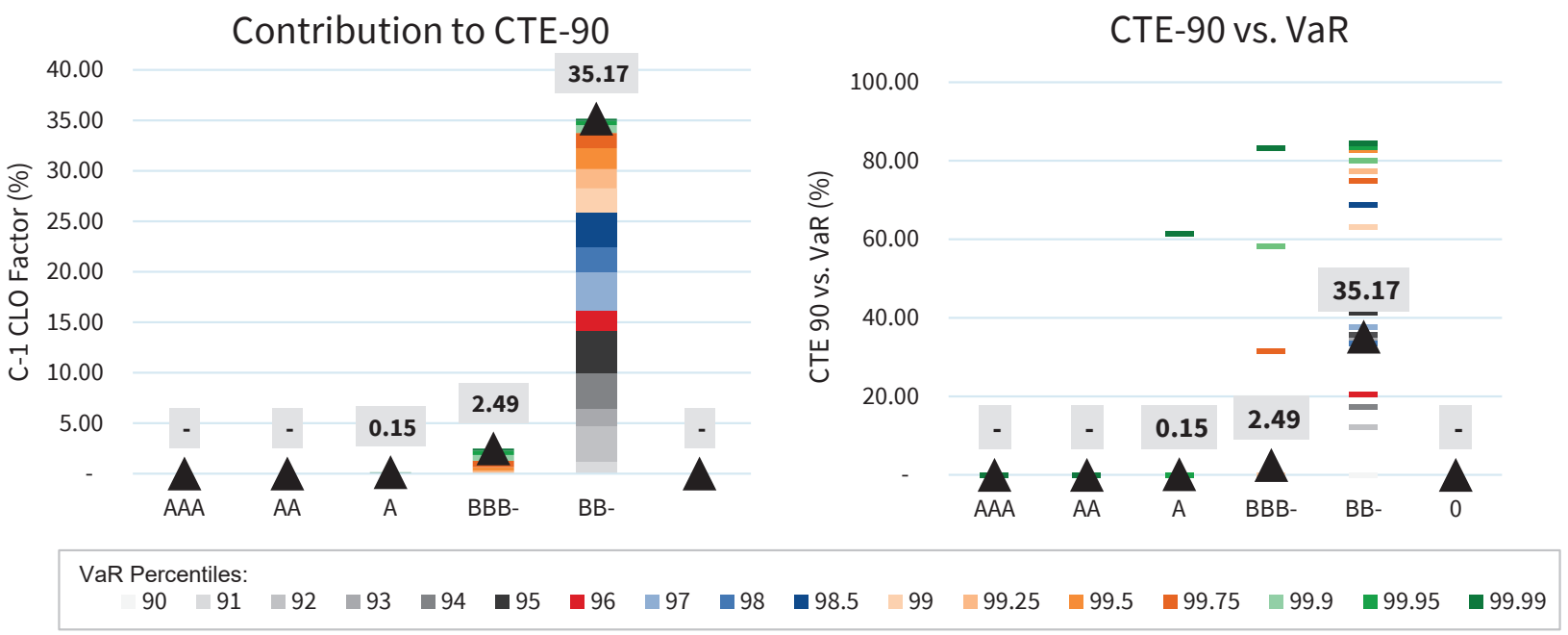
Hypothetical Results for Carlyle 2021-1, Deal ID#867578342 40



C1CS Update on CLO C-1 Factors Modeling
September 8, 2025

American Academy of Actuaries

ACLI
Financial Security for Life

August 14, 2025

Mr. Philip Barlow, Chairman
RBC Investment Risk and Evaluation Working Group
National Association of Insurance Commissioners
1100 Walnut Street, Suite 1500
Kansas City, MO 64106-2197

Re: Proposal 2025-12-IRE SVO-identified funds alignment project

Submitted Electronically

Dear Mr. Barlow:

The American Council of Life Insurers (ACLI) welcomes the opportunity to comment on the exposed proposal for the Life RBC formula to align the RBC treatment for bond funds with ACLI principles. We appreciate the Working Group's consideration of our proposed RBC principles for bond funds in developing this proposal. The candidate principles were developed to evaluate and ensure consistent RBC treatment between various fund types where the underlying holdings are bonds and currently meet the criteria for the SVO WARF methodology.

Following our review of the exposed proposal and discussion with NAIC staff, we offer the following observations and recommendations:

1. Treatment through C-1cs Rather Than C-1o
   The exposed proposal suggests that SEC registered funds designated by the SVO should be included in the preferred stock section and ultimately flow through C-1o. To better reflect the nature of these investments and formulaic complexity, ACLI recommends that SEC-registered funds designated by the SVO be treated as unaffiliated common stock and reported through C-1cs.

   This would further reduce operational complexity by not having "preferred stock categories" that are mentioned several times in the annual statements and instructions. In certain instances, the annual statements would only be referring to true preferred stock amounts while other instances would be referring to preferred stock amounts inclusive of common stock mutual funds. Reporting SEC-registered funds designated by the SVO through C-1cs would help ensure accurate reporting in all instances and simplify reporting.

American Council of Life Insurers | 101 Constitution Ave, NW, Suite 700 | Washington, DC 20001-2133

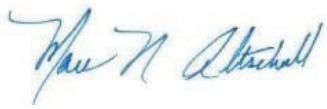
2. Creation of New Lines within C-1cs
   To facilitate accurate RBC factor application and avoid changes to the AVR schedule, ACLI suggests six new lines be created within C-1cs, corresponding to each NAIC designation. The six NAIC designations are the same for bonds on Schedule BA and preferred stock on Schedule D-2-1 and Schedule BA.

3. AVR Considerations
   The addition of lines for each of the six NAIC designations to C-1cs would alleviate the need to make any changes to the AVR schedule. However, if the existing C-1cs structure is retained without modification, AVR adjustments would be required to ensure proper update of RBC.

4. Clarification of Schedule D-2-2 Instructions
   We recommend that the instructions for Schedule D-2-2 be updated to clearly specify which subcategories (i.e., "Designation Assigned by SVO" for mutual funds, unit investment trusts, and closed-end funds) should be reported in the specific categories. This clarification will support consistent application of RBC treatment.

We appreciate the Working Group's openness to feedback and look forward to continued collaboration to ensure the RBC framework reflects the evolving investment landscape while maintaining regulatory integrity.

Sincerely,



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BCS Insurance Company

August 4, 2025

Dear Chair and members of **Property and Casualty Risk-Based Capital (E) Working Group**,

While we support the principle of developing a proposal for harmonization that includes assigning bond-like treatment to SVO designated funds, we urge the Working Group to expand this from Life companies only to all insurer types.

Industry research notes that 96% of SVO-designated mutual funds and a significant amount of private funds reside on non-life insurance balance sheets. However, for fixed income funds, as a P&C insurer, presently we are subject to punitive RBC charges, i.e., Schedule D-2 Equity charge to mutual funds and Schedule BA charge to private funds. At the same time, Life insurers have been benefiting from bond-like treatment for SVO designated private funds and will likely be able to apply the same to mutual funds given the exposure draft. This inconsistency disadvantages us as a P&C insurer.

There are capital efficiency considerations to our investment decisions. We utilize fund vehicles such as mutual funds for certain fixed income exposures due to their liquidity, diversification, operational and expense efficiencies. In our view, the ability to invest in fixed income funds and to receive fair RBC treatment commensurate with the associated SVO designation is critical for leveling market access. This is primarily true for smaller insurers, where cost or complexity issues render funds as the only reasonable vehicle, but also impacts larger insurers seeking to access more niche strategies for similar benefit.

In our opinion, this movement furthers the guiding RBC principle of “equal capital for equal risk” and agrees with the recent Principles-Based Bond Definition initiative that stressed “substance over form.” Aligning these metrics improves solvency assessments for all insurance lines, not just Life companies where this has been exposed.

Sincerely yours,

Alexander D Hudson

Vice President, Investment Services & Treasury
BCS Insurance Company

THE DOCTORS COMPANY
medical malpractice insurance

T.C. Wilson III
Chief Investment Officer

July 9, 2025

Dear Chair and members of Risk-Based Capital and Evaluation (E) Working Group members and interested parties:

While we support the principle of developing a proposal for harmonization that includes assigning bond-like treatment to SVO designated funds, we urge the Working Group to expand this from Life companies only to all insurer types.

Industry research notes that 96% of SVO-designated mutual funds and a significant amount of private funds reside on non-life insurance balance sheets. However, for fixed income funds, as a P&C insurer, presently we are subject to punitive RBC charges, i.e., Schedule D-2 Equity charge to mutual funds and Schedule BA charge to private funds. At the same time, Life insurers have been benefiting from bond-like treatment for SVO designated private funds and will likely be able to apply the same to mutual funds given the exposure draft. This inconsistency disadvantages us as a P&C insurer.

As allocators, there are capital efficiency considerations to our investment decisions. We utilize fund vehicles such as ETFs and mutual funds extensively for certain fixed income exposures due to their liquidity, diversification, operational and expense efficiencies. In our view, the ability to invest in fixed income funds and to receive fair RBC treatment commensurate with the associated SVO designation risk level is critical for leveling market access. This is primarily true for smaller insurers, where cost or complexity issues render funds as the only reasonable vehicle, but also impacts larger insurers seeking to access more niche strategies for similar benefit.

In our opinion, this movement furthers the guiding RBC principle of “equal capital for equal risk” and agrees with the recent Principles-Based Bond Definition initiative that stressed “substance over form.” Aligning these metrics improves solvency assessments for all insurance lines, not just Life companies where this has been exposed.

Sincerely,

TC Wilson
Chief Investment Officer
The Doctors Company Group

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Capital Adequacy (E) Task Force
RBC Proposal Form

☐ Capital Adequacy (E) Task Force
☒ Catastrophe Risk (E) Subgroup
☐ Variable Annuities Capital. & Reserve (E/A) Subgroup
☐ Health RBC (E) Working Group
☐ P/C RBC (E) Working Group
☐ Economic Scenarios (E/A) Subgroup
☐ Life RBC (E) Working Group
☐ Longevity Risk (A/E) Subgroup
☐ RBC Investment Risk & Evaluation (E) Working Group

DATE: 11/3/2025

CONTACT PERSON: Derek Noe
TELEPHONE: 816-783-8973
EMAIL ADDRESS: dnoe@naic.org
ON BEHALF OF: Catastrophe Risk (E) Subgroup
NAME: Wanchin Chou
TITLE: Chair
AFFILIATION: Connecticut Department of Insurance
ADDRESS: 153 Market St,
Hartford, CT 06103

FOR NAIC USE ONLY

Year 2025

DISPOSITION

ADOPTED:
☒ TASK FORCE (TF) 1st Release:11/19/2025
☒ WORKING GROUP (WG) 1st Release: 11/12/2025
☒ SUBGROUP (SG) 1st Release:11/12/2025

EXPOSED:
☐ TASK FORCE (TF) _____
☒ WORKING GROUP (WG) 1st Release: 11/3/2025
☐ SUBGROUP (SG) _____

REJECTED:
☐ TF ☐ WG ☐ SG _____

OTHER:
☐ DEFERRED TO _____
☐ REFERRED TO OTHER NAIC GROUP
☐ (SPECIFY) _____

IDENTIFICATION OF SOURCE AND FORM(S)/INSTRUCTIONS TO BE CHANGED

☐ Health RBC Blanks ☐ Property/Casualty RBC Blanks ☐ Life and Fraternal RBC Blanks
☐ Health RBC Instructions ☐ Property/Casualty RBC Instructions ☐ Life and Fraternal RBC Instructions
☐ Health RBC Formula ☐ Property/Casualty RBC Formula ☐ Life and Fraternal RBC Formula
☒ OTHER Cat Event Lists

DESCRIPTION/REASON OR JUSTIFICATION OF CHANGE(S)

2025 U.S. and non-U.S. Catastrophe Event Lists

Additional Staff Comments:

New events were determined based on the sources from Swiss Re and Aon Benfield.

** **This section must be completed on all forms.** **Revised 2-2023**

U.S. List of Catastrophes for Use in Reporting catastrophe Data in PR036 and PR100+

Type of Event	Name	Date	Location	Overall losses when occurred
Hurricane	Matthew	2016	Florida, North Carolina, South Carolina, Geor ia and Vir inia	$ 2,698,400,000
Hurricane	Hermine	2016	Florida, North Carolina, South Carolina, Geor ia and Vir inia	$ 245,640,000
Severe Convective Storm	Thunderstorm, flood, landslides	1/31/2016 - 2/1/2016	CA	25-100m
Severe Convective Storm	Thunderstorms, wind	2/19/2016 - 2/20/2016	MI, IL	100-300m
Severe Convective Storm	Thunderstorms, tornadoes, hail	2/22/2016-2/25/2016	TX, NC, LA, FL, GA, VA, NY, SC, PA, MA, AL, CT, MS, DC, DE	600m-1b
Severe Convective Storm	Thunderstorms, hail, flood	3/5/2016 - 3/11/2016	LA, TX, CA, MS, AR, TN, OK	300-600m
Severe Convective Storm	Thunderstorms, tornadoes, hail	3/13/2016 - 3/14/2016	SC, AR, NC	100-300m
Severe Convective Storm	Thunderstorms, tornadoes, hail	3/13/2016 - 3/15/2016	IL, WA, CA	100-300m
Severe Convective Storm	Thunderstorms, hail	3/17/2016 - 3/18/2016	TX, LA, MS, AR, FL, AL	600m-1b
Severe Convective Storm	Thunderstorms, hail	3/27/2016	IN	25-100m
Severe Convective Storm	Thunderstorms, hail, tornadoes, flood	3/30/2016 - 4/1/2016	TX, OK, MS, AR, AL, LA, KS	100-300m
Severe Convective Storm	Thunderstorms, hail	4/2/2016 - 4/3/2016	IN, OH, NJ, IL, PA, MD, VA, NY, DE, DC	100-300m
Severe Convective Storm	Thunderstorms, tornadoes, hail	4/25/2016 - 4/28/2016	TX, KS, MO, IN, WV, OK, IL, NC, MS	600m-1b
Severe Convective Storm	Thunderstorms, hail, tornadoes, flood	4/29/2016 - 5/3/2016	TX, AR, VA, IN, NC, MD, OK, GA, MO, IL, WV	1-3b
Severe Convective Storm	Thunderstorms, tornadoes, hail	5/7/2016 - 5/10/2016	NE, KY, TX, OK, CO, TN, KS	600m-1b
Severe Convective Storm	Thunderstorms, tornadoes, hail	5/11/2016 - 5/12/2016	MO, TX, NE, IL	600m-1b
Severe Convective Storm	Thunderstorms, hail	5/16/2016 - 5/19/2016	TX	100-300m
Severe Convective Storm	Thunderstorms, tornadoes, hail	5/21/2016 - 5/28/2016	TX, MT, KS, MO, CO	600m-1b
Severe Convective Storm	Thunderstorms, tornadoes, flood	5/29/2016 - 6/2/2016	TX	100-300m
Severe Convective Storm	Thunderstorms, hail	6/6/2016 - 6/7/2016	CO	100-300m
Severe Convective Storm	Thunderstorms, hail	6/16/2016 - 6/18/2016	VA, GA, AL, SC	100-300m
Severe Convective Storm	Thunderstorms, hail	6/16/2016 - 6/18/2016	ND, SD, MN	100-300m
Severe Convective Storm	Thunderstorms, hail, flood	7/5/2016 - 7/7/2016	MN, TN, KY, WI	100-300m
Severe Convective Storm	Thunderstorms, hail	7/7/2016 - 7/9/2016	CO, MI, NC, TN	100-300m
Severe Convective Storm	Thunderstorms, hail, tornadoes	7/13/2016 - 7/15/2016	CO, OK, IL, AR, MO, KS	300-600m
Severe Convective Storm	Thunderstorms, hail	7/20/2016 - 7/21/2016	MN	25-100m
Severe Convective Storm	Thunderstorms, hail, flood	7/30/2016 - 8/1/2016	MD, NJ, NY, PA, VA	100-300m
Severe Convective Storm	Thunderstorms, hail, tornadoes, flood	8/24/2016 - 8/25/2016	IN, OH	25-100m
Severe Convective Storm	Thunderstorms, hail, tornadoes, flood	9/19/2016 - 9/23/2016	WI, MN, IA	100-300m
Severe Convective Storm	Thunderstorms, tornadoes	11/28/2016 - 12/1/2016	TN, AL, GA, SC, MS, LA, NC	100-300m
Severe Convective Storm	Hailstorm	3/23/2016	TX	1-3b
Severe Convective Storm	Hailstorm	4/10/2016 - 4/15/2016	TX, FL	1-3b
Severe Convective Storm	Hailstorm	7/28/2016 - 7/29/2016	CO, WY	1-3b
Severe Convective Storm	Hailstorm	11/4/2016 - 11/6/2016	TX, NM	300-600m
Wildfire	Erskine Fire	6/23/16-7/11/16	Lake Isabella, Kern County, California	~26 million
Wildfire	Soberanes Fire	7/22/16-9/30/16	Soberanes Creek, Garrapata State Park, Santa Lucia Preserve, Monterey County, California	> 200 million
Wildfire	Chimney Fire	8/13/16-9/6/16	Santa Lucia Range, San Luis Obispo County, California	> 25 million
Wildfire	Clayton Fire	8/13/16-8/26/16	Lake County, California	>25 million
Wildfire	Gatlinburg Wildfire	11/29/16-12/5/16	Sevier County, Gatlinburg, Pigeon Forge, Tennessee	~637 million
Wildfire	Northern California Wildfires	10/8/17-10/31/17	Northern California	~ 11 billion
Wildfire	Southern California Wildfires	12/4/17-12/23/17	Southern California	~ 2.2 billion
Hurricane	Harvey	2017	Texas, Lousiana	25+ million
Hurricane	Jose	2017	East Coast of the United States	25+ million
Hurricane	Irma	2017	Eastern United States	25+ million
Hurricane	Maria	2017	Southeastern United States, Mid-Atlantic States	25+ million
Hurricane	Nate	2017	Louisiana, Mississippi, Alabama, Tennessee and Eastern United States	25+ million
Severe Convective Storm	Thunderstorms, tornadoes	1/1/2017 - 1/3/2017	GA, TX, AL, LA, MS	100-100m
Severe Convective Storm	Tornadoes	1/18/2017 - 1/23/2017	CA, GA, MS, TX, FL, AL, LA, SC	600m-1b
Severe Convective Storm	Thunderstorms, tornadoes, hail	2/7/2017	LA, AL, FL, MS	100-300m
Severe Convective Storm	Thunderstorms, hail, tornadoes, flood	2/19/2017 - 2/20/2017	TX	100-300m
Severe Convective Storm	Windstorm, flood	2/19/2017 - 2/21/2017	CA	25-100m
Severe Convective Storm	Thunderstorms, tornadoes, hail	2/25/2017	VA, PA	100m-300m
Severe Convective Storm	Thunderstorms, tornadoes, hail	2/28/2017 - 3/2/2017	IL, MO, IN, KY, OH, TN, GA, IA, AR, NC, VA, AL, SC, WV, MD, MI	1-3b
Severe Convective Storm	Thunderstorms, tornadoes, hail	3/6/2017 - 3/9/2017	MO, MI, NY, MN, IA, OH, IL, WI, AR, OK, NE	1-3b
Severe Convective Storm	Thunderstorms, hail	3/21/2017 - 3/22/2017	SC, TN, GA, NC	600m-1b
Severe Convective Storm	Thunderstorms, tornadoes, hail	3/28/2017 - 3/31/2017	TX, VA, NC, OK	100-300m
Severe Convective Storm	Thunderstorms, hail, tornadoes, flood	4/2/2017 - 4/3/2017	TX, GA, LA, MS, AL, SC, FL, AR, NC	100-300m

U.S. List of Catastrophes for Use in Reporting catastrophe Data in PR036 and PR100+

Type of Event	Name	Date	Location	Overall losses when occurred
Severe Convective Storm	Thunderstorms, tornadoes, hail	4/4/2017 - 4/6/2017	AL, KY, GA, VA, SC, TX, MO, NC, TN,FL, MD, OK, AR, KS, DC	600m-1b
Severe Convective Storm	Thunderstorms, tornadoes	4/10/2017 - 4/11/2017	TX, IL, IN	100-300m
Severe Convective Storm	Thunderstorms, hail, tornadoes, flood	4/21/2017 - 4/25/2017	TX, TN, OK, NC, VA, SC	600m-1b
Severe Convective Storm	Thunderstorms, tornadoes, hail	4/26/2017	TX	25-100m
Severe Convective Storm	Thunderstorms, tornadoes, hail	5/3/2017 - 5/5/2017	TX, LA, GA, VA, NC	100-300m
Severe Convective Storm	Thunderstorms, tornadoes, hail	5/15/2017 - 5/18/2017	IL, WI, MN, OK, IA, NY	600m-1b
Severe Convective Storm	Thunderstorms, tornadoes, hail	5/27/2017 - 5/28/2017	MO, TN, VA, OK, KY	300-600m
Severe Convective Storm	Thunderstorms, hail	6/2/2017 - 6/4/2017	TX	100-300m
Severe Convective Storm	Thunderstorms, tornadoes, hail	6/12/2017 - 6/14/2017	TX, WY, Midwest	600m-1b
Severe Convective Storm	Thunderstorms, tornadoes, hail	6/16/2017 - 6/19/2017	NE, IA, KS, MO, PA, IL, VA, NY	300-600m
Severe Convective Storm	Thunderstorms, tornadoes, hail	6/27/2017 - 6/29/2017	NE, IA, IL	1-3b
Severe Convective Storm	Thunderstorms, hail, tornadoes, flood	7/11/2017 - 7/12/2017	IL, MN	100-300m
Severe Convective Storm	Thunderstorms, hail	7/21/2017 - 7/23/2017	IL, KS, MO	300-600m
Severe Convective Storm	Thunderstorms, hail, tornadoes, flood	8/5/2017 - 8/8/2017	TX, OK, LA, KS, MO	100-300m
Severe Convective Storm	Thunderstorms, hail, flood	10/14/2017 - 10/15/201	IL, MO, KS	100-300m
Severe Convective Storm	Thunderstorms, hail	11/5/2017 - 11/6/2017	OH, MO	100-300m
Severe Convective Storm	Thunderstorms, tornadoes, hail	3/26/2017 - 3/28/2017	TX, OK, AL, TN, KY, MS	1-3b
Severe Convective Storm	Thunderstorms, tornadoes, hail	5/8/2017 - 5/11/2017	CO, NM, OK, TX, MO	1-3b
Severe Convective Storm	Hailstorm	6/11/2017	MN, WI	1-3b
Tropical Storm	Alberto	2018	Southeast, Midwest	25+ million
Hurricane	Lane	2018	Hawaii	25+ million
Tropical Storm	Gordon	2018	Southeast, Gulf coast of the United States, Arkansas and Missouri	25+ million
Hurricane	Florence	2018	Southeast, Mid-Atlantic	25+ million
Hurricane	Michael	2018	Southeastern and East Coasts of United States	25+ million
Wildfire	Spring Creek Fire	6/27/18-7/11/18	Spring Creek, Colorado	< 100 million
Wildfire	Carr, Mendocino California Wildfires	7/23/18-8/15/18	Northern California	>1,000 million
Wildfire	Northern California Camp Wildfire	11/8/18-11/25/18	Butte County, California	>7.5 billion
Wildfire	Southern California Woolsey Wildfires	11/8/18-11/21/18	Los Angeles andVentura County, California	2.9 billion
Severe Convective Storm		1/8/2018 - 1/10/2018	CA	<1,000m
Severe Convective Storm		2/24/2018 - 2/26/2018	KY, TN, MO, AR	<1,000m
Severe Convective Storm		3/18/2018 - 3/21/2018	TX, LA, AL, MS, GA, FL, SC	>1,000m
Severe Convective Storm		4/6/2018 - 4/7/2018	TX, LA, MS, OK	<1,000m
Severe Convective Storm		4/13/2018 - 4/17/2018	TX, OK, MO, AR, LA, MS, IA, KS, VA, NC, SC, GA, FL	<1,000m
Severe Convective Storm		4/28/2018 - 5/5/2018	KS, MO, IA, IL	>1,000m
Severe Convective Storm		5/12/2018 - 5/16/2018	Northeast, Midwest, Southern	>1,000m
Severe Convective Storm		6/3/2018 - 6/6/2018	Southwest	<1,000m
Severe Convective Storm		6/12/2018 - 6/13/2018	Midwest	<1,000m
Severe Convective Storm		6/18/2018 - 6/20/2018	Midwest	>1,000m
Severe Convective Storm		6/24/2018 - 6/26/2018	Midwest	<1,000m
Severe Convective Storm		6/29/2018 - 7/1/2018	Midwest	<1,000m
Severe Convective Storm		7/19/2018 - 7/22/2018	Midwest, Southern	>1,000m
Severe Convective Storm		7/21/2018 - 7/26/2018	Northeast	<1,000m
Severe Convective Storm		7/26/218 - 7/29/2018	Midwest, Southern	<1,000m
Severe Convective Storm		7/30/2018 - 7/31/2018	Southwest	<1,000m
Severe Convective Storm		8/6/2018 - 8/7/2018	Midwest	<1,000m
Severe Convective Storm		9/20/2018 - 9/21/2018	Midwest	<1,000m
Severe Convective Storm		10/31/2018 - 11/1/2018	Midwest	>1,000m
Severe Convective Storm		11/14/2018 - 11/16/2018	Northeast	<1,000m
Hurricane	Dorian	2019	Southeast, Mid-Atlantic	500+ million
Hurricane	Barry	2019	Southeast, Midwest, Northeast	300+ million
Tropical Storm	Imelda	2019	Plains, Southeast	25+ million
Tropical Storm	Nestor	2019	Southeast	25+ million
Tropical Storm	Olga	2019	Louisiana, Mississippi, Texas and Arkansas	25+ million
Wildfire	Saddleridge Wildfire	10/10/19-10/23/19	Sylmar, Los Angeles, Calimesa, Riverside County, California	<1,000 million
Wildfire	Kincade Wildfire	10/23/19-11/6/19	Northeast of Geyserville, Sonoma County, California	<1,000 million
Severe Convective Storm		2/1/2019 - 2/3/2019	CA	<100m
Severe Convective Storm		2/23/2019 - 2/26/2019	Midwest, Northeastern	<1,000m

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Type of Event	Name	Date	Location	Overall losses when occurred
Severe Convective Storm		2/26/2019 - 2/28/2019	CA	<100m
Severe Convective Storm		3/3/2019 - 3/4/2019	Southern	<1,000m
Severe Convective Storm		3/23/2019 - 3/25/2019	Southern	>1,000m
Severe Convective Storm		3/26/2019 - 3/27/2019	FL	<1,000m
Severe Convective Storm		4/5/2019 - 4/7/2019	Southern	<1,000m
Severe Convective Storm		4/12/2019 - 4/15/2019	Midwest, Southeast	<1,000m
Severe Convective Storm		4/17/2019 - 4/20/2019	Southern	<1,000m
Severe Convective Storm		4/23/2019 - 4/25/2019	Southern	<1,000m
Severe Convective Storm		4/30/2019 - 5/2/2019	Midwest, Southern	<1,000m
Severe Convective Storm		5/7/2019 - 5/10/2019	Southern	<1,000m
Severe Convective Storm		5/13/2019	NC	<1,000m
Severe Convective Storm		5/16/2019 - 5/17/2019	Midwest	<1,000m
Severe Convective Storm		5/17/2019 - 5/18/2019	TX	<1,000m
Severe Convective Storm		5/20/2019 - 5/22/2019	Midwest, Southern	<1,000m
Severe Convective Storm		5/24/2019 - 5/25/2019	Southern	<100m
Severe Convective Storm		5/26/2019 - 5/29/2019	Multistate	>1,000m
Severe Convective Storm		6/4/2019 - 6/6/2019	Midwest	<1,000m
Severe Convective Storm		6/9/2019 - 6/10/2019	Southern	<1,000m
Severe Convective Storm		6/15/2019 - 6/16/2019	IN	<100m
Severe Convective Storm		6/16/2019 - 6/17/2019	TX	<1,000m
Severe Convective Storm		6/23/2019 - 6/24/2019	TX	<1,000m
Severe Convective Storm		6/29/2019 - 6/30/2019	IL, NY	<100m
Severe Convective Storm		7/4/2019 - 7/5/2019	CO	<1,000m
Severe Convective Storm		7/7/2019 - 7/8/2019	Southern	<1,000m
Severe Convective Storm		7/17/2019 - 7/18/2019	MN, WY	<1,000m
Severe Convective Storm		7/19/2019 - 7/23/2019	Northeast, Midwest	<1,000m
Severe Convective Storm		7/26/2019 - 7/27/2019	MN	<1,000m
Severe Convective Storm		8/4/2019 - 8/5/2019	MN, WI	<1,000m
Severe Convective Storm		8/6/2019	ND, SD	<1,000m
Severe Convective Storm		8/10/2019 - 8/11/2019	MT	<1,000m
Severe Convective Storm		8/14/2019 - 8/18/2019	Midwest	<1,000m
Severe Convective Storm		8/25/2019 - 8/26/2019	Midwest, South	<1,000m
Severe Convective Storm		9/10/2019 - 9/11/2019	Midwest	<1,000m
Severe Convective Storm		9/27/2019 - 9/28/2019	Midwest	<100m
Severe Convective Storm		10/16/2019 - 10/17/201	Northeast	<1,000m
Severe Convective Storm		10/20/2019 - 10/21/201	Southern	>1,000m
Severe Convective Storm		10/26/2019 - 10/27/201	CA	<100m
Severe Convective Storm		10/31/2019 - 11/1/2019	Northeast, South	<1,000m
Severe Convective Storm		11/19/2019 - 11/21/201	AZ	<100m
Severe Convective Storm		11/26/2019 - 11/28/201	Midwest	<1,000m
Tropical Storm	Cristobal	2020	Southeast, Plains, Midwest	150 million
Tropical Storm	Fay	2020	Southeast, Northeast	400 million
Hurricane	Hanna	2020	Texas	350 million
Hurricane	Isaias	2020	Southeast, Mid-Atlantic, Northeast	> 3 billion
Hurricane	Laura	2020	Plains, Southeast, Mid-Atlantic	> 4 billion
Hurricane	Sally	2020	Southeast (Alabama, Mississippi, Louisiana)	> 1 billion
Tropical Storm	Beta	2020	Plains, Southeast	25+ million
Hurricane	Delta	2020	Gulf Coast of United States, Southeast, Northeast (AL, GA, NC, SC, MS, LA, TX)	> 2 billion
Hurricane	Eta	2020	Florida	>1 billion
Hurricane	Zeta	2020	Gulf coast of the United States, Southeastern United States, Mid-Atlantic	> 1.5 billion
Wildfire	Cameron Peak	08/13/20-12/02/20	Roosevelt National Forest, Larimer County, Colorado	~71 million
Wildfire	SCU Lighting Complex Wildfire	8/16/20-9/16/20	San Franciscon Bay Area, Central Valleym Santa Clara, Alameda, Contra Costa, San Joaquin, Merced, Stanislaus	<1,000 million
Wildfire	Beachie Creek Wildfire	8/16/20-10/10/20	Approx. 2 miles south of Jaw Bones flats in rugged terrain deep in the Opal Creek Wilderness.	>1,000 million
Wilfire	CZU Lightning Complex Wildfire	8/16/20-9/22/20	San Mateo and Santa Cruz Counties, California	>1,000 million
Wildfire	LNU Lightning Complex WildFire	8/17/20-10/2/20	Lake, Napa, Sonoma, Solano, and Yolo Counties, California	> 1,000 million
Wildfire	Carmel Fire	8/18/20-9/4/20	Carmel Valley, California	<1,000 milion

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Type of Event	Name	Date	Location	Overall losses when occurred
Wildfire	North Complex Fire	8/18/20-10/12/20	Plumas and Butte Counties, California	<1,000 milion
Wildfire	Creek Fire	9/4/20-10/12/20	Fresno and Madera Counties, California	<1,000 milion
Wildfire	Bobcat Fire	9/6/20-10/23/20	Central San Gabriel Mountains, in and around the Angeles National Forest California	< 1,000 million
Wildfire	Babb Road Fire	9/7/20-9/18/20	Malden and Pine City, Palouse County of Eastern Washington	<1,000 million
Wildfire	Almeda Fire	9/7/20-9/16/20	Jackson County, Oregon	<1,000 milion
Wildfire	Holiday Farm Fire	9/7/20-10/3/20	Willamette National Forest	<1,000 milion
Wildfire	Echo Mountain Complex Fire	9/7/20-9/23/20	north of Lincoln City, Oregon	<100 milion
Wildfire	Riverside FIre	9/8/20-10/3/20	Valley Drive between Misty Ridge Drive and Mitchell Avenue, Oregon	<100 milion
Wildfire	Slater Fire	9/8/20-10-9/20	Northern California and Southern Oregon	<100 million
Wildfire	Glass Fire	9/27/20-10/19/20	Napa and Sonoma Counties, California	> 1,000 million
Wildfire	East Troublesome Fire	10/14/20-11/9/20	Grand County, Colorado	~543 million
Severe Convective Storm		1/10/2020 - 1/12/2020	Midwest, Southern	<1,000m
Severe Convective Storm		2/5/2020 - 2/8/2020	South, Northeast	<1,000m
Severe Convective Storm		2/8/2020 - 2/11/2020	AZ, CA	<100m
Severe Convective Storm		3/2/2020 - 3/4/2020	Midwest, Southern	>1,000m
Severe Convective Storm		3/17/2020 - 3/20/2020	Midwest, Southern	<1,000m
Severe Convective Storm		3/27/2020 - 3/30/2020	Midwest. Southern	>1,000m
Severe Convective Storm		4/7/2020 - 4/9/2020	Northeast, Midwest	>1,000m
Severe Convective Storm		4/10/2020 - 4/14/2020	Northeast, Southern	>1,000m
Severe Convective Storm		4/18/2020 - 4/20/2020	Southern	<1,000m
Severe Convective Storm		4/21/2020 - 4/24/2020	Southern	>1,000m
Severe Convective Storm		4/24/2020 - 4/26/2020	Southern	<1,000m
Severe Convective Storm		4/27/2020 - 4/30/2020	South, Northeast	<1,000m
Severe Convective Storm		5/2/2020 - 5/3/2020	Southern	<1,000m
Severe Convective Storm		5/4/2020 - 5/5/2020	Southern	>1,000m
Severe Convective Storm		5/7/2020 - 5/8/2020	Southern	<1,000m
Severe Convective Storm		5/13/2020 - 5/15/2020	Midwest, Northeast	<1,000m
Severe Convective Storm		5/16/2020 - 5/21/2020	South, Northeast	<1,000m
Severe Convective Storm		5/20/2020 - 5/24/2020	Southern	>1,000m
Severe Convective Storm		5/25/2020 - 5/26/2020	TX	<100m
Severe Convective Storm		5/27/2020 - 5/28/2020	TX	>1,000m
Severe Convective Storm		6/2/2020 - 6/3/2020	Northeast	<1,000m
Severe Convective Storm		6/4/2020	SD	<1,000m
Severe Convective Storm		6/5/2020 - 6/11/2020	Midwest	<1,000m
Severe Convective Storm		6/6/2020 - 6/9/2020	Southern	<1,000m
Severe Convective Storm		6/19/2020 - 6/21/2020	TX	<1,000m
Severe Convective Storm		7/5/2020 - 7/7/2020	Northeast	<1,000m
Severe Convective Storm		7/10/2020 - 7/12/2020	Midwest	<1,000m
Severe Convective Storm		7/17/2020 - 7/19/2020	Midwest	<1,000m
Severe Convective Storm		7/25/2020 - 7/27/2020	TX	<1,000m
Severe Convective Storm		8/4/2020 - 8/5/2020	CO	<1,000m
Severe Convective Storm		8/8/2020 - 8/11/2020	Midwest	>1,000m
Severe Convective Storm		8/13/2020 - 8/17/2020	Midwest, Southern	<1,000m
Severe Convective Storm		8/26/2020 - 8/28/2020	Northeast	<1,000m
Severe Convective Storm		8/29/2020 - 8/30/2020	TX	<100m
Severe Convective Storm		9/5/2020 - 9/6/2020	IA, MN	<1,000m
Severe Convective Storm		9/7/2020 - 9/9/2020	ID, UT	<1,000m
Severe Convective Storm		10/7/2020 - 10/8/2020	Northeast	<1,000m
Severe Convective Storm		10/25/2020 - 10/28/202	CA, OK	<1,000m
Severe Convective Storm		11/10/2020 - 11/12/202	Midwest, Southern	<1,000m
Severe Convective Storm		11/15/2020 - 11/16/202	Northeast	<1,000m
Severe Convective Storm		11/30/2020 - 12/1/2020	Northeast	<100m
Tropical Storm	Claudette	2021	Gulf Coast of the United States, Georgia, Carolinas	> 350 million
Hurricane	Elsa	2021	East Coast of the United States	1.2 billion
Tropical Storm	Fred	2021	Eastern United States (particularly Florida and North Carolina)	1.3 billion
Hurricane	Henri	2021	Northeastern United States	550 million

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Type of Event	Name	Date	Location	Overall losses when occurred
Hurricane	Ida	2021	Gulf Coast of the United States (especially Louisana), East Coast of the United States (especially the Northeastern United States)	44 billion
Tropical Storm	Nicholas	2021	LA, TX	>1.1b
Tropical Storm	Wanda	2021	Southern United States, Mid-Atlantic United States, Northeastern United States	>200 million
Wildfire	Bootleg Wildfire	7/17/21-8/6/21	Northwest of Beatty, Oregon	<1,000 million
Wildfire	Dixie Wildfire	7/14/21-10/5/21	Butte, Plumas, Tehama, Lassen and Shasta Counties, California	>1,000 million
Wildfire	Caldor Fire	8/14/21-10/5/21	El Dorado National Forest and other areas of the Sierra Nevada in El Dorado, Amador, and Alpine County, Calfornia	<1,000 million
Wildfire	Corkscrew Fire	8/15/21-8/30/21	Ford, WA; Tum Tum, Springdale, City of Deer Park, Loon Lake, Clayton, H395, Scoop Mt	<100 million
Wilfire	Marshall Fire	12/30/21-1/1/22	Boulder County, Colorado	~ 2 billion
Severe Convective Storm		1/11/2021 - 1/13/2021	Western	<1,000m
Severe Convective Storm		1/17/2021 - 1/20/2021	CA	<1,000m
Severe Convective Storm		1/25/2021 - 1/26/2021	Southern	<100m
Severe Convective Storm		1/24/2021 - 1/29/2021	AZ, CA	<1,000m
Severe Convective Storm		2/25/2021 - 2/26/2021	TX	<1,000m
Severe Convective Storm		3/9/2021 - 3/11/2021	MN	<100m
Severe Convective Storm		3/9/2021 - 3/11/2021	Midwest, Southern	<1,000m
Severe Convective Storm		3/22/2021 - 3/23/2021	TX	<1,000m
Severe Convective Storm		3/24/2021 - 3/26/2021	Northeast, Midwest	>1,000m
Severe Convective Storm		3/27/2021 - 3/29/2021	Northeast, Midwest, Southern	<1,000m
Severe Convective Storm		4/6/2021 - 4/8/2021	TX	<1,000m
Severe Convective Storm		4/9/2021 - 4/11/2021	Southern	<1,000m
Severe Convective Storm		4/9/2021 - 4/14/2021	LA, TX	<1,000m
Severe Convective Storm		4/15/2021 - 4/16/2021	TX	>1,000m
Severe Convective Storm		4/27/2021 - 5/2/2021	Southern, Northeast	>1,000m
Severe Convective Storm		5/3/2021 - 5/4/2021	Southern, Northeast	<1,000m
Severe Convective Storm		5/7/2021 - 5/11/2021	Southern, Midwest	<1,000m
Severe Convective Storm		5/14/2021 - 5/19/2021	Southern, Midwest	<1,000m
Severe Convective Storm		5/26/2021 - 5/28/2021	South, Northeast	<1,000m
Severe Convective Storm		5/25/2021 - 5/26/2021	Northeast	<1,000m
Severe Convective Storm		5/29/2021 - 5/31/2021	Midwest	<1,000m
Severe Convective Storm		6/7/2021 - 6/9/2021	TX	<100m
Severe Convective Storm		6/11/2021 - 6/14/2021	Midwest, Northeast	<1,000m
Severe Convective Storm		6/17/2021 - 6/20/2021	Midwest, Northeast	>1,000m
Severe Convective Storm		6/24/2021 - 7/1/2021	Midwest	<1,000m
Severe Convective Storm		7/8/2021 - 7/10/2021	Midwest	<1,000m
Severe Convective Storm		7/9/2021 - 7/11/2021	Southern	<1,000m
Severe Convective Storm		7/22/2021 - 7/25/2021	AZ, NM	<1,000m
Severe Convective Storm		7/24/2021	MI	<100m
Severe Convective Storm		7/26/2021 - 7/27/2021	MN, WI	<1,000m
Severe Convective Storm		7/28/2021 - 7/29/2021	Midwest, Northeast	<1,000m
Severe Convective Storm		8/1/2021	TX	<100m
Severe Convective Storm		8/7/2021 -8/9/2021	Midwest	<100m
Severe Convective Storm		8/10/2021 - 8/13/2021	Midwest, Northeast	<1,000m
Severe Convective Storm		8/10/2021 - 8/16/2021	AZ	<1,000m
Severe Convective Storm		8/17/2021 - 8/19/2021	Western	<1,000m
Severe Convective Storm		8/21/2021 - 8/22/2021	TN	<100m
Severe Convective Storm		8/26/2021 - 8/28/2021	Midwest	<1,000m
Severe Convective Storm		9/6/2021 - 9/7/2021	Midwest	<1,000m
Severe Convective Storm		9/15/2021 - 9/17/2021	Midwest	<100m
Severe Convective Storm		9/24/2021 - 9/29/2021	Southern	<100m
Severe Convective Storm		9/30/2021 - 10/2/2021	TX	<100m
Severe Convective Storm		10/4/2021 - 10/7/2021	Southern	<1,000m
Severe Convective Storm		10/10/2021 - 10/11/2021	Southern	<1,000m
Severe Convective Storm		10/10/2021 - 10/12/2021	Western	<100m
Severe Convective Storm		10/24/2021 - 10/28/2021	Western, Southern	<1,000m
Severe Convective Storm		10/24/2021 - 10/25/2021	Midwest	<100m

U.S. List of Catastrophes for Use in Reporting catastrophe Data in PR036 and PR100+

Type of Event	Name	Date	Location	Overall losses when occurred
Severe Convective Storm		10/24/2021 - 10/25/2021	Northeast	<100m
Severe Convective Storm		11/11/2021 - 11/13/2021	WA	<100m
Severe Convective Storm		11/14/2021 - 11/16/2021	TX	<100m
Severe Convective Storm		11/10/2021 - 11/11/2021	TX	<100m
Severe Convective Storm		12/10/2021 - 12/11/2021	South, Eastern, Central	>1,000m
Severe Convective Storm		12/13/2021 - 12/16/2021	TX	>1,000m
Severe Convective Storm		12/17/2021 - 12/18/2021	TX	<100m
Severe Convective Storm		12/21/2021	FL	<100m
Wildfire	Calf Canyon/Hermits Peak Fire	4/6/22-8/22/22	San Miguel County, Mora County, Taos County	> 25 million
Wildfire	McKinney Fire	7/29/22-9/7/222	Siskiyou County, Northern California	> 25 million
Wildfire	Cedar Creek Fire	8/1/22-present	Central Oregon	> 25 million
Wildfire	Mosquito Fire	9/6/22- present	Northern California, Placer County, El Dorado County	> 25 million
Hurricane	Hurricane Fiona	9/18/22-9/20/22	PR	>3 billion
Hurricane	Ian	9/23/22-10/2/22	Florida and the Carolinas, FL, GA, NC, SC, VA	>110 billion
Hurricane	Hurricane Nicole	11/9/22-11/11/22	FL, GA, SC	>1 billion
Severe Convective Storm		1/21/2022 - 1/22/2022	GA, SC	>25m
Severe Convective Storm		2/21/2022 - 2/22/2022	MO, KY	>500m
Severe Convective Storm		3/5/2022 - 3/7/2022	MO, IA, IL, WI, IN	>250m
Severe Convective Storm		3/11/2022 - 3/13/2022	FL, GA	>50m
Severe Convective Storm		3/14/2022 - 3/16/2022	TX, FL, GA, SC	>100m
Severe Convective Storm	New Orleans Tornado	3/21/2022 - 3/23/2022	TX, LA, MS, AL, OK	>250m
Severe Convective Storm		3/29/2022 - 3/31/2022	TX, OK, AR, LA, AL, MS, FL, TN	>500m
Severe Convective Storm		4/2/2022 - 4/4/2022	MS, LA, AR, TX, OK	>50m
Severe Convective Storm		4/3/2022 - 4/7/2022	MS, AL, GA, FL, SC, NC, TN	>500m
Severe Convective Storm		4/10/2022 - 4/14/2022	MO, AR, TX, LA, IA, NE, KS, MS, AL, TN, KY, MN, WI	>1b
Severe Convective Storm		4/15/2022 - 4/17/2022	AR, MS, LA, FL, AL	>250m
Severe Convective Storm		4/21/2022 - 4/24/2022	TX, OK, KS, NE, SD, IA	>250m
Severe Convective Storm	Andover Tornado	4/26/2022 - 4/30/2022	NC, VA, KS, MO, NE, OK	>100m
Severe Convective Storm	Tornadoes, Hail	5/1/2022 - 5/3/2022	TX, OK, AR, KS, KY, OH,	>500m
Severe Convective Storm	Tornadoes, Hail	5/4/2022 - 5/6/2022	TX, OK, MS, FL, GA, SC, NC, VA, TN, KY	>250m
Severe Convective Storm	Thunderstorms, Hail	5/9/2022 - 5/10/2022	MN, WI, TX	>1b
Severe Convective Storm	Upper Midwest Derecho	5/11/2022 - 5/12/2022	ND, SD, MN, IA, NE	>1b
Severe Convective Storm	Tornadoes, Hail	5/13/2022 - 5/16/2022	IL, MO, TX, OK, KA, NE, NC, NY, NH, CO	>250m
Severe Convective Storm	Tornadoes, Hail	5/17/2022 - 5/19/2022	KS, NE, OK, MO, IL, KY	>25m
Severe Convective Storm		5/19/2022 - 5/22/2022	MN, WI, MI, IN, OH, AR, TX	>1b
Severe Convective Storm	Tornadoes, Hail	5/23/2022 - 5/25/2022	TX, NC, SC, MS, IL	>50m
Severe Convective Storm	Tornadom, Hail	5/29/2022	NE, SD, MN	>25m
Severe Convective Storm	Tornadoes, Hail	5/30/2022 - 6/2/2022	MN, IA, NE, SD, KS, OK, TX, VA, OH	>250m
Severe Convective Storm		6/1/2022 - 6/3/2022	NM, CO, TX	>25m
Severe Convective Storm	Tornadoes, Hail	6/4/2022 - 6/8/2022	KS, NE, MO, IN, OH, OK, AR, TX	>1b
Severe Convective Storm	Tornadoes, Hail	6/11/2022 - 6/17/2022	KS, NE, SD, MN, OH, KY, MI, IN, WI, VA, NC, SC	>1b
Severe Convective Storm	Tornadoes, Hail	6/22/2022 - 6/23/2022	OH, KS, MN, KY, ND, SD	>25m
Severe Convective Storm	South Dakota Derecho	7/1/2022 - 7/7/2022		>250m
Severe Convective Storm		7/7/2022 - 7/13/2022	MT, ND, SD, MN, NE, IA	>250m
Severe Convective Storm		7/21/2022 - 7/25/2022	ND, SD, NE, KS, IL, IN, OH, WI, IA, MN, MI	>500m
Severe Convective Storm		8/1/2022 - 8/4/2022	WV, PA, IL, WI, MN, MI, MD	>25m
Severe Convective Storm		8/11/2022 - 8/12/2022	WA, OR, ID, MT	>25m
Severe Convective Storm		8/20/2022 - 8/21/2022	IA, IL, IN, OH, MO	>250m
Severe Convective Storm		8/27/2022 - 8/29/2022	MN, IA, IL, MI	>25m
Severe Convective Storm		8/28/2022 - 9/6/2022	TX, OK, KS	>100m
Severe Convective Storm		9/18/2022 - 9/21/2022	IL, MO, IA, WI, MI	>250m
Severe Convective Storm		10/1/2022 - 10/4/2022	CO, UT, AZ	>25m
Severe Convective Storm		10/15/2022 - 10/26/202	OK, AR, NE, ND, MN	>100m
Severe Convective Storm		10/24/2022 - 10/25/202	TX	>100m
Severe Convective Storm	Southern Plains Tornadoes	11/4/2022 - 11/5/2022	TX, LA, OK, AR	>100m
Severe Convective Storm		11/4/2022 - 11/5/2022	WI, IA, IL	>25m
Severe Convective Storm		11/11/2022	TX, VA	>25m

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Type of Event	Name	Date	Location	Overall losses when occurred
Severe Convective Storm	Western PA Hail	11/27/2022	PA	>25m
Severe Convective Storm		11/29/2022 - 11/30/202	LA, MS, AL, GA, FL, AR, TN, KY	>25m
Severe Convective Storm	Mid-December Tornadoes	12/13/2022 - 12/14/202	TX, OK, LA, AR, MS, AL, FL, GA	>100m
Wildfire	Hawaii Wildfire	8/8/23-8/17/23	Hawaii	> 25 million
Hurricane	Hurricane Hilary	8/17/23-8/22/23	West, Southwest United States	> 25 million
Wildfire	Washington Wildfire	8/18/23-8/22/23	Washington	> 25 million
Hurricane	Hurricane Idalia	8/27/23-8/31/23	Southeastern United States	> 25 million
Hurricane	Hurricane Lee	9/14/23-9/17/23	Northeast United States	> 25 million
Tropical Storm	Ophelia	9/22/23-9/26/23	East Coast of the United States	> 25 million
Severe Convective Storm	Selma Tornado	1/12/2023	MS, AL, GA, TN, KY, NC, SC	>250m
Severe Convective Storm	Houston Tornado	1/24/2023	TX, LA	>100m
Severe Convective Storm		2/7/2023	TX, LA, MS	>100m
Severe Convective Storm		2/15/2023 - 2/17/2023	OK, AR, MO, MS, TN	>100m
Severe Convective Storm	Southern Plains Derecho	2/26/2023 - 2/28/2023	TX, OK, KS, MO, IL, IN, OH	>250m
Severe Convective Storm		3/1/2023 - 3/3/2023	TX, AR, OK, LA, KY, IN, OH	>1b
Severe Convective Storm	Dallas Hail	3/16/2023 - 3/17/2023	TX, OK	>250m
Severe Convective Storm	Mississippi Tornado	3/23/2023 - 3/28/2023	TX, OK, MO, IL, AR, TN, MS, AL, GA, LA	>1b
Severe Convective Storm		3/30/2023 - 4/1/2023	NE, IA, MO, IL, WI, AR, TN, KY, IN, OH, MI, NJ, MD	>1b
Severe Convective Storm		4/2/2023	TX, LA, MS	>25m
Severe Convective Storm		4/3/2023 - 4/5/2023	IA, WI, IL, MO, KY, IN, OH, TX	>1b
Severe Convective Storm	Missouri Tornadoes	4/14/2023 - 4/16/2023	KS, NE, MO, IL, AR, TX, LA	>250m
Severe Convective Storm	Oklahoma Tornadoes	4/18/2023 - 4/22/2023	KS, NE, IA, WI, IL, OK, TX	>1b
Severe Convective Storm		4/23/2023 - 4/27/2023	TX, FL	>500m
Severe Convective Storm		4/28/2023 - 5/1/2023	TX	>500m
Severe Convective Storm		5/2/2023 -5/9/2023	TX, NE, MO, IL, IA, IL, KY, KS	>1b
Severe Convective Storm		5/9/2023 - 5/16/2023	CO, KS, TX, OK, LA, NE, IA, KY	>1b
Severe Convective Storm		5/17/2023 - 5/20/2023	TX	>1b
Severe Convective Storm		5/22/2023 - 5/26/2023	TX, NM, CO	>250m
Severe Convective Storm		5/23/2023 - 5/25/2023	ID, MT	>25m
Severe Convective Storm		5/31/2023 - 6/4/2023	NM, TX, TN, PA	>100m
Severe Convective Storm		6/5/2023 - 6/8/2023	KS, TX, TN, VA	>100m
Severe Convective Storm		6/9/2023 - 6/14/2023	TX, OK, AR, MS, AL, TN, GA, LA	>1b
Severe Convective Storm		6/15/2023 - 6/19/2023	TX, OK, LA, AMS, AL, FL, KS, AR, MO	>1b
Severe Convective Storm		6/15/2023 - 6/16/2023	OH, MI, VA	>250m
Severe Convective Storm		6/21/2023 - 6/26/2023	TX, CO, NM, WY, NE, SD, IA, MN, AR, IN, KY	>3b
Severe Convective Storm	Midwest Derecho	6/28/2023 - 7/4/2023	CO, KS, NE, IL, MO, IA, IN, KY, PA	>1b
Severe Convective Storm		7/3/2023 - 7/9/2023	SC, NC, VA	>250m
Severe Convective Storm		7/5/2023 - 7/10/2023	TX, OK, CO, KS, NE	>1b
Severe Convective Storm	Illinois Tornadoes	7/9/2023 - 7/14/2023	NE, IA, SD, IL, MI, MN	>500m
Severe Convective Storm		7/15/2023 - 7/19/2023	KS, MO, NE	>250m
Severe Convective Storm		7/19/2023 - 7/21/2023	MI, OH, PA, TN, AL	>1b
Severe Convective Storm		7/19/2023 - 7/20/2023	MN	>25m
Severe Convective Storm		7/25/2023 - 7/31/2023	MN, WI, IA, IL, IN, OH, MO, KS, NE	>500m
Severe Convective Storm	Arizona Duststorm	7/25/2023 - 7/30/2023	NY, NH, VT, PA, MA	>25m
Severe Convective Storm		8/4/2023 - 8/8/2023	MO, KS, CO, IL, NC, PA, NE	>500m
Severe Convective Storm		8/10/2023 - 8/11/2023	SD, NE, MN, IA, MO, WI, MI	>1b
Severe Convective Storm		8/12/2023 - 8/15/2023	OH, PA, NY, KY, TN, NC, SC, GA	>25m
Severe Convective Storm		8/22/2023 - 8/24/2023	MI, OH,PA	>250m
Severe Convective Storm		8/31/2023 - 9/2/2023	AZ, CA, NV	>25m
Severe Convective Storm		9/9/2023 - 9/11/2023	KS, NE, TX, OK	>250m
Severe Convective Storm		9/12/2023 - 9/14/2023	TX	>25m
Severe Convective Storm		9/23/2023 - 9/24/2023	MN, SD, NE, KS, MO, OK, TX	>500m
Severe Convective Storm		9/26/2023 - 9/27/2023	MO, IL, KY	>25m
Severe Convective Storm		10/2/2023 - 10/5/2023	TX, KS, NE, OK	>250m
Severe Convective Storm		10/23/2023 - 10/24/202	WI, MN	>100m
Severe Convective Storm	Tornados	10/24/2023 - 10/26/202	TX	>100m
Severe Convective Storm	Tornadoes, Hail	12/8/2023 - 12/10/2023	LA, TN, KY, MS, AL, FL, NC	>250m

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Type of Event	Name	Date	Location	Overall losses when occurred
Severe Convective Storm		1/8/24-1/10/24	Multistate	> 25 million
Winter Storm		1/11/24-1/18/24	Multistate	> 25 million
Severe Convective Storm		1/19/24-1/22/24	Multistate	> 25 million
Severe Convective Storm	Jan Southern SCS	1/22/24-1/26/24	Multistate	> 25 million
Severe Convective Storm	Early Feb Outbreak	2/8/24-2/13/24	Midwest, Southeast	> 25 million
Severe Convective Storm	Polar Front & SCS	2/26/24-2/29/24	Multistate	> 25 million
Severe Convective Storm	Western US Storm	2/28/24-3/4/24	Multistate	> 25 million
Wildfire	Smokehouse Creek Fire	2/26/24-3/9/24	Texas	> 25 million
Severe Convective Storm		2/28/24-3/2/24	Ohio, Pennsylvania	> 25 million
Severe Convective Storm	Early March Storm Complex	3/6/24-3/11/24	Southeast, Midwest	> 25 million
Winter Storm	Colorado Snow Storm	3/13/24-3/15/24	Colorado	> 25 million
Severe Convective Storm	Mid-March SCS Outbreak	3/12/24-3/17/24	Northeast	> 25 million
Severe Convective Storm	San Antonio Hail & SCS	3/21/24-3/23/24	Texas	> 25 million
Severe Convective Storm	Late March Southern SCS	3/24/24-3/28/24	California, Southeast	> 25 million
Severe Convective Storm	Early April Outbreak	3/31/24-4/4/24	California, Midwest	> 25 million
Severe Convective Storm	Southern SCS & Floods	4/6/24-4/12/24	Multistate	> 25 million
Severe Convective Storm	April Mid-Atlantic SCS	4/14/24-4/16/24	US	> 25 million
Severe Convective Storm	April Plains & Midwest SCS	4/15/24-4/16/24	Texas, Missouri	> 25 million
Severe Convective Storm	Central & Eastern Outbreak	4/17/24-4/20/24	Southeast	> 25 million
Severe Convective Storm	Texas April SCS	4/19/24-4/21/24	Texas	> 25 million
Severe Convective Storm	Late April Central SCS	4/25/24-4/29/24	Midwest, Southwest	> 25 million
Severe Convective Storm	Early May Hail	4/30/24-5/2/24	Kansas, Oklahoma, Texas	> 25 million
Severe Convective Storm	Texas SCS	5/3/24-5/5/24	Texas	> 25 million
Severe Convective Storm	Early May SCS	5/6/24-5/10/24	Multistate	> 25 million
Severe Convective Storm	Southern SCS	5/11/24-5/14/24	Southwest, Southeast	> 25 million
Severe Convective Storm	Houston Derecho	5/15/24-5/19/24	Southwest, Southeast	> 25 million
Severe Convective Storm	Mid-May SCS	5/17/24-5/22/24	Multistate	> 25 million
Severe Convective Storm	Late May Plains Outbreak	5/23/24-5/24/24	Southwest, Midwest	> 25 million
Severe Convective Storm	Late May Central & East SCS	5/25/24-5/26/24	Multistate	> 25 million
Severe Convective Storm	Dallas SCS	5/27/24-5/29/24	Southwest	> 25 million
Severe Convective Storm	Denver SCS	5/30/24-6/1/24	Southwest, Southeast	> 25 million
Severe Convective Storm	TX Hail & MD Tornadoes	6/2/24-6/5/24	Multistate	> 25 million
Severe Convective Storm	Early June Outbreak	6/6/24-6/10/24	Multistate	> 25 million
Severe Convective Storm	Colorado June SCS	6/9/24-6/10/24	Colorado	> 25 million
Severe Convective Storm	Midwest Mid-June Outbreak	6/12/24-6/13/24	Southwest, Midwest	> 25 million
Severe Convective Storm	Central & East Mid-June SCS	6/14/24-6/18/24	Multistate	> 25 million
Wildfire	South Fork & Salt fires	6/17/24-6/25/24	New Mexico	> 25 million
Severe Convective Storm	Central & East Late-June SCS	6/19/24-6/23/24	Multistate	> 25 million
Tropical Storm	Trophical Storm Alberto	6/19/24-6/20/24	Texas, Louisiana	> 25 million
Severe Convective Storm		6/24/24-6/26/24	Multistate	> 25 million
Severe Convective Storm	US Lat-June Outbreak	6/27/24-6/30/24	Multistate	> 25 million
Severe Convective Storm	Early July Plains Outbreak	7/1/24-7/4/24	Multistate	> 25 million
Severe Convective Storm	Southeast SCS	7/1/24-7/4/24	Multistate	> 25 million
Hurricane	Hurricane Beryl	7/1/24-7/12/24	Texas, Louisiana, the Ohio Valley, and the Lower Peninsula of Michigan	> 25 million
Severe Convective Storm	Early July Central Outbreak	7/6/24-7/7/24	Multistate	> 25 million
Severe Convective Storm	Chicago Derecho & SCS	7/13/24-7/18/24	Multistate	> 25 million
Severe Convective Storm	Arizon Monsoon SCS	7/14/24-7/15/24	Arizona	> 25 million
Severe Convective Storm	Late July Central Outbreak	7/19/24-7/20/24	Multistate	> 25 million
Severe Convective Storm	July Southwest Monsoon	7/15/24-7/21/24	Multistate	> 25 million
Severe Convective Storm	Late July US SCS Outbreak	7/24/24-8/1/24	Multistate	> 25 million
Wildfire	Park Fire California	7/24/24-8/20/24	California	> 25 million
Severe Convective Storm	Early Aug Eastern Outbreak	8/2/24-8/3/24	Multistate	> 25 million
Severe Convective Storm	Minnesota Aug SCS	8/3/24-8/5/24	Minnesota	> 25 million
Hurricane	Hurricane Debby	8/3/24-8/14/24	Florida, Georgia, and the Carolinas	> 25 million
Severe Convective Storm	Northeast July SCS	8/4/24-8/6/24	Northeast	> 25 million
Severe Convective Storm	Mid August SCS	8/12/24-8/19/24	Multistate	> 25 million
Severe Convective Storm	August Northern Outbreak	8/22/24-8/30/24	Multistate	> 25 million

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Hurricane	Hurricane Francine	9/9/24-9/14/24	Mississippi and Louisiana	> 25 million
Severe Convective Storm	Oklahoma City Hail & SCS	9/21/24-9/24/24	Oklahoma	> 25 million
Hurricane	Hurricane Helene	9/24/24-9/29/24	Florida, Carolinas, Georgia, Alabama, Tennessee, Kentucky, Virginia, West Virginia, Illinois, Indiana, Ohio	> 25 million
Hurricane	Hurricane Milton	10/5/24-10/12/24	Florida, Georgia	> 25 million
Severe Convective Storm		11/2/24-11/4/24	South Central US	>25 million
Wildfire	Wildland Fire Mountain Fire	11/6/24-11/14/24	California	>25 million
Winter storm		11/19/25-11/24/24	Multistate	>25 million
Wind and thunderstorm		12/13/24-12/16/24	Northeast, West Coast	>25 million
Wind and thunderstorm		12/26/24-12/29/24	South	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes	1/5/2025	Arkansas, Louisiana, Alabama	>25 million
Wildfire	Palisades Fire	1/7/25-1/28/25	California	>1 billion
Wildfire	Eaton Fire	1/7/25-1/27/25	California	>1 billion
Severe Convective Storm	Wind	1/7/25-1/9/25	California	>25 million
Severe Convective Storm	Flooding, Freezing, Ice, Snow, Wind	1/9/25-1/11/25	Georgia, Texas	>25 million
Severe Convective Storm	Flooding, Snow, Wind	1/11/25-1/13/25	Alaska	>25 million
Severe Convective Storm	Flooding, Freezing, Ice, Snow, Wind	1/20/25-1/22/25	Florida, Georgia, Louisiana, Texas	>25 million
Severe Convective Storm	Flooding, Freezing, Ice, Snow, Wind	1/21/25-1/25/25	Illinois, Maryland, New Jersey, Pennsylvania, Ohio, Virginia	>25 million
Severe Convective Storm	Flooding, Snow, Wind	1/30/25-2/7/25	California, Nevada, Oregon, Washington	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes	2/5/25-2/7/25	Kentucky, Tennesse	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes	2/11/25-2/13/25	Virginia	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes	2/12/25-2/17/25	Alabama, California, Conneticut, Georgia, Kentucky, Massachusetts, Maryland, North Carolina, New Jersey, New York, Pennsylvainia, Tennesse	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes	2/15/25-2/16/25	Louisiana, Mississippi, Alabama, Georgia, Tennesse, North Carolina, South Carolina	>25 million
Severe Convective Storm		2/21/25-2/25/25	California, Oregon, Washington	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes	3/3/25-3/6/25	Oklahoma, Texas, Louisiana, Mississippi, Alabama, Georgia, Tennesse, North Carolina, Virginia	>25 million
Severe Convective Storm		3/7/25-3/10/25	Florida, Georgia, Texas	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	3/14/25-3/17/25	Missouri, Iowa, Illinois, Indiana, Alabama, Louisiana, Mississippi, Tennesse, West Virginia, Pennsylvania, New York, Ohio	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	3/18/25-3/20/25	Arkansas, Illinois, Indiana, Missouri, Nebraska, New Mexico, Texas	>25 million
Severe Convective Storm	Hail	3/23/25-3/24/25	Texas, Louisiana, Mississippi, Alabama, Tennesse	>25 million
Severe Convective Storm		3/25/25-3/27/25	Texas	>25 million
Severe Convective Storm		3/28/25-3/31/25	Arkansas, Florida, Georgia, Indiana, Kentucky, Louisiana, Michigan, Missouri, Ohio, Tennesse, Texas	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	4/1/25-4/7/25	Texas, Oklahoma, Kansas, Nebraska, Missouri, Arkansas,Louisiana, Mississippi, Tennesse, Kentucky, Illinois, Indiana, Michigan, Ohio, West Virginia, Georgia, Alabama, South Carolina, North Carolina	>25 million
Severe Convective Storm	Wind, Hail	4/10/25-4/11/25	Tennesse, Alabama, Georgia	>25 million
Severe Convective Storm	Wind, Hail	4/14/25-4/15/25	Kentucky, West Virginia, Virginia	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	4/16/25-4/21/25	Nebraska, Iowa, Missouri, Wisconsin, Oklahoma, Texas, Illinois	>25 million
Severe Convective Storm		4/21/25-4/26/25	Iowa, Kansas, Louisiana, Nebraska, New Mexico, Oklahoma, Texas	>25 million
Severe Convective Storm		4/27/25-5/1/25	Kansas, Missouri, New York, Ohio, Oklahoma, Pennsylvania, Texas	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	5/1/25-5/3/25	Nebraska, Minnesota, Wisconsin, Texas, Oklahoma, Kansas, Missouri, Ohio, Pennsylvania, Illinois, Arkansas, Tennesse, Mississippi, Alabama, Kentucky, Georgia, New Jersey, New York, Massachusetts, Conneticut	>25 million
Severe Convective Storm	Wind, Thunderstorms, Hail	5/4/25-5/8/25	Texas, Louisiana	>25 million
Severe Convective Storm	Wind, Thunderstorms, Hail	5/9/25-5/14/25	Alabama, Florida, Georgia, Maryland, North Carolina, Pennsylvania, South Carolina, Virginia	>25 million
Severe Convective Storm		5/15/25-5/16/25	Illinois, Indiana, Kentucky, Maryland, Michigan, Missouri, North Carolina, Ohio, Pennsylvania, Texas, Virginia, Wisconsin	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	5/17/25-5/20/25	Alabama, Arkansas, Georgia, Kansas, Missouri, Mississippi, Oklahoma, Tennesse, Texas	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	5/22/25-5/27/25	Texas, Oklahoma, Mississippi Tennesse, Alabama, Georgia, Louisiana	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes	5/28/25-5/30/25	West Virginia, Virginia, South Carolina	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	6/1/25-6/7/25	Texas, Colorado, Kansas, Oklahoma, Nebraska, Iowa, Minnesota, Missouri, Illinois	>25 million

U.S. List of Catastrophes for Use in Reporting catastrophe Data in PR036 and PR100+

Type of Event	Name	Date	Location	Overall losses when occurred
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	6/5/25-6/8/25	Texas, Oklahoma, Arkansas, Tennesse, Alabama, Mississippi, Georgia, South Carolina, Virginia, Missouri	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	6/8/25-6/12/25	Illinois, Texas	>25 million
Wildfire	Rowena Fire	6/11/25-6/30/25	Oregon	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	6/15/25-6/20/25	Montana, Minnesota, South Dakota, Nebraska, Kansas, Oklahoma, Illinois, Indiana, Ohio, West Virginia, Virginia, Maryland, North Dakota	>25 million
Severe Convective Storm	Wind, Thunderstorms, Hail	6/23/25-6/26/25	Georgia, South Carolina, North Carolina, Florida	>25 million
Severe Convective Storm	Wind, Thunderstorms, Hail	6/27/25-7/3/25	Pennsylvania, New York, New Jersey, Conneticut, Vermont, New Hampshire	>25 million
Severe Convective Storm		7/3/25-7/7/25	Texas	>25 million
Severe Convective Storm		7/4/25-7/7/25	Colorado	>25 million
Tropical Storm	Tropical Storm Chantal	7/5/25-7/7/25	Florida, North Carolina, Virginia	500 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	7/8/25-7/13/25	Texas, Oklahoma, Virginia, Maryland, Deleware, New Jersey, Pennsylvania, South Carolina, Niorth Dakota, South Dakota, Missouri, Iowa,Illinois	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	7/14/25-7/19/25	Nebraska, South Dakota	>25 million
Severe Convective Storm		7/20/25-7/30/25	Florida, Georgia, Illinois, Maryland, Michigan, North Carolina, New Jersey, Ohio, Texas, Virginia	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	7/26/25-7/30/25	Minnesota, Iowa, South Dakota, Nebraska	>25 million
Severe Convective Storm		7/31/25-8/3/25	Texas, Wyoming	>25 million
Severe Convective Storm	Wind, Thunderstorm, Hail	8/4/25-8/12/25	North Dakota, Montana, Nebraska, Kansas, Colorado, Wisconsin	>25 million
Severe Convective Storm	Wind, Thunderstorm, Hail	8/14/25-8/20/25	South Dakota, Minnesota, Iowa, Wisconsin, Illinois	>25 million
Wildfire	TCU September Lightning Complex	9/2/25-9/13/2025	California	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	9/3/25-9/5/25	Kansas, Texas	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	9/6/2025	Massachusetts, Conneticut, New Hampshire, New York	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	9/8/25-9/9/25	Texas, Oklahoma, Kansas	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	9/14/2025	North Dakota, South Dakota, Nebraska	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	9/15/25-9/21/25	Minnesota, Nebraska, Texas	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	9/25/25-9/28/25	Arizona	>25 million
Severe Convective Storm		10/11/25-10/13/25	Arizona	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	10/11/25-10/14/25	Conneticut, Massachusetts, North Carolina, New Jersey, New York, South Carolina, Virginia	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	10/18/2025	Louisiana, Mississippi	>25 million
Severe Convective Storm	Wind, Thunderstorms, Tornadoes, Hail	10/23/25-10/26/25	Texas, Oklahoma, Florida	>25 million

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2016	Hurricane	08/28/16	09/06/16	Hurricane Hermine		Dominican Republic, Cuba, The Bahamas	N/A	N/A	> 25 million
2016	Tro ical C clone	02/16/16	02/22/16	TC Winston		South Pacific Islands	N/A	N/A	> 25 million
2016	Earth uake	02/06/16		Earth uake	Taiwan	Asia	N/A	N/A	> 25 million
2016	Earth uake	01/03/16		Kaohsiun EQ	India, Ban ladesh, M anmar	Asia	N/A	N/A	> 25 million
2016	Earth uake	02/14/16		Christchurch EQ	New Zealand	Oceania	N/A	N/A	> 25 million
2016	Earth uake	04/14/16	04/16/16	Kumamoto EQs	Ja an	Asia	N/A	N/A	> 25 million
2016	Earth uake	04/16/16		Ecuador EQ	Ecuador	South America	N/A	N/A	> 25 million
2016	Tro ical C clone	05/14/16	05/23/16	CY Roanu	Sri Lanka, india, Ban ladesh, China	Asia	N/A	N/A	> 25 million
2016	Earth uake	08/24/16		Ital EQ	Ital	Euro e	N/A	N/A	> 25 million
2016	Tro ical C clone	09/14/16	09/16/16	STY Meranti	China, Taiwan, Phili ines	Asia	N/A	N/A	> 25 million
2016	Tro ical C clone	07/08/16	07/12/16	STY Ne artak	China, Taiwan	Asia	N/A	N/A	> 25 million
2016	Tro ical C clone	09/26/16	09/29/16	TY Me i	Taiwan, China	Asia	N/A	N/A	> 25 million
2016	Earth uake	09/10/16		Ka era EQ	Tanzania, U anda	Africa	N/A	N/A	> 25 million
2016	Tro ical C clone	08/29/16	09/01/16	TY Lionrock	China, Ja an, South Korea	Asia	N/A	N/A	> 25 million
2016	Tro ical C clone	09/19/16	09/22/16	TY Malakas	Ja an, China	Asia	N/A	N/A	> 25 million
2016	Tro ical C clone	08/18/16	08/20/16	TS Dianmu	China, Vietnam	Asia	N/A	N/A	> 25 million
2016	Tro ical C clone	07/31/16	08/03/16	TY Nidia	China, Philli ines Vietnam	Asia	N/A	N/A	> 25 million
2016	Tropical Cyclone	08/02/16	08/10/16	HU Earl	Belize, Mexico, Carribbean Islands	Caribbean Islands, Mexico and Central America	N/A	N/A	> 25 million
2016	Tro ical C clone	08/22/16	08/23/16	TS Mindulle	Ja an	Asia	N/A	N/A	> 25 million
2016	Tro ical C clone	09/06/16	09/08/16	HU Newton	Mexico	North America non-U.S.	N/A	N/A	> 25 million
2016	Tro ical C clone	10/04/16	10/07/16	STY Chaba	Ja an, Korea	Asia	N/A	N/A	> 25 million
2016	Tro ical C clone	10/16/16	10/22/16	STY Haima	Philli ines, China	Asia	N/A	N/A	> 25 million
2016	Tro ical C clone	10/14/16	10/20/16	TY Sarika	Philli ines, China, Vietanm	Asia	N/A	N/A	> 25 million
2016	Earth uake	10/26/16		Central Ital EQ	Ital	Euro e	N/A	N/A	> 25 million
2016	Earth uake	10/27/16		Central Ital EQ	Ital	Euro e	N/A	N/A	> 25 million
2016	Earth uake	10/21/16		Tottori	Ja an	Asia	N/A	N/A	> 25 million
2016	Hurricane	09/28/16	10/10/16	Hurricane Matthew		Carribbean Islands and Eastern Canada	N/A	N/A	> 25 million
2016	Hurricane	08/28/16	09/06/16	Hurricane Hermine		Dominican Republic, Cuba, The Bahamas	N/A	N/A	> 25 million
2016	Wildfire	01/06/16		Waroona-Yarloo Bushfire	Western Australia				~$71.25m
2016	Wildfire	05/01/16	05/26/16	Canada Wildfire	Canada	Fort McMurra			$3.52b
2016	Wildfire	11/22/16	11/27/16	November 2016 Israel Fires	Israel	Various regions in Israel, mainly in Haifa, Judaean Mountains and the Sharon Plain			>$25m
2016	Severe Convective Storm	02/22/16	02/25/16	Thunderstorms, tornadoes	Canada				600m-1b
2016	Severe Convective Storm	03/08/16	03/11/16	Thunderstorms, hail	UAE, Oman				100m
2016	Severe Convective Storm	04/20/16	04/25/16	Thunderstorm, hail	China				25+m
2016	Severe Convective Storm	06/23/16		Thunderstorm, hail, tornado	China				100+m
2016	Severe Convective Storm	06/23/16		Thunderstorms, hail	Netherlands				527m
2016	Severe Convective Storm	06/24/16	06/25/16	Thunderstorm, hail, flood	Germany				253m
2016	Severe Convective Storm	06/28/16	06/30/16	Thunderstorms, hail, tornado, flood	Canada				64m
2016	Severe Convective Storm	07/15/16	07/16/16	Thunderstorms, hail, flood	Canada				56m
2016	Severe Convective Storm	07/18/16	07/20/16	Thunderstorm, hail, tornadoes	Canada				74m
2016	Severe Convective Storm	07/30/16	08/01/16	Thunderstorms, hail, tornadoes, flood	Canada				327m
2016	Severe Convective Storm	11/11/16		Thunderstorms, hail	Australia				197m
2016	Severe Convective Storm	07/22/16		Hailstorm	Canada				56m
2017	Earth uake	01/18/17		Earth uake	Ital	Euro e	N/A	N/A	> 25 million
2017	Earth uake	01/28/17		Earth uake	China	Asia	N/A	N/A	> 25 million

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2017	Earth uake	02/10/17		Earth uake	Phili ines	Asia	N/A	N/A	> 25 million
2017	Earth uake	03/27/17		Earth uake	China	Asia	N/A	N/A	> 25 million
2017	Cyclone	03/28/17	04/05/17	CY Debbie	Australia	Queensland, New South Wales, New Zealand	N/A	N/A	> 25 million
2017	Earth uake	05/11/17		Earth uake	China	Asia	N/A	N/A	> 25 million
2017	T hoon	07/29/17	07/31/17	TY Nesat & TS Haitan	China, Taiwan, Phili ines	Asia	N/A	N/A	> 25 million
2017	T hoon	08/07/17	08/09/17	T hoon Noru	Ja an	Asia	N/A	N/A	> 25 million
2017	Earth uake	08/08/17		Earth uake	China	Asia	N/A	N/A	> 25 million
2017	T hoon	08/23/17	08/24/17	TY Hato	China	Macau, Hon Kon	N/A	N/A	> 25 million
2017	T hoon	08/25/17	08/28/17	TY Pakhar	China	Asia	N/A	N/A	> 25 million
2017	Hurricane	08/25/17	09/02/17	Hurricane Harvey		Caribbean Islands and Central America	N/A	N/A	> 25 million
2017	Hurricane	08/30/17	09/16/17	Hurricane Irma		Caribbean Islands and Ca e Verde	N/A	N/A	> 25 million
2017	Hurricane	09/05/17	09/26/17	Hurricane Jose		Caribbean Islands and Eastern Canada	N/A	N/A	> 25 million
2017	Hurricane	09/16/17	10/03/17	Hurricane Maria		Caribbean Islands, UK, Francs and S ain	N/A	N/A	> 25 million
2017	Earth uake	09/07/17		Earth uake		Mexico, Guatemala	N/A	N/A	> 25 million
2017	Earth uake	09/19/17		Earth uake	Mexico	Mexico Cit	>200	N/A	> 25 million
2017	Hurricane	10/04/17		Hurricane Nate		Central America, Cayman Islands, Cuba Yucatan Peninsula	N/A	N/A	> 25 million
2017	Wildfire	06/06/17		Kn sna Fires	South Africa	Kn sna re ion of the Western Ca e			~$146m
2017	Wildfire	07/01/17	08/01/17	British Columnbia Wildfires	Canada	British Columbia			>$78m
2017	Wildfire	10/15/17	10/16/17	Iberian Wildfires	Portugal	Northern Portugal and Northwestern S ain			~$210m
2017	Severe Convective Storm	02/01/17	02/02/17	Windstorm Kurt, Live, Marcel	France, S ain				86m
2017	Severe Convective Storm	02/23/17	02/24/17	Windstorm Thomas	UK, German , Bel ium, Netherlands, Ireland				292m
2017	Severe Convective Storm	03/06/17	03/07/17	Windstorm Zues	France				341m
2017	Severe Convective Storm	03/08/17	03/09/17	Windstorm	Canada				84m
2017	Severe Convective Storm	05/23/17	05/24/17	Thunderstorms, hail, flood	Canada				52m
2017	Severe Convective Storm	08/06/17	08/10/17	Thunderstorms, hail, flood	Ital				168m
2017	Severe Convective Storm	10/05/17		Windstorm Xavier	German , Poland, Czech Re ublic, Netherlands				420m
2017	Severe Convective Storm	10/09/17	10/10/17	Thunderstorms, hail, flood	South Africa				81m
2017	Severe Convective Storm	10/16/17	10/18/17	Windstorm	Canada				87m
2017	Severe Convective Storm	10/29/17		Windstorm Herwart	Germany, Austria, Denmark, Poland, Czech Republic, Slovakia, Hun ar				390m
2017	Severe Convective Storm	12/19/17		Thunderstorms, hail, flood	Australia				296m
2017	Severe Convective Storm	02/18/17		Hailstorm	Australia				400m
2017	Severe Convective Storm	06/22/17	06/23/17	Hailstorm Paul, Hailstorm Rasmund	Germany, Hungary				721m
2017	Severe Convective Storm	06/24/17	06/28/17	Thunderstorms, hail, flood	Ital				132m
2017	Severe Convective Storm	07/21/17	07/27/17	Hailstorm	Switzerland				88m
2017	Severe Convective Storm	07/27/17		Thunderstorms, hail, flood	Turke				185m
2018	Earth uake	02/06/18		Earth uake	Taiwan				> 25 million
2018	Earth uake	02/16/18		Earth uake	Mexico				> 25 million
2018	C clone	02/09/18	02/20/18	CY Gita	Ton a, Fi i, Samoa, New Zealand				> 25 million
2018	Earth uake	02/26/18		Earth uake	Pa ua New Guinea				> 25 million
2018	Earth uake	03/05/18		Earth uake	Pa ua New Guinea				> 25 million
2018	C clone	03/17/18		CY Marcus					> 25 million
2018	Tro ical Storm	05/23/18	05/27/18	Tro ical Storm Mekunu	Yamen, Oman , Saudi Arabia				> 25 million
2018	Tropical Storm	06/02/18	06/07/18	Tropical Storm Ewiniar	Vietnam, China, Taiwan, Philippines and Ryukyu Islands	Guangdong Province, Jiangxi, Fujian, Zhejiang Provinces, and Hainan Island.			> 25 million
2018	Earth uake	06/18/18		Earth uake	Ja an				> 25 million
2018	Super Typhoon	07/10/18	07/12/18	STY Maria	China, Taiwan, Guam and Japan	Fujian province, Yantze River Basin, Ja an's R uk u Islands			> 25 million

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2018	Tro ical Storm	07/17/18	07/24/18	TS Sonh-Tinh	Vietnam, China, Loas	Ja an, Russian Far East			> 25 million
2018	Tropical Storm	07/22/18	07/25/15	TS Ampil	China	Jiangsu, Zhejiang, Shandong, and Hebei			> 25 million
2018	T hoon	07/27/18	08/03/18	TY Jon dari	Ja an, China				> 25 million
2018	Earth uake	08/05/15	08/09/18	Earth uake	Indonesia				> 25 million
2018	Tropical Storm	08/09/18	08/15/18	TS Yagi	Philippines, China	Zhejiang, Anhui, Jiangsu and Shandon Provinces.			> 25 million
2018	Tro ical Storm	08/13/18	08/19/18	TS Bebinca	China	Hon Kon , Guan don and Hainan			> 25 million
2018	Typhoon	08/16/18	08/18/18	TY Rumbia	China	Shanghai, Jiangsu, Zhehiang, Anhui, Shandon and Henan			> 25 million
2018	Typhoon	08/23/18	08/25/18	TY Soulik	Japan, South Korea, China and Russia	Haenam County, South Jeolla Province			> 25 million
2018	Typhoon	09/04/18	09/05/18	RY Jebi	Japan, Mariana Islands, Taiwan, Japan, Russian Far East and Artic				> 25 million
2018	Earth uake	09/06/18		Earth uake	Ja an	Hokkaido			> 25 million
2018	Super Typhoon	09/15/18	0918/18	STY Mangkhut	N. Mariana Islands, Philippines, China and Hong Kong				> 25 million
2018	Hurricane	Leslie	09/23/18	Hurricane Leslie	Azores, Bermuda, Europe	Azores, Bermuda, Madeira, Iberian Peninsula, France			> 25 million
2018	Hurricane	10/07/18	10/16/18	Hurricane Michael	Central American, Yucatan Peninsula, Cayman Islands, Cuba, Atlantic, Canad				> 25 million
2018	Wildfire	May-18	Aug-18	Sweden Wildfires	Sweden	ranging from north of Arctic Circle to the sourthern Count of Scania.			>$87m
2018	Wildfire	Jul-18		Greece Wildfires	Greece	Attica, Greece			~38.1m
2018	Severe Convective Storm	01/01/18		Windstorm In mar	France				<226m
2018	Severe Convective Storm	01/03/18		Windstorm Burglind	Austria, Belgium, France, Germany, Ireland, Luxembour , Netherlands, Switzerland, U.K.				1020m
2018	Severe Convective Storm	01/17/18	01/18/18	Windstorm Friederike	Belgium, France, Germany, Great Britain, Netherlands, Ital , Central Euro e				2,100m
2018	Severe Convective Storm	01/23/18	01/24/18	Windstorm Geor ina	Ireland, Norwa , U.K.				<226m
2018	Severe Convective Storm	09/19/18	09/20/18	Windstorm Dorcas-Elena	Ireland, Norwa , U.K.				<226m
2018	Severe Convective Storm	09/23/18		Windstorm Fabienne	German , Austria, Switzerland				<226m
2018	Severe Convective Storm	04/10/18	04/11/18	Tornadoes	New Zealand				51m
2018	Severe Convective Storm	May	June		Central/western Europe				900m
2018	Severe Convective Storm	12/20/18		Hailstorm	Australia				492m
2019	C clone	05/03/19	05/05/19	C clone Fani	India, Ban ladesh				>500 million
2019	Earth uake	06/17/19		Earth uake	China				> 25 million
2019	Tro ical Storm	08/01/19	08/08/19	Tro ical Storm Wi ha	China, Vietnam				> 25 million
2019	T hoon	08/09/19	08/11/19	T hoon Lekima	China				> 855 million
2019	T hoon	08/15/19	08/16/19	T hoon Krosa	Ja an				>25 million
2019	Hurricane	08/31/19	09/07/19	Hurricane Dorian	Caribbean, Bahamas, Canada				>1 billion
2019	T hoon	09/05/19	09/08/19	T hoon Lin lin	Ja an, China, Korea				>5.78 billion
2019	T hoon	09/08/19	09/09/19	T hoon Faxai	Ja an				> 7 billion
2019	Hurricane	09/19/19	09/22/19	Hurricane Humberto	Bermuda				>25+ million
2019	Hurricane	09/17/19	09/26/19	Hurricane Lorenzo	Portu al				>25+ million
2019	Earth uake	11/26/19		Earth uake	Albania				>25+ million
2019	C clone	11/08/19	11/11/19	C clone Matmo Bulbul	India, Ban ladesh				>25+ million
2019	T hoon	10/01/19	10/02/19	T hoon Ha ibis	Ja an				> 7 billion
2019	Earth uake	12/18/19		Earth uake	Phili ines				>25+ million
2019	Wildfire	Sep-19	Mar-20	Australian Bushfires	New South Wales, Queensland, Victoria, South Australia, Western Australia, Tasmania and Northern Territor				~910 million
2019	Severe Convective Storm	03/09/19	03/10/19	Windstorm Dragi-Eberhard	Belgium. France, UK, Germany, Czech Republic, Poland, Slovakia, Netherlands, Luxembour				851m
2019	Severe Convective Storm	06/20/19	06/23/19	Windstorm	Ital				277m
2019	Severe Convective Storm	07/08/19	07/10/19	Windstorm	Ital				165m
2019	Severe Convective Storm	11/17/19		Sunshine Coast Hailstorm	Australia				112m

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2019	Severe Convective Storm	12/10/19	12/22/19	Ewindstorm Elsa-Fabien	S ain, Portu al, France				149m
2019	Severe Convective Storm	06/10/19	06/13/19	Euro ean Hailstorm	German , Poland, Slvenia, Czech Re ublic				830m
2020	Earth uake	03/22/20		Earth uake	Croatia				>25+ million
2020	C clone	04/01/20	04/11/20	C clone Harold	Solomon Islands, Canuatu, Fi i, Ton a				> 25+ million
2020	Tro ical Storm	05/31/20		Tro ical Storm Amanda	El Salvador, Guatemala, Honduras				> 25+ million
2020	Tro ical Storm	06/01/20	06/05/20	Tro ical Storm Cristobal	Mexico, Guatemala, El Salvador				150 million
2020	Hurricane	07/25/20	07/27/20	Hurricane Hanna	Mexico				350 million
2020	Hurricane	07/28/20	08/01/20	Hurricane Isaias	Caribbean, Canada				> 3 billion
2020	Hurricane	08/22/20	08/25/20	Hurricane Laura	Caribbean				> 4 billion
2020	T hoon	05/15/20	05/22/20	T hoon Am han	India, Ban ladesh, Sri Lanka				15 billion
2020	Tro ical Storm	06/03/20	06/04/20	Tro ical Storm Nisar a	India				> 25+ million
2020	T hoon	08/03/20	08/04/20	T hoon Ha u it	China, Taiwan				> 100+ million
2020	Hurricane	10/05/20	10/12/20	Hurricane Delta	Jamaica, Nicaragua, Cayman Island, Yucatan Peninsula				> 2 billion
2020	Hurricane	10/24/20	10/30/20	Hurricane Zeta	Cayman Islands, Jamaica, Central America, Yucatan Peninsula, Ireland, United Kin dom				> 1.5 billion
2020	C clone	04/01/20	04/11/20	C clone Harold	Solomon Islands, Canuatu, Fi i, Ton a				> 25+ million
2020	Hurricane	10/31/20	11/14/20	Hurricane Eta	Colombia, Jamaica, Central America, Cayman Islands, Cuba, The Bahamas				> 7.9 billion
2020	Hurricane	11/14/20	11/19/20	Hurricane Iota	ABC Islands, Colombia, Jamaica, Central America				> 1.4 billion
2020	T hoon	11/22/20	11/23/20	T hoon Goni	Phili ines, Vietnam, Cambodia, Laos				> 400+ million
2020	T hoon	11/08/20	11/15/20	T hoon Vamco	Phili ines, Vietnam, Laos, Thailand				> 400+ million
2020	Wildfire	10/04/20		Lake Ohau Fire	New Zealand	Northwest of Lake Ohau Villa e			~$25m
2020	Severe Convective Storm	01/20/20		Hailstorm	Australia				1,250m
2020	Severe Convective Storm	02/08/20	02/11/20	Windstorm Sabine/Ciara	Austria, Belgium, Switzerland. Germany, Denmark, France, UK, Ireland, Luxembourg, Netherlands, Norwa , Sweden				2,200m
2020	Severe Convective Storm	02/15/20	02/17/24	Windstorm Victoria-Dennis	Belgium, Demark, France, Germany, Ireland, Luxembour , Netherlands, Norwa , Sweden, UK				372m
2020	Severe Convective Storm	09/26/20	09/27/20	Windstorm Odette	Belgium				28+m
2020	Severe Convective Storm	09/30/20	10/03/20	Windstorm Alex-Brigitte	UK, Spain, Portugal, France, Italy, Austria, Poland, Czech Re ublic				340m
2020	Severe Convective Storm	10/31/20		South East Queensland Hailstorm	Australia				905m
2021	Wildfire	02/05/21		Perth Hills Wildfire	Australia	Shire of Mundaring, Shire of Chittering, Shire of Northam City of Swan			~$63m
2021	Earth uake	01/14/21	01/14/21	West Sulawesi	Indonesia				> 58.1 million
2021	Earthquake	02/13/21	02/13/21	Fukushima Prefecture Offshore	Japan				1.3 billion
2021	Tro ical C clone	05/17/21		Toro ical C clone Tautae	India				> 25+ million
2021	Tro ical Storm	06/19/21	06/23/21	Tro hical Storm Claudette	Oaxaca, Veracruz, Atlantic Canada				> 25+ million
2021	Earth uake	06/21/21	06/21/21	China	Yunnan Dali				> 25+ million
2021	Earth uake	06/21/21	06/21/21	China	Southern Qin hai				> 25+ million
2021	Hurricane	07/01/21	07/14/21	Elsa	Lesser Antilles, Greater Antilles, Venezuela, Colombia, Atlantic Canada, Greenland, Iceland				50 million
2021	Typhoon	07/16/21	07/31/21	In-fa (Fabian)	Philippines, Ryukyu Islands, Taiwan, China, North Korea				> 25+ million
2021	Trophical Storm	08/11/21	08/20/21	Fred	Lesser Antilles, Greater Antilles, Southern Quebec, The Maritimes				25 million
2021	Hurricane	08/13/21	08/21/21	Grace	Lesser Antilles, Greater Antilles, Yucatan Peninsula, Central Mexico				513 million
2021	Earth uake	08/14/21	08/14/21		Haiti				1 billion
2021	Hurricane	08/26/21	09/04/21	Ida	Venezuela, Colombia, Jamaica, Cayman Islands, Cuba, Atlantic Canada				> 250 million
2021	Earth uake	09/07/21	09/07/21	Guerrero	Mexico				200 million
2021	Earth uake	09/16/21			China				> 25+ million

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2021	Hurricane	09/12/21	09/18/21	Nicholas	Yucatan Peninsula, Tamauli as				1.1 billion
2021	Hurricane	09/10/21	09/11/21	Larr	Canada				80 million
2021	Cyclone	10/02/21	10/04/21	Cyclone Shaheen	Oman, Iran, India, Pakistan, United Arab Emirates, Saudi Arabia, Yemen				> 25+ million
2021	Earth uake	10/07/21	10/07/21		Ja an				> 25+ million
2021	Tro ical Storm	10/10/21	10/14/21	Tro ical Storm Kom asu	Phili ines, Hon Kon , China				245 million
2021	Earth uake	10/16/21	10/16/21		Indonesia				> 25+ million
2021	Tro ical C clone	10/24/21	11/02/21	A ollo	Ital , Malta, Tunisia, Al eria, Lib a, Turke				> 25+ million
2021	Tro ical Storm	10/31/21	11/07/21	Wanda	Atlantic Canada, Bermuda, Azores				> 25+ million
2021	Earth uake	11/14/21	11/14/21		Iran				> 25+ million
2021	Tro ical C clone	12/14/21	12/18/21	Rai Odette	Caroline Islands, Palau, Phili ines				> 25+ million
2021	Severe Convective Storm	01/08/21	01/10/21	Windstorm Filomena	S ain				259m
2021	Severe Convective Storm	01/18/21	01/20/21	Windstorm Christo h	UK, Norwa				106-159m
2021	Severe Convective Storm	03/10/21	03/13/21	Windstorm Klaus-Luis	France, Belgium, UK, Ireland, Germany, Netherlaands, Luxembour				192m
2021	Severe Convective Storm	10/20/21	10/23/21	Windstorm Aurore	France, Belgium, Germany, Poland, Luxembourg, Czech Re ublic				362m
2021	Severe Convective Storm	11/26/21	11/28/21	Windstorm Arwen	UK				330-396m
2021	Severe Convective Storm	06/18/21	07/01/21	Europe Hailstorm	Austria, Czech Republic, Germany, Poland, Switzerland, Slovakia, France, Ital				2,132m
2021	Severe Convective Storm	06/24/21		Tronado	Czech Re ublic				200m
2021	Severe Convective Storm	10/28/21	10/29/21	Hail	Australia				733m
2022	Wildfire	01/15/22	02/28/22	Corrientes	Corrientes Province, Ar entina				> 25+ million
2022	Earth uake	03/16/22		Fukushima Earth uake	Ja an				2.8 billion
2022	Tro ical Storm	04/08/22	04/12/22	Me i	Phili ines				>25+ million
2022	Typhoon	08/28/22	09/07/22	Hinnamnor	Japan, Taiwan, Philippines, South Korea, Russian, Far East				>25+ million
2022	Earth uake	09/05/22		Ludin Earth uake	Ludin Count in Sichuan rovince				>25+ million
2022	Hurricane	09/14/22	09/28/22	Fiona	Leeward Islands, Puerto Rico, Dominican Republic, Lucayan Archipelago, Bermuda, Eastern Canada, Saint Pierre and Miquelon, Greenland				660 million
2022	Hurricane	09/23/22	10/02/22	Ian	Trinidad and Tobago, Venezuela, Colombia, ABC Islands, Jamaica, Ca man Islands, Cuba				> 110 billion
2022	Hurricane	10/07/22	10/10/22	Julia	Trinidad and Tobago, Venezuela, ABC islands, Colombia, Nicaragua, El Salvador, Honduras, Guatemala, Panama, Mexico				>400 million
2022	Severe Convective Storm	01/16/22	01/17/22	Windstorm Hannelore	Norway, Sweden, Denmark, Poland, Finland, Lithuania, Liechtenstein				>25m
2022	Severe Convective Storm	01/29/22	01/30/22	Windstorms Malik, Nadia, Valtteri	Denmark, Germany, Sweden, Austria, Czech Republic, UK, Norway, Poland, Slovakia, Lithuania, Latvia				>100m
2022	Severe Convective Storm	02/06/22	02/07/22	Windstorm Roxana	German , France, UK, Bel ium				>25m
2022	Severe Convective Storm	02/16/22	02/21/22	Windstorms Dudley, Eunice, Franklin	Germany, Belgium, Netherlands, Luxembourg, UK, Ireland, France, Poland, Czech Republic, Austria, Denmark, Switzerland				>1b
2022	Severe Convective Storm	04/06/22	04/07/22	Windstorm Nasim	German , Bel ium, France, UK, Netherlands				>25m
2022	Severe Convective Storm	05/20/22		Emmelinde	France, German				>100m
2022	Severe Convective Storm	05/22/22	05/25/22	Finja	France, Italy, Austria, Hungary, Switzerland, Slovenia				>100m
2022	Severe Convective Storm	06/02/22	06/06/22	Leocardia, May	France, Switzerland, Germany, Slovenia, Austria, Czech Re ublic, Hun ar				>250m
2022	Severe Convective Storm	06/19/22	06/24/22	Petra, Qiara	France, Germany, Switzerland, Italy, Czech Republic, Poland				>1b
2022	Severe Convective Storm	06/26/22	06/29/22	Rebecca, Scarlett	France, Czech Republic, Germany, Italy, Poland, Netherlands, Austria				>250m
2022	Severe Convective Storm	06/30/22	07/01/22	Ulrike	France, German , Poland				>25m

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2022	Severe Convective Storm	07/20/22		Carolin	Switzerland, France, Denmark, Austria, Poland				>25m
2022	Severe Convective Storm	08/17/22	08/21/22	Karin, Lavinia	France, Ital , Austria, Switzerland, Slovenia,				>100m
2022	Severe Convective Storm	05/21/22		Southern Canada Derecho	Canada				>250m
2022	Severe Convective Storm	07/18/22	07/21/22		Canada				>25m
2023	Wildfire	02/01/23	03/06/23		Chile				>25 million
2023	Earth uake	02/06/23	02/20/23		Turke , S ria				> 25 million
2023	C clone	02/12/23	02/17/23	Gabrielle	New Zealand				> 25 million
2023	T hoon	05/23/23	05/31/23	Mawar	Guam				> 25 million
2023	Earth uake	06/16/23		France Earth uake	France				> 25 million
2023	Wildfire	08/15/23	09/21/23	Kelowna Wildfire	Canada				> 25 million
2023	Wildfire	08/24/23	09/30/23	Bush Creek Wildfire	Canada				> 25 million
2023	Earth uake	09/08/23			Morocco				> 25 million
2023	T hoon	07/26/23	08/01/23	Doksuri	Phili ines, Taiwan, China, Vietnam				> 25 million
2023	T hoon	08/26/23	09/03/23	Saola	Eastern Asoa				> 25 million
2023	T hoon	09/03/23	09/07/23	Haikui	Phili ines, Taiwan, China				> 25 million
2023	T hoon	09/27/23	10/11/23	Koinu	China, Ja an, Phili ines				>25 million
2023	Hurricane	10/22/23	10/25/23	Otis	Southern Mexico, rimaril Guerrero				> 25 million
2023	Earth uake	12/18/23		Jishishan Earth uake	China				> 25 million
2023	Severe Convective Storm	01/15/23	01/18/23	Windstorm Gerard/Gero	Belgium, Switzerland, Czech Republic, Germany, France, UK				>25m
2023	Severe Convective Storm	02/16/23	02/18/23	Windstorm Otto/Ulf	German , Denmark, UK, Norwa , Poland, Sweden				>25m
2023	Severe Convective Storm	03/07/23	03/10/23	Windstorm Larisa/Diethelm	Austria, Belgium, Czech Republic, Germany,France, Ireland, UK, Netherlands, Luxembour				>25m
2023	Severe Convective Storm	03/30/23	03/31/23	Windstorm Mathis/Markus	Belgium, Swtzerland, Czech Republic, Germany, France, UK				>25m
2023	Severe Convective Storm	07/04/23	07/06/23	Windstorm Pol	German , Ital , Netherlands				>25m
2023	Severe Convective Storm	11/01/23	11/03/23	Windstorm Ciaran/Emir	Bulgaria, Germany, Spain, France, UK, Ireland, Italy, Netherlands				>1b
2023	Severe Convective Storm	11/04/23	11/05/23	Windstorm Domingos/Fred	S ain, France				>100m
2023	Severe Convective Storm	11/15/23	11/17/23	Windstorm Frederico/Linus	German , France, UK				>25m
2023	Severe Convective Storm	12/20/23	12/22/23	Windstorm Pia/Zoltan	Austria, Belgium, Czech Republic, Germany, Denmark, France, UK, Netherlands,Norwa				>100m
2023	Severe Convective Storm	12/26/23	12/28/23	Windstorm Gerrit/Bodo	Ireland, UK				>25m
2023	Severe Convective Storm	06/18/23	06/23/23	Lows Kay, Lambert	Austria, Belgium, Czech Republic, Germany, France, Slovakia				>250m
2023	Severe Convective Storm	07/06/23		Zar oza	S ain, France				>25m
2023	Severe Convective Storm	07/11/23	07/13/23		Austria, Czech Republic, France, Germany, Italy, Slovenia, Serbia				>250m
2023	Severe Convective Storm	07/17/23	07/19/23		Austria, Bosnia, Croatia, Germany, Italy, Serbia, Slovakia, Slovenia				>1b
2023	Severe Convective Storm	07/20/23	07/25/23		Bosnia, Switzerland, Germany, France, Serbia, Hun ar , Ital , Serbia, Slovakia, Slovenia, Romania				>1b
2023	Severe Convective Storm	08/12/23	08/16/23	Arend, Bernd	Austria, Czech Republic, Germany, France, Italy, Poland				>100m
2023	Severe Convective Storm	08/24/23	08/30/23	Denis, Rae	Austria, Czech Republic, France, Germany, Italy, Lithuania, Latvia, Norway, Poland, Spain, Switzerland				>1b
2023	Severe Convective Storm	07/01/23			Canada				>25m
2023	Severe Convective Storm	07/13/23			Canada				>25m
2023	Severe Convective Storm	07/15/23	07/16/23		Canada				>25m
2023	Severe Convective Storm	07/20/23	07/21/23		Canada				>25m
2023	Severe Convective Storm	08/03/23			Canada				>25m
2023	Severe Convective Storm	08/23/23	08/25/23		Canada				>25m
2023	Severe Convective Storm	08/24/23			Canada				>25m
2023	Severe Convective Storm	05/23/23	05/26/23		Australia				>25m
2023	Severe Convective Storm	12/23/23	12/26/23		Australia				>100m
2024	Earth uake	01/01/24		Noto Earth uake	Ishikawa Ja an				>25 million

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2024	Severe Convective Storm	01/20/24	01/22/24	Windstorm Isha	Belgium, Switzerland, Germany, Denmark France, Great Britain, Ireland, Netherlands, Norwa				>25 million
2024	Severe Convective Storm	01/23/24	01/24/24	Windstorm Jocelyn	Great Britain, Ireland, Demark, Germany, Netherlands, Norwa , Poland				>25 million
2024	Severe Convective Storm	01/31/24	02/01/24	Windstorm In unn	Norwa , Great Britain, Ireland, Sweden				>25 million
2024	Wildfire	02/01/24	03/22/24	Chile Wildfires	Chile				>25 million
2024	Severe Convective Storm	02/12/24	02/23/24	Windstorm Louis	Western & Northern Euro e				>25 million
2024	Severe Convective Storm	02/14/24		Victoria Valentine's Day SCS	Australia				>25 million
2024	Severe Convective Storm	02/21/24	02/23/24	Windstorm Nelson	France, Pot u al, S ain, Great Britain				>25 million
2024	Severe Convective Storm	03/30/24	04/03/24	Easter Weekend SCS	Czech Re ublic, France, Ital , Poland				>25 million
2024	Earth uake	04/03/24		Hualien Earth uake	Taiwan				>25 million
2024	Severe Convective Storm	04/03/24	04/08/24		Australia				>25 million
2024	Severe Convective Storm	04/04/24	04/07/24	Windstorm Olivia	Ireland, Great Britain, France, Spain, Portugal, Netherlands				>25 million
2024	Severe Convective Storm	04/16/24		H o o Hailstorm	Ja an				>25 million
2024	Severe Convective Storm	05/14/24	05/17/24		Western & Central Euro e				>25 million
2024	Severe Convective Storm	06/06/24	06/10/24	Storm Tina	Austria, Demark, Hungary, Switzerland, Slovakia, Romania				>25 million
2024	Severe Convective Storm	06/17/24	06/20/24	Storm Wibke	Denmark, France, Czech Republic, Poland, Switzerland, Beli uim				>25 million
2024	Severe Convective Storm	06/10/24	06/16/24		Chile				>25 million
2024	Tro ical Storm	06/19/24	06/20/24	Tro ical Storm Alberto	Mexico, Yucatan Peninsula				>25 million
2024	Severe Convective Storm	06/25/24	06/28/24		Central Euro e				>25 million
2024	Severe Convective Storm	06/28/24	06/30/24	Storm Annelie	France, Ital , Switzerland				>25 million
2024	Hurricane	07/01/24	07/12/24	Hurricane Beryl	Barbados, Windward Islands, Trinidad and Tobago, Venezuela, Hispaniola, Jamaica, Cayman Islands, Yucatan Peninsula, Belize, Eastern Canada				>25 million
2024	Typhoon	07/23/24	07/28/24	Typhoon Gaemi	Taiwan, China, Philippines, Yaeyama Islands, Indonesia, Vietnam, North Korea				>25 million
2024	Hurricane	08/03/24	08/14/24	Hurricane Debb	Caribbean, Quebec, Atlantic Canada				>25 million
2024	Hurricane	08/13/24	08/19/24	Hurricane Ernesto	Bermuda, Puerto Rico, U.S. Virgin Islands, Antigua and Barbuda, Guadelou e				>25 million
2024	Wildfire	08/23/24	09/06/24	Brazil/Sao Paulo Fires					
2024	T hoon	08/28/24	08/31/24	T hoon Shanshan	Ja an, South Korea				>25 million
2024	Typhoon	09/01/24	09/12/24	Typhoon Yagi	China, Phillippines, Vietnam, Loas, Thailand, Myanmar, Hon Kon , Macau				>25 million
2024	Hurricane	09/09/24	09/14/24	Hurricane Francine	Mexico				>25 million
2024	Wildfire	09/15/24	09/20/24	Portu al Wildfires	Central and Northern Portu al				>25 million
2024	Typhoon	09/15/24	09/17/24	Typhoon Bebinca	China, Philippines, NorthMariana Islands, Ryukyu Islands				>25 million
2024	Hurricane	09/22/24	09/28/24	Hurricane John	Mexico				>25 million
2024	Hurricane	09/24/24	09/29/24	Hurricane Helene	Yucatan Peninsula, Honduras, Cayman Islands, Cuba				>25 million
2024	T hoon	09/26/24	10/04/24	T hoon Krathon Julian	Phili ines, Taiwan				>25 million
2024	Hurricane	10/05/24	10/12/24	Hurricane Milton	Mexico, Yucatan Peninsula, Western Cuba, The Bahamas				>25 million
2024	Tro ical Storm	10/25/24	10/27/24	Tro ical Storm Trami	Phili ines, Vietnam				>25 million
2024	Huricane	11/04/24	11/10/24	Huricane Rafeal	Cuba, Panama, Coast Rica, Columbia				>25 million
2024	T hoon	11/01/24	11/07/24	T hoon Kon -re	Phili ines, China, South Korea, Ja an, Taiwan				>25 million
2024	T hoon	11/09/24	11/20/24	T hoon Man- i	Phili ines, Guam, Northern Mariana Islands				>25 million
2025	Earth uake	01/07/25			China, Ne al				>100 million
2025	Windstorm	01/23/25	01/25/25	Windstorm Eow n Gilles	UK, Ireland				>500 million
2025	C clone	02/27/25	02/28/25	C clone Garance	Reunion, Mauritus				>100 million
2025	C clone	03/06/25	03/08/25	C clone Alfred	Australia				>100 million
2025	Earth uake	03/28/25			M anmar, Thailand, Vietnam				>100 million
2025	Earth uake	04/23/25			Turke				>25 million

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2025	Severe Convective Storm	05/02/25	05/04/25		Spain, France, Portugal, Germany, Austria, Czechia, Poland, Sebia, Bosnia, Romania, Bulgaria, Macedonia				>100 million
2025	Severe Convective Storm	05/13/25	05/14/25		China				>25 million
2025	Wildfire	Ma	June		Canada				>25 million
2025	Severe Convective Storm	06/13/25	06/15/25		France, Italy, Germany, Switzerland, Belgium, Austria, Czechia, Croatia				>100 million
2025	T hoon Wuti	06/11/25	06/15/25		China, Phili ines, Thailand, Veitnam				>25 million
2025	Hurricane Erick	06/16/25	06/21/25		Mexico, Guatemala, El Salvador, Honduras				>25 million
2025	Severe Convective Storm	06/21/25	06/27/25		France, Italy, Germany, Switzerland, Belgium, Austria, Czechia, Slovakia				>25 million
2025	T hoon Danas	07/04/25	07/10/25		China, Taiwan, Phili ines				>25 million
2025	Tro ical Storm Wi ha	07/18/25	07/24/25		China, Phili ines, Vietnam,				>25 million
2025	Wildfire	07/01/25	07/31/25		Cyprese, Greece, Turkey, Bulgaria, Bosnia, Herze ovina				>25 million
2025	Severe Convective Storm	09/04/25	09/09/25		France, Switzerland, Germany, Italy, Austria, Belgium, Luxembour , Poland				>25 million
2025	Su er T hoon Ra asa	09/22/25	09/26/25		China, Taiwan, Phili ines				>25 million
2025	Windstorm Am	10/03/25	10/04/25		UK, Ireland, France, Norwa , Sweden				>25 million
Source: Munich Re's NAT CAT Service, Swiss Re Sigma and Aon Benfield									

Priority 1 – High Priority
Priority 2 – Medium Priority
Priority 3 – Low Priority

CAPITAL ADEQUACY (E) TASK FORCE
WORKING AGENDA ITEMS FOR CALENDAR YEAR 2026

2026 #	Owner	2026 Priority	Expected Completion Date	Working Agenda Item	Source	Comments	Date Added to Agenda
Ongoing Items – Life RBC							
L1	Life RBC WG	Ongoing	Ongoing	Make technical corrections to Life RBC instructions, blank and /or methods to provide for consistent treatment among asset types and among the various components of the RBC calculations for a single asset type.			
L2	Life RBC WG	1	2026 or later	1. Monitor the impact of the changes to the variable annuities reserve framework and risk-based capital (RBC) calculation and determine if additional revisions need to be made. 2. Develop and recommend appropriate changes including those to improve accuracy and clarity of variable annuity (VA) capital and reserve requirements.	CADTF	Being addressed by the Variable Annuities Capital and Reserve (E/A) Subgroup	
L3	Life RBC WG	1	2026 or later	1. Provide recommendations for the appropriate treatment of longevity risk transfers by updating the approach to develop the C-2 capital amount for longevity reinsurance products. 2. Monitor and make recommendations as needed based on the impact from changes to the non-variable annuity reserve framework.	New Jersey	Being addressed by the Longevity (E/A) Subgroup	
L4	Life RBC WG	1	2026 or later	Monitor the economic scenario governance framework, review material economic scenario generator updates, key economic conditions, and metrics, support the implementation of an economic scenario generator for use in statutory reserve and capital calculations and develop and maintain acceptance criteria		Being addressed by the Generator of Economic Scenarios (GOES) (E/A) Subgroup	
Carryover Items Currently being Addressed – Life RBC							
L5	Life RBC WG	1	2027 or later	Update C3 Phase I to modernize the cash-flow testing methodology and revise the scope to include FIAs.	AAA	Being addressed by the American Academy of Actuaries	
L6	Life RBC WG	1	2024 or later	Review companies at action levels, including previous years, to determine what drivers of the events are and consider whether changes to the RBC statistics are warranted. Deliberate the relevant weights assigned to various risk components.			
L7	Life RBC WG	2	2026 or later	In light of SAPWG INT to permit admittance of negative IMR, SAPWG requested CADTF to consider: 1. The elimination of any admitted net negative IMR from Total Adjusted Capital (TAC). 2. Sensitivity testing with and without negative IMR.	CADTF	12/2/23 - received CADTF referral for Negative Interest Maintenance Reserve (IMR).	

L8	Life RBC WG	2	2026 or later	Consider SAPWG Referral for Investments in Tax Credit Structures, specifically to consider possible factor changes for investments in Tax Credit Structures	SAPWG referral	3/27/24 – received SAPWG referral on Tax Credit Investments 2025 to address the structural and instructional changes. 5/1/25 - Tax Credit Investment Proposal 2024-21-L MOD was adopted	
L9	Life RBC WG	2	2026 or later	Consider possible structural changes to account for reporting changes for collateral loans addressed through instructional changes for 2024 with the adoption of proposal 2024-15-L	SAPWG referral	2/29/24 – received SAPWG regarding collateral loan reporting changes 6/16/24 – Collateral loans proposal 2024-15-L was adopted 6/5/25 – received another referral from SAPWG on Collateral Loan Schedule BA reporting changes	
New Items – Life RBC							

2026 #	Owner	2026 Priority	Expected Completion Date	Working Agenda Item	Source	Comments	Date Added to Agenda
Ongoing Items – RBC IR & E							
Carryover Items Currently being Addressed – RBC IR &E							
IR1	RBC IRE	2	2026 or later	Supplemental Investment Risks Interrogatories (SIRI)	**Referred from CADTF** Referral from Blackrock and IL DOI	The Task Force received the referral on Oct. 27. This referral will be tabled until the bond factors have been adopted and the TF will conduct a holistic review all investment referrals.	**1/12/2022** 11/19/2020
IR2	RBC IRE	2	2026 or later	NAIC Designation for Schedule D, Part 2 Section 2 - Common Stocks Equity investments that have an underlying bond characteristic should have a lower RBC charge. Similar to existing guidance for SVO-identified ETFs reported on Schedule D-1, are treated as bonds.	**Referred from CADTF** Referral from SAPWG 8/13/2018	10/8/19 - Exposed for a 30-day Comment period ending 11/8/2019 3-22-20 - Tabled discussion pending adoption of the bond structure and factors.	**1/12/2022** 10/11/2018
IR3	RBC IRE	2	2026 or later	Comprehensive Fund Review for investments reported on Schedule D Pt 2 Sn2	**Referred from CADTF** Referral from VOSTF 9/21/2018	Discussed during Spring Mtg. NAIC staff to do analysis. 10/8/19 - Exposed for a 30-day comment period ending 11/8/19 3-22-20 - Tabled discussion pending adoption of the bond structure and factors.	**1/12/2022** 11/16/2018
IR4	RBCIRE	1	2026 or later	Evaluate the appropriate RBC treatment of Asset-Backed Securities (ABS), including Collateralized Loan Obligations (CLO), collateralized fund obligations (CFOs), or other similar securities carrying similar types of tail risk (Complex Assets).	**Request from E Committee, SAPWG, VOSTF**	Per the request of E Committee comments were solicited asking if these types of assets	1/12/2022

				Address the tail risk concerns not captured by reserves for these privately structured securities.	**Referral from the Macroprudential (E) Working Group**	should be considered a part of the RBC framework.	8/13/2022
IR5	RBC IRE	1	2026 or later	Evaluate the appropriate RBC treatment of Residual Tranches.	**Request from E Committee, SAPWG, VOSTF**	Per the request of E Committee comments were solicited asking if these types of assets should be considered a part of the RBC framework. Proposal 2023-09-IRE was adopted in 2023 to effect a 45% factor for residual tranches/interest for life insurers with effect from YE 2024 reporting. This was deemed an interim solution, subject to positive or negative adjustments based on American Academy of Actuaries' study. (IR4)	1/12/2022
IR6	RBC IRE	1	2026 or later	Phase 2 Bond analysis - evaluate and develop an approach to map other ABS to current bond factors following the established principles from Phase I where the collateral has an assigned RBC. This project will likely require an outside consultant, and the timeline could exceed 2-3 years.	**Request from E Committee**	Per the request of E Committee comments were solicited requesting the need for outside review.	1/12/2022

IR7	RBC IRE	2	2026 or later	Evaluate asset concentration related issues and the potential changes to the risk-based capital formulas to address the risk.	**Referral from CADTF**	4/30/24 – Task Force referred to the Working Group.	10/22/2024
New Items – RBC IR & E							

2026 #	Owner	2026 Priority	Expected Completion Date	Working Agenda Item	Source	Comments	Date Added to Agenda
Ongoing Items – P&C RBC							
P1	Cat Risk SG	1		Continue development of RBC formula revisions to include a risk charge based on catastrophe model output:			
			Year-end 2027 or later	a) Evaluate other catastrophe risks for possible inclusion in the charge - determine whether to recommend developing charges for any additional perils, and which perils or perils those should be.	Referral from the Climate and Resiliency Task Force. March 2021		4/26/2021
P2	PCRBCWG	1	Ongoing	Review and analyze the P/C RBC charges that have not been reviewed since developed.			3/23/2023
Carryover Items Currently being Addressed – P&C RBC							
P3	P&C RBC WG	2	Year-end 2027 or later	Evaluate a) the current growth risk methodology whether it is adequately reflects both operational risk and underwriting risk; b) the premium and reserve based growth risk factors either as a stand-alone task or in conjunction with the ongoing underwriting risk factor review with consideration of the operational risk component of excessive growth; c) whether the application of the growth factors to NET proxies adequately accounts for growth risk that is ceded to reinsures that do not trigger growth risk in their own right. *Referral to the Academy:*	Referral from Operational Risk Subgroup	1) Sent a referral to the Academy on 6/14/18 conference call.	1/25/2018
P4	P&C RBC WG	1	2027 Summer Meeting or later	Continue working with the Academy to review the methodology and revise the underwriting (Investment Income Adjustment, Loss Concentration, LOB UW risk) charges in the PRBC formula as appropriate.		11/16/23 The Academy provided a presentation on their Underwriting Risk Report at the Joint PCRBC And Cat Risk SG meeting. 3/17/23 Proposal 2024-11-P was exposed for a 30-day public comment period during the Spring National Meeting. 4/25/24 Proposal 2024-11-P was adopted during the	6/10/2019

						PCRBCWG interim meeting. 11/12/25 The Academy provided a presentation on loss concentration factors report at the Joint PCRBC and Cat Risk SG meeting.	
P5	P&C RBC WG	1	2027 Summer Meeting or later	Evaluate the Underwriting Risk Line 1 Factors in the P/C formula.			7/30/2020
P6	Cat Risk SG	1	2026 Summer Meeting	Quantify the R5 Ex-cat Factors for wildfire peril to determine the R5 excluding the wildfire peril in addition to earthquake, and hurricane.			3/21/2023
P7	Cat Risk SG	2	2026 Fall Meeting	Consider: 1) further investigating all geographic concentration related issues. possibly modifying the property and casualty (P/C) risk-based capital formulas		6/10/24 Exposed a referral from the Tas Force for a 30-day comment period ending July 10.	
New Items – P&C RBC							
P8	Cat Risk SG	1	2026 Summer Meeting	Evaluate the possibility of adding Wildfire peril in the Rcat component		11/12/25 Proposal 2025-20-CR was exposed for a 60-day comment period ending 1/11/26.	
P9	Cat Risk SG	1	2026 Summer Meeting	Evaluate the possibility of separating earthquake and hurricane loss experience data in PR100s.		11/12/25 Proposal 2025-19-CR was exposed for a 60-day comment period ending 1/11/26.	
P10	P&C RBC WG	1	2026 Summer Meeting	Evaluate the possibility of updating the Loss and Premium concentration factors in PR017 and PR018			

2026 #	Owner	2026 Priority	Expected Completion Date	Working Agenda Item	Source	Comments	Date Added to Agenda
Ongoing Items – Health RBC							
X1	Health RBC WG	Yearly	Yearly	Evaluate the yield of the 6-month U.S. Treasury Bond as of Jan. 1 each year to determine if further modification to the Comprehensive Medical, Medicare Supplement and Dental and Vision underwriting risk factors is required. Any adjustments will be rounded up to the nearest 0.5%.	HRBCWG	Adopted 2025-03-CA (YE-2025)	11/4/2021
X2	Health RBC WG	3	Ongoing	Continue to monitor the Federal Health Care Law or any other development of federal level programs and actions (e.g., state reinsurance programs, association health plans, mandated benefits, and cross-border) for future changes that may have an impact on the Health RBC Formula.	4/13/2010 CATF Call	Adopted 2014-01H Adopted 2014-02H Adopted 2014-05H Adopted 2014-06H Adopted 2014-24H Adopted 2014-25H Adopted 2016-01-H Adopted 2017-09-CA Adopted 2017-10-H The Working Group will continually evaluate any changes to the health formula because of ongoing federal discussions and legislation. Discuss and monitor the development of federal level programs and the potential impact on the HRBC formula.	1/11/2018
Carryover Items Currently being Addressed – Health RBC							
X3	Health RBC WG	2	Year-End 2026 RBC or Later	Consider changes for stop-loss insurance or reinsurance.	AAA Report at Dec. 2006 Meeting	(Based on Academy report expected to be received at YE-2016) 2016-17-CA	

						Adopted proposal 2023-01-CA	
X4	Health RBC WG	1	Year-End 2026 or later	Change the Structure of page XR013, PR020, and LR020 to align with the lines of business found on Page 7 Analysis of Operations. Add separate line to separate the Investment Income Adjustment from the factors	HRBCWG	Separation of H-2 Underwriting Review	9/29/2025
X5	Health RBC WG	1	Year-End 2026 or later	Expand Exhibit 7 to include new modes of Managed Care Business Expand to collect data by line of business found on Page 7 Analysis of Operations	HRBCWG	Separation of H-2 Underwriting Review	9/29/2025
X6	Health RBC WG	1	Year-End 2027 or later	Develop implementation of updated factors for pages XR013, PR020, and LR020	HRBCWG	Separation of H-2 Underwriting Review	9/29/2025
X7	Health RBC WG	3	Year-End 2025 or later	Discuss and determine the re-evaluation of the bond factors for the 20 designations.	Referral from Investment RBC July/2020	Working Group will use two- and five-year time horizon factors in 2020 impact analysis. Proposal 2021-09-H - Adopted 5/25/21 by the WG	9/11/2020
New Items – Health RBC							
X8	Health RBC WG	2	Year-End 2027 or later	Discuss incorporating designations for non-bond debt on schedule BA resulting from the adoption of the principle based bond definition.	Referral from SAP WG	WG will review 2025 filings to determine prevalence	4/30/2025
X9	Health RBC WG	2	Year-End 2028 or later	Analyze long-term care insurance (LTCI) underwriting performance to create a more nuanced set of risk factors that considers pricing changes over time.	HRBCWG		4/30/2025

2026 #	Owner	2026 Priority	Expected Completion Date	Working Agenda Item	Source	Comments	Date Added to Agenda
Ongoing Items – Task Force							
CA1			Ongoing	Update RBC as deemed necessary upon changes adopted by other Working Groups.			
CA2	CADTF	3	Ongoing	Receivable for Securities factor		Consider evaluating the factor every 3 years. (2024, 2027, 2030 etc.)	
CA3	CADTF	1	Ongoing	Update the annual investment income adjustment to the comprehensive medical, medicare supplement, and dental and vision factors.	HRBC WG	6/30/25 – the TF adopted the proposal.	4/30/2024
CA4	CADTF	2	2026 or later	Evaluate if changes should be made in the RBC formula to reflect the possible changes in Schedule BA Collateral Loan reporting, including structural changes to RBC blanks and forecasting and changes of risk charges that commensurate with underlying collateral type.	SAP WG	1/23/24 – the TF received a referral from SAPWG regarding collateral loan reporting changes 3/26/24 – the TF exposed this referral for a 45-day public comment period. 6/28/24 – the SAPWG provided updates on this project. 10/14/24 – the SAPWG provide another referral to the Task Force. 3/25/25 – the SAPWG provide another update at the Spring Meeting. 6/30/25 – the TF exposed another referral from SAPWG	1/23/2024

						for a 45-day public comment period.	
CA5	CADTF	2	Pending	Review the RBC Preamble to determine whether additional modification is required to clarify and emphasize the purposes and intent of using RBC.	RBC Purposes & Guidelines Ad Hoc Subgroup	5/15/25 – TF discussed received comments. 10/31/25 – pending until further direction from MOGO	4/30/2024
CA6	CADTF	2	2025 or later	Evaluate if changes should be made in the RBC formula to reflect the possible changes in the existing low-income housing tax credit investment lines in the RBC formulas to allow the expansion of including any type of state or federal tax credit program,	SAPWG	4/30/24 – the referral was exposed for a 30-day public comment period. 6/28/24 – the SAPWG provided updates on this project. 11/18/24 – TF exposed proposal 2024-26-CA for a 75-day public comment period. 3/25/25 – TF re-exposed proposal for a 30-day public comment period. 5/15/25 – TF adopted Proposal 2024-26-CA	4/30/2024
Carryover Items Currently being Addressed – Task Force							
New Items –Task Force							
CA7	CADTF	1	2025	Evaluate if expanding the instructions for LR034, LR035, PR033, PR034, and XR027 to facilitate consistent labeling of various company action levels across lines of business.		3/25/25 – TF exposed proposal for a 30-day public comment period. 5/15/25 – TF adopted proposal 2025-07-CA MOD.	

Appendix A – Collateral loan reported in 2024 Annual Filings by Type of Businesses

Collateral Backing Collateral Loan	Note Disclosure Total	% of Total	Life	P/C	Health	Title
Unaffiliated Cash / CE & ST	$145,575,627	0.52%	130,530,533	15,045,094	0	0
Issuer Credit Obligations - Affiliated	$3,286,243,783	11.79%	3,286,243,783	0	0	0
Issuer Credit Obligations - Unaffiliated	$1,196,181,621	4.29%	961,887,012	234,294,609	0	0
Asset-Backed Securities - Affiliated	$1,292,104,481	4.63%	1,292,104,481	0	0	0
Asset-Backed Securities - Unaffiliated	$547,154,663	1.96%	387,361,556	159,793,107	0	0
Preferred Stocks - Affiliated	$25,000,000	0.09%	25,000,000	0	0	0
Preferred Stocks - Unaffiliated	$875,892,650	3.14%	853,520,992	22,371,658	0	0
Common Stocks - Affiliated	$10,089,663	0.04%	0	10,089,663	0	0
Common Stocks - Unaffiliated	$93,746,538	0.34%	71,203,425	22,543,113	0	0
Real Estate - Affiliated	$584,798,322	2.10%	579,047,946	5,750,376	0	0
Real Estate - Unaffiliated	$304,055,142	1.09%	304,055,142	0	0	0
Mortgage Loans - Affiliated	$377,120,058	1.35%	362,750,328	14,369,730	0	0
Mortgage Loans - Unaffiliated	$5,966,730,875	21.40%	5,966,724,799	6,076	0	0
JV, LLC & Partnerships - Affiliated	$10,603,824,022	38.04%	10,298,106,774	305,717,248	0	0
JV, LLC & Partnerships - Unaffiliated	$1,292,344,887	4.64%	1,095,729,794	196,615,093	0	0
Other Qualifying - Affiliated	$309,339,173	1.11%	120,624,492	188,714,681	0	0
Other Qualifying - Unaffiliated	$916,698,627	3.29%	889,318,137	27,380,490	0	0
Does Not Qualify - Affiliated	$4,912,141	0.02%	0	4,912,141	0	0
Does Not Qualify - Unaffiliated	$45,869,262	0.16%	6,449,676	28,022,784	200,000	11,196,802
Reported Note Total	**$27,877,681,535**	**100%**	**26,630,658,870**	**1,235,625,863**	**200,000**	**11,196,802**
2024 Industry Total Cash & Invested Assets			**5,751,220,000,000**	**2,858,387,000,000**	**359,086,000,000**	**11,673,000,000**
Total Collateral loan as a % of Total Cash & Invested Assets			**0.46%**	**0.04%**	**0.00%**	**0.10%**