MEETING MATERIALS PACKET

LIFE ACTUARIAL (A) TASK

FORCE November 29-30, 2023

NAIC FALL NATIONAL MEETING

November 29-30, 2023

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Draft date: 11/20/23

2023 Fall National Meeting
Orlando, Florida

LIFE ACTUARIAL (A) TASK FORCE
Wednesday, November 29, 2023
8:00 a.m. – 4:30 p.m.
Hilton Orlando Bonnet Creek—Floridian Ballroom J–L and Corridor III—Level 1

Thursday, November 30, 2023
8:00 a.m. – 11:00 a.m.
Hilton Orlando Bonnet Creek—Floridian Ballroom J–L and Corridor III—Level 1

ROLL CALL

Member	Representative	State
Cassie Brown, Chair	Rachel Hemphill	Texas
Scott A. White, Vice Chair	Craig Chupp	Virginia
Mark Fowler	Sanjeev Chaudhuri	Alabama
Lori Wing-Heier	Sharon Comstock	Alaska
Ricardo Lara	Ahmad Kamil	California
Andrew N. Mais	Wanchin Chou	Connecticut
Dana Popish Severinghaus	Vincent Tsang	Illinois
Amy L. Beard	Scott Shover	Indiana
Doug Ommen	Mike Yanacheak	Iowa
Vicki Schmidt	Nicole Boyd	Kansas
Timothy N. Schott	Marti Hooper	Maine
Grace Arnold	Fred Andersen	Minnesota
Chlora Lindley-Myers	William Leung	Missouri
Eric Dunning	Michael Muldoon	Nebraska
D.J. Bettencourt	Jennifer Li	New Hampshire
Justin Zimmerman	Seong-min Eom	New Jersey
Adrienne A. Harris	Bill Carmello	New York
Judith L. French	Peter Weber	Ohio
Glen Mulready	Andrew Schallhorn	Oklahoma
Michael Humphreys	Steve Boston	Pennsylvania
Jon Pike	Tomasz Serbinowski	Utah
Allan L. McVey	Tim Sigman/Joylynn Fix	West Virginia

NAIC Support Staff: Scott O'Neal/Jennifer Frasier

AGENDA

Wednesday, November 29, 2023

8:00 – 8:15 a.m.	1. Call to Order/Roll Call/Consider Adoption of its Minutes and Written Subgroup Reports—*Rachel Hemphill (TX)*
8:15 – 8:45 a.m.	2. Consider Adoption of the Report of the Valuation Manual (VM)-22 (A) Subgroup —*Ben Slutsker (MN)*
8:45 – 9:00 a.m.	3. Receive an Update from the VM-22 Policyholder Behavior Drafting Group—*Vincent Tsang (IL), Steve Tizzoni (Equitable), and Karl Lund (Pacific Life)*
9:00 – 9:30 a.m.	4. Hear an Update on Mortality Experience Data Collection and Consider Adoption of the Report of the Experience Reporting (A) Subgroup—*Fred Andersen (MN) and Pat Allison (NAIC)*
9:30 – 9:45 a.m.	Break
9:45 – 10:30 a.m.	5. Discuss Comments Received on the Generator of Economic Scenarios (GOES) Corporate Model Decision —*Rachel Hemphill (TX)*
10:30 – 11:30 a.m.	6. Discuss Comments Received on GOES Acceptance Criteria and Stylized Facts—*Rachel Hemphill (TX)*
11:30 – 12:00 a.m.	7. Discuss Actuarial Guideline LIII —*Application of the Valuation Manual for Testing the Adequacy of Life Insurer Reserves* (AG 53) —*Fred Andersen (MN)*
12:00 – 1:30 p.m.	Lunch
1:30 – 2:30 p.m.	8. Review Results of New Calibration of the GOES—*Daniel Finn (Conning) and Scott O'Neal (NAIC)*
2:30 – 2:45 p.m.	9. Consider Adoption of the GOES (E/A) Subgroup Report and Hear a Timeline Update—*Mike Yanacheak (IA) and Scott O'Neal (NAIC)*
2:45 – 3:00 p.m.	10. Hear an Update from the American Academy of Actuaries (Academy) Economic Scenario Generator Subcommittee on Equity Acceptance Criteria—*Jason Kehrberg (Academy)*
3:00 – 3:15 p.m.	Break
3:15 – 3:45 p.m.	11. Discuss Comments Received on Amendment Proposal Form (APF) 2023-10—*Rachel Hemphill (TX)*

3:45 – 4:15 p.m.	12. Discuss Comments Received on APF 2023-12—*Rachel Hemphill (TX)*
4:15 – 4:30 p.m.	13. Consider Exposure of APF 2023-13—*Rachel Hemphill (TX)*

Thursday, November 30, 2023

8:00 – 8:30 a.m.	14. Hear an Update on Society of Actuaries (SOA) Research and Education—*Dale Hall (SOA)*
8:35 – 8:50 a.m.	15. Hear an Update from the Academy Council on Professionalism and Education—*Lisa Slotznick (Academy, Committee on Qualifications), Laura Hanson (Actuarial Standards Board—ASB) and Cande Olson (Actuarial Board for Counseling and Discipline—ABCD)*
8:50 – 9:05 a.m.	16. Hear an Update from the Academy Life Practice Council—*Amanda Barry-Moilanen (Academy)*
9:05 – 9:20 a.m.	17. Discuss Revision to the VM-20, Requirements for Principle-Based Reserves for Life Products, Future Mortality Improvement Rates and Application—*Rachel Hemphill (TX)*
9:20 – 9:35 a.m.	Break
9:35 - 9:50 a.m.	18. Consider Adoption of Request for Life Knowledge Statements for US Appointed Actuaries, Illustration Actuaries, and Qualified Actuaries—*Rachel Hemphill (TX)*
9:50 – 10:05 a.m.	19. Hear an Update from the Insurance Compact's Product Standards Committee—*Tomasz Serbinowski (UT)*
10:05 – 11:00 a.m.	20. Discuss Any Other Matters Brought Before the Task Force
11:00 a.m.	Adjournment

Agenda Item 1

Consider Adoption of its Minutes

and Written Subgroup Reports

Draft: 11/16/23

Life Actuarial (A) Task Force
Virtual Meeting
November 2, 2023

The Life Actuarial (A) Task Force met Nov. 2, 2023. The following Task Force members participated: Cassie Brown, Chair, represented by Rachel Hemphill (TX); Scott A. White, Vice Chair, represented by Craig Chupp (VA); Mark Fowler represented by Sanjeev Chaudhuri (AL); Lori K. Wing-Heier represented by Sharon Comstock (AK); Ricardo Lara represented by Ahmad Kamil, Thomas Reedy, and Ted Chang (CA); Andrew N. Mais represented by Wanchin Chou (CT); Doug Ommen represented by Mike Yanacheak (IA); Dana Popish Severinghaus represented by Vincent Tsang (IL); Amy L. Beard represented by Scott Shover (IN); Vicki Schmidt represented by Nicole Boyd (KS); Timothy N. Schott represented by Marti Hooper (ME); Grace Arnold represented by Fred Andersen and Ben Slutsker (MN); Chlora Lindley-Myers represented by William Leung (MO); Eric Dunning represented by Michael Muldoon (NE); D.J. Bettencourt represented by Jennifer Li (NH); Justin Zimmerman represented by Seong-min Eom (NJ); Adrienne A. Harris represented by Amanda Fenwick (NY); Judith L. French represented by Peter Weber (OH); Glen Mulready represented by Andrew Schallhorn (OK); Michael Humphreys represented by Steve Boston (PA); and Jon Pike represented by Tomasz Serbinowski (UT).

1. Adopted its Summer National Meeting Minutes

Hemphill introduced the Task Force's Summer National Meeting minutes for adoption. Chupp requested that a few editorial changes be made.

Chupp made a motion, seconded by Yanacheak, to adopt the Task Force's Summer National Meeting minutes with Chupp's suggested language changes (*see NAIC Proceedings – Summer 2023, Life Actuarial (A) Task Force*). The motion passed unanimously.

2. Exposed APF 2023-11

Hemphill walked through amendment proposal form (APF) 2023-11, which seeks to ensure references to risk-based capital (RBC) in the *Valuation Manual* are consistent with the regulatory intent and scope of RBC.

Chupp made a motion, seconded by Andersen, to expose APF 2023-11 (Attachment A) for a 21-day public comment period ending Nov. 22. The motion passed unanimously.

3. Exposed APF 2023-12

Andersen discussed APF 2023-12, which looks to clarify state insurance regulator expectations regarding equity return assumptions in VM-30, Actuarial Opinion and Memorandum Requirements. Chang asked whether the appointed actuary would be required to use a metric with a certain confidence level in determining the equity return assumptions. Andersen noted that the APF sought to maintain the same confidence level as reserves but that flexibility around that standard could be discussed. Chang, noting language in the APF that referenced a company's current portfolio, said that the reinvestment strategy of the company was also important when considering the appropriateness of the equity return assumptions. Hemphill and Andersen noted that it makes sense to consider language changes during the exposure period in light of Chang's comments.

Andersen made a motion, seconded by Chupp, to expose APF 2023-12 (Attachment B) for a 21-day public comment period ending Nov. 22. The motion passed unanimously.

4. Reported a Regulator-Only Task Force Discussion

Hemphill noted that the Task Force met in regulator-to-regulator session Oct. 26, pursuant to paragraph 3 (specific companies, entities, or individuals) of the NAIC Policy Statement on Open Meetings. Hemphill further stated that during this meeting, state insurance regulators discussed reviews of indexed universal life (IUL) insurance illustrations and heard an update on the product filings of certain index-linked variable annuities (ILVAs). Hemphill stated that state insurance regulators decided to collaborate on future reviews of IUL products as a result of the meeting.

Having no further business, the Life Actuarial (A) Task Force adjourned.

SharePoint/NAIC Support Staff Hub/Member Meetings/A CMTE/LATF/2023-3-Fall/LATF Calls/11 02/Nov 02 Minutes.docx

Draft: 11/16/23

Life Actuarial (A) Task Force
E-Vote
October 11, 2023

The Life Actuarial (A) Task Force conducted an e-vote that concluded Oct. 11, 2023. The following Task Force members participated: Scott A. White, Vice Chair, represented by Craig Chupp (VA); Mark Fowler represented by Sanjeev Chaudhuri (AL); Lori K. Wing-Heier represented by Sharon Comstock (AK); Ricardo Lara represented by Ahmad Kamil (CA); Andrew N. Mais represented by Wanchin Chou (CT); Dana Popish Severinghaus represented by Vincent Tsang (IL); Amy L. Beard represented by Scott Shover (IN); Vicki Schmidt represented by Nicole Boyd (KS); Timothy Schott represented by Marti Hooper (ME); Grace Arnold represented by Fred Andersen (MN); Eric Dunning represented by Michael Muldoon (NE); D.J. Bettencourt represented by Jennifer Li (NH); Justin Zimmerman represented by Seong-min Eom (NJ); Adrienne A. Harris represented by Amanda Fenwick (NY); Judith L. French represented by Peter Weber (OH); Glen Mulready represented by Andrew Schallhorn (OK); Michael Humphreys represented by Steve Boston (PA); and Jon Pike represented by Tomasz Serbinowski (UT).

1. Adopted Memorandum on Planned Changes to U.S. Regulatory Content in the SOA's Curriculum

The Life Actuarial (A) Task Force conducted a joint e-vote with the Health Actuarial (B) Task Force and the Casualty Actuarial and Statistical (C) Task Force to consider adoption of the memorandum on planned changes to U.S. regulatory content in the Society of Actuaries' (SOA's) Fellowship educational pathway. For the Life Actuarial (A) Task Force, Chupp made a motion, seconded by Li, to adopt the memorandum (Attachment A) and distribute it to the SOA. The motion passed unanimously.

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Draft: 11/1/23

Life Actuarial (A) Task Force
Virtual Meeting
October 5, 2023

The Life Actuarial (A) Task Force met Oct. 5, 2023. The following Task Force members participated: Cassie Brown, Chair, represented by Rachel Hemphill (TX); Scott A. White, Vice Chair, represented by Craig Chupp (VA); Mark Fowler represented by Sanjeev Chaudhuri (AL); Lori K. Wing-Heier represented by Sharon Comstock (AK); Ricardo Lara represented by Ahmad Kamil and Thomas Reedy (CA); Andrew N. Mais represented by Wanchin Chou (CT); Dana Popish Severinghaus represented by Vincent Tsang (IL); Amy L. Beard represented by Scott Shover (IN); Vicki Schmidt represented by Nicole Boyd (KS); Timothy N. Schott represented by Marti Hooper (ME); Grace Arnold represented by Fred Andersen and Ben Slutsker (MN); Chlora Lindley-Myers represented by William Leung (MO); Eric Dunning represented by Michael Muldoon (NE); D.J. Bettencourt represented by Jennifer Li (NH); Justin Zimmerman represented by Seong-min Eom (NJ); Adrienne A. Harris represented by Amanda Fenwick (NY); Judith L. French represented by Peter Weber (OH); Glen Mulready represented by Andrew Schallhorn (OK); Michael Humphreys represented by Steve Boston (PA); and Jon Pike represented by Tomasz Serbinowski (UT).

1. Adopted APF 2023-09

Hemphill introduced amendment proposal form (APF) 2023-09. She noted that the amendment is intended to allow the Society of Actuaries (SOA) to develop industry historical and future mortality rates, and the Task Force approves these rates. She said that while these rates were developed in what the SOA working group believed to be the most theoretically appropriate way to avoid any inconsistency with the methodology companies use to develop company-specific historical mortality improvement, the currently exposed language would not have been sufficient to avoid all inconsistencies with the company's mortality improvement assumptions. Therefore, Hemphill recommended that the Task Force consider adopting APF 2023-09 and remove the additional language that requires companies to reflect mortality improvement considerations adopted by the Task Force, which is posted on the SOA's website. Brian Bayerle (American Council of Life Insurers—ACLI) noted that his group's concerns were addressed through Hemphill's suggested changes to APF 2023-09.

Leung made a motion, seconded by Schallhorn, to adopt APF 2023-09 with Hemphill's suggested language changes (Attachment A). The motion passed unanimously.

2. Adopted the Task Force's 2024 Proposed Charges

Weber made a motion, seconded by Schallhorn, to adopt the Task Force's 2024 proposed charges (Attachment B). The motion passed unanimously.

3. Exposed Acceptance Criteria for the Generator of Economic Scenarios (GOES)

Following three regulator-to-regulator meetings on Sept. 26, Sept. 21, and Sept. 9/18, Scott O'Neal (NAIC) walked through a presentation (Attachment B) on acceptance criteria to be used in calibrating the next version of the generator of economic scenarios (GOES). After O'Neal walked through the equity acceptance criteria, Jason Kehrberg (American Academy of Actuaries—Academy) noted that the Academy intended to provide an updated analysis that would add more recent data and more percentiles to the Academy's proposed equity acceptance criteria. Dan Kim (American Equity) asked what the frictional cost component represented in the corporate acceptance criteria. Kehrberg noted that the frictional cost captured the trading cost for the bond fund as individual bonds move outside of the fund target and need to be replaced with others.

Slutsker made a motion, seconded by Reedy, to expose the GOES acceptance criteria for a 36-day public comment period ending Nov. 10. The motion passed unanimously.

Having no further business, the Life Actuarial (A) Task Force adjourned.

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Draft: 11/2/23

Life Actuarial (A) Task Force
Virtual Meeting
September 28, 2023

The Life Actuarial (A) Task Force met Sep. 28, 2023. The following Task Force members participated: Cassie Brown, Chair, represented by Rachel Hemphill; Scott A. White, Vice Chair, represented by Craig Chupp (VA); Mark Fowler represented by Sanjeev Chaudhuri (AL); Lori K. Wing-Heier represented by Sharon Comstock (AK); Ricardo Lara represented by Ahmad Kamil (CA); Andrew N. Mais represented by Wanchin Chou (CT); Doug Ommen represented by Mike Yanacheak (IA); Dana Popish Severinghaus represented by Vincent Tsang (IL); Amy L. Beard represented by Scott Shover (IN); Vicki Schmidt represented by Nicole Boyd (KS); Timothy N. Schott represented by Marti Hooper (ME); Grace Arnold represented by Fred Andersen and Ben Slutsker (MN); Chlora Lindley-Myers represented by William Leung (MO); Eric Dunning represented by Michael Muldoon (NE); D.J. Bettencourt represented by Jennifer Li (NH); Justin Zimmerman represented by Seong-min Eom (NJ); Adrienne A. Harris represented by Amanda Fenwick (NY); Judith L. French represented by Peter Weber (OH); Michael Humphreys represented by Steve Boston (PA); and Jon Pike represented by Tomasz Serbinowski (UT).

1. Adopted the 2023 GRET Tables

Leung made a motion, seconded by Weber, to adopt the 2023 Generally Recognized Expense Tables (GRETs) (Attachment). The motion passed unanimously.

2. Exposed APF 2023-10

Hemphill introduced amendment proposal form (APF) 2023-10, noting that it was submitted by the American Academy of Actuaries' (Academy's) Life Reserve Working Group (LRWG), and the amendment sought to change the discount rate used in the VM-20, Requirements for Principle-Based Reserves for Life Products, stochastic reserve calculation to be the net asset earned rate on additional assets rather than 105% of the scenario-specific 1-year U.S. Treasury rate currently in place. Chupp noted that he thought a reference in the rationale section of APF 2023-10 needed to be corrected, and Hemphill agreed. Chupp then asked what the original rationale was for using the 105% of the 1-year U.S. Treasury rate as the discount rate. Dylan Strother (Academy) noted that the LRWG did some research into the current VM-20 stochastic reserve discount rate and noted that it may simply have been ported from C3 Phase II during the development of VM-20, but the discount rate used in C3 Phase II has now been updated to be the net asset earned rate on additional assets.

Slutsker asked if field testing would be needed to assess the impact of changing the VM-20 discount rate, especially considering the changes that are coming to the economic scenario generator used in VM-20. Strother noted that the LRWG did some initial testing and did not see large impacts, but one of the benefits of exposing APF 2023-10 could be that it would prompt companies to perform some of their own testing on this change and share the impacts with regulators and/or interested parties. Hemphill noted that she would like to see analysis performed by commenters to understand whether this was a material issue now or would only become more impactful after the adoption of a new economic scenario generator. Hemphill also walked through a number of small typos that she wanted to correct in the exposed version of APF 2023-10.

Leung made a motion, seconded by Chupp, to expose APF 2023-10 (Attachment A) with the reference and typo corrections identified by Chupp and Hemphill for a 47-day public comment period ending Nov. 13. The motion passed unanimously.

3. Exposed the Task Force's 2024 Proposed Charges

Hemphill walked through the change that was made to the Task Force's 2024 proposed charges to remove the evaluation of the Standard Projection Amount (SPA) for VM-21, Requirements for Principle-Based Reserves for Variable Annuities, noting that the evaluation had been performed. Connie Tang (retired) asked if the evaluation of the SPA also applied to VM-22, Requirements for Principle-Based Reserves for Non-Variable Annuities. Slutsker noted that the overarching expectation is that VM-21 and VM-22 would have consistency. Slutsker further stated that discussion of the VM-22 SPA will take place in a few months from now when a fuller methodology is expected to be ready for commentary.

Yanacheak made a motion, seconded by Weber, to expose the Task Force's 2024 proposed charges for a xx-day public comment period ending XX (Attachment B). The motion passed unanimously.

Having no further business, the Life Actuarial (A) Task Force adjourned.

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Draft: 10/24/23

Life Actuarial (A) Task Force
Virtual Meeting
September 14, 2023

The Life Actuarial (A) Task Force met Sept. 14, 2023. The following Task Force members participated: Cassie Brown, Chair, represented by Rachel Hemphill (TX); Scott A. White, Vice Chair, represented by Craig Chupp (VA); Mark Fowler represented by Sanjeev Chaudhuri (AL); Lori K. Wing-Heier represented by Sharon Comstock (AK); Ricardo Lara represented by Ahmad Kamil (CA); Andrew N. Mais represented by Wanchin Chou (CT); Doug Ommen represented by Mike Yanacheak (IA); Dana Popish Severinghaus represented by Vincent Tsang (IL); Amy L. Beard represented by Scott Shover (IN); Vicki Schmidt represented by Nicole Boyd (KS); Grace Arnold represented by Fred Andersen and Ben Slutsker (MN); Chlora Lindley-Myers represented by William Leung (MO); Eric Dunning represented by Michael Muldoon (NE); D.J. Bettencourt represented by Jennifer Li (NH); Justin Zimmerman represented by Seong-min Eom (NJ); Adrienne A. Harris represented by Bill Carmello (NY); Judith L. French represented by Peter Weber (OH); Glen Mulready represented by Andrew Schallhorn (OK); Michael Humphreys represented by Steve Boston (PA); and Jon Pike represented by Tomasz Serbinowski (UT).

1. Reported its Regulator-to-Regulator Task Force Meeting

Hemphill said that the Task Force met Sept. 7 in regulator-to-regulator session, pursuant to paragraph 3 (specific companies, entities, or individuals) of the NAIC Policy Statement on Open meetings. She further noted that because of the discussion, the Task Force decided to distribute additional materials to state insurance regulators to assist them with their review of index-linked variable annuity (ILVA) product filings.

2. Adopted Year-End 2023 AG 53 Templates

Slutsker walked through the *Actuarial Guideline LIII—Application of the Valuation Manual for Testing the Adequacy of Life Insurer Reserves* (AG 53) templates to be used for 2023 year-end reporting, noting that the main changes included: 1) adding a tab to highlight the projected asset portfolio allocation; and 2) adding a tab to get a more refined breakdown of a company's nontraditional assets.

Slutsker made a motion, seconded by Yanacheak, to adopt the year-end 2023 AG 53 templates (Attachment A). The motion passed unanimously.

3. Adopted the 2023 VM-20 HMI and FMI Rates

Marianne Purushotham (Society of Actuaries—SOA) walked through a presentation (Attachment B) that contained the 2023 VM-20, Requirements for Principle-Based Reserves for Life Products, historical mortality improvement (HMI) and future mortality improvement (FMI) rate recommendation. Scott O'Neal (NAIC) then discussed a presentation (Attachment C) that illustrated the impact of the new HMI and FMI rates using a VM-20 universal life with secondary guarantees (ULSG) model office. Chupp asked whether the impact of COVID-19 that was reflected in the HMI and FMI rates was solely the impact of COVID-19 and not from other excess mortality factors that may be related to COVID-19. Purushotham noted that their data did not distinguish between the initial shock mortality impact of COVID-19 and ongoing related mortality factors and that the methodology included both impacts in the development of the HMI and FMI rates. Slutsker asked if it could be made clear on the SOA's website that the HMI and FMI rates did not apply to limited underwriting, to which Purushotham responded that they would make it clear on the website. Chou asked about the large increase to deterministic reserves shown for younger ages due to the change in the smoothing method. O'Neal stated that much of the deterministic reserve

increase for younger ages was due to the impact of the smoothing methodology change on the HMI rates, further stating that companies with high levels of credibility would not be affected by the change in HMI rates until much later in the projection. Therefore, O'Neal said that the increase to company deterministic reserves resulting from the new HMI rates would likely be much less significant than what was implied in the presentation.

Chupp made a motion, seconded by Slutsker, to adopt the 2023 HMI and FMI rates (Attachment B). The motion passed unanimously.

4. Heard a Presentation from the Academy on GOES Interim Interest Rate Acceptance Criteria

Jason Kehrberg (American Academy of Actuaries—Academy) and Iouri Karpov (Academy) walked through a presentation (Attachment D) that highlighted the Academy's recommended generator of economic scenarios (GOES) interim interest rate acceptance criteria.

Having no further business, the Life Actuarial (A) Task Force adjourned.

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Draft: 10/11/23

Life Actuarial (A) Task Force
Virtual Meeting
August 31, 2023

The Life Actuarial (A) Task Force met Aug. 31, 2023. The following Task Force members participated: Cassie Brown, Chair, represented by Rachel Hemphill (TX); Scott A. White, Vice Chair, represented by Craig Chupp (VA); Lori K. Wing-Heier represented by Sharon Comstock (AK); Ricardo Lara represented by Ahmad Kamil and Thomas Reedy (CA); Andrew N. Mais represented by Wanchin Chou (CT); Doug Ommen represented by Mike Yanacheak (IA); Dana Popish Severinghaus represented by Vincent Tsang (IL); Amy L. Beard represented by Scott Shover (IN); Vicki Schmidt represented by Nicole Boyd (KS); Grace Arnold represented by Fred Andersen and Ben Slutsker (MN); Chlora Lindley-Myers represented by William Leung (MO); Eric Dunning represented by Michael Muldoon (NE); D.J. Bettencourt represented by Jennifer Li (NH); Justin Zimmerman represented by Seong-min Eom (NJ); Adrienne A. Harris represented by Bill Carmello (NY); Judith L. French represented by Peter Weber (OH); Glen Mulready represented by Andrew Schallhorn (OK); Michael Humphreys represented by Steve Boston (PA); and Jon Pike represented by Tomasz Serbinowski (UT).

1. Adopted Amendment Proposal Form 2023-08, Optional Interest Maintenance Reserve Template, and Temporary Interest Maintenance Reserve Guidance

Hemphill said that comments on the exposure of amendment proposal form (APF) 2023-08, the optional interest maintenance reserve (IMR) template, and the temporary IMR guidance had been discussed at the Task Force's meeting during the Summer National Meeting. Hemphill then walked through APF 2023-08 and the temporary guidance.

Leung made a motion, seconded by Chupp, to adopt APF 2023-08 (Attachment A) and the temporary IMR guidance (Attachment B). The motion passed unanimously.

Hemphill then discussed the optional IMR template and edits and corrections that had been made after hearing from commenters.

Leung made a motion, seconded by Weber, to adopt the optional IMR template (Attachment C). The motion passed unanimously.

Referred a Memorandum on Changes to the Society of Actuaries' Fellowship Pathway to the Health Actuarial (B) Task Force and Casualty Actuarial and Statistical (C) Task Force

Hemphill noted that she and several Task Force members had expressed concern regarding the removal of regulatory content from the Society of Actuaries' (SOA's) fellowship educational pathway at the Summer National Meeting. Hemphill said that these comments had been incorporated into a memorandum addressed to the SOA that would serve as a formal response from the Task Force. Additionally, Hemphill stated that this memorandum could be referred to the Health Actuarial (B) Task Force and Casualty Actuarial and Statistical (C) Task Force to determine if those groups would join the Life Actuarial (A) Task Force in a joint memorandum to the SOA. Chou said that the referral to the Health Actuarial (B) Task Force and the Casualty Actuarial and Statistical (C) Task Force was the appropriate way to move forward in responding to the SOA's educational changes.

Ann Weber (SOA) noted that the SOA was early in the process of updating its fellowship pathway, and a more comprehensive report on the specific changes was expected to be delivered at the Life Actuarial (A) Task Force,

Health Actuarial (B) Task Force, and Casualty Actuarial and Statistical (C) Task Force meetings in November. Weber further stated that the SOA was taking concerns raised by state insurance regulators very seriously. Hemphill stated that she had concerns with receiving the SOA feedback too late in the process for the SOA to incorporate the feedback in the updates to the fellowship pathway. Weber responded that the SOA is planning to allow for sufficient time to review feedback before implementing the updates to the fellowship pathway.

Yanacheak made a motion, seconded by Andersen, to refer the memorandum (Attachment D) to HATF and CASTF. During discussion of the motion, Serbinowski stated that he did not share the concerns regarding the changes to the fellowship pathway, noting that an actuary who went through the SOA's educational curriculum in the 1980s would have needed to do a significant amount of self-study to keep up with the changes to regulations and actuarial methodologies and that the same type of self-study could be employed for regulatory material. Hemphill acknowledged Serbinowski's point but stated that it was important to develop a foundation of regulatory knowledge through the fellowship pathway so that an actuary can build from that foundation as regulations evolve over time. Chupp agreed with Hemphill, stating that there would be a lack of awareness of regulatory issues without inclusion in the fellowship pathway.

Rhonda Ahrens (Thrivent) noted that from her experience as a former state insurance regulator, there was no process in place for regulators to audit if the SOA's regulatory material was adequate and that she hoped that the potential changes to the fellowship pathway would spur more interest on the regulatory content. Hemphill agreed that there is no process in place for the Task Force to review the SOA's education regulatory content but noted that several regulators are active as volunteers for the SOA's educational initiatives. Andersen noted that he supported the memorandum because: 1) there had been situations where certain regulatory material was cut that led to errors in company filings; and 2) it was significant that the SOA had called out that it is removing regulatory material from the required curriculum. Reedy said that when he and his colleagues perform on-site reviews of insurance companies, they work with more than just the appointed actuary, which points to a broader need for exposure to regulatory content. Reedy further stated that he was concerned that the removal of the regulatory content from the fellowship pathway would reinforce the notion that statutory reporting is a secondary framework, and Hemphill agreed.

The motion passed unanimously.

Having no further business, the Life Actuarial (A) Task Force adjourned.

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November 29, 2023

From: Fred Andersen, Chair
Indexed Universal Life (IUL) Illustration (A) Subgroup

To: Rachel Hemphill, Chair
The Life Actuarial (A) Task Force

Subject: The Report of the Indexed Universal Life (IUL) Illustration (A) Subgroup (IUL Illustration SG) to the Life Actuarial (A) Task Force

The IUL Illustration SG has not met since the adoption of group's main work product, revisions to Actuarial Guideline 49A, by the Life Actuarial (A) Task Force on December 11, 2022. The revisions to Actuarial Guideline 49A were subsequently adopted by the NAIC's Executive (EX) Committee and Plenary at the Spring National Meeting on March 25. Regulators are reviewing the impact of the Guideline revisions on the market.

November 29th, 2023

From: Seong-min Eom, Chair
The Longevity Risk (E/A) Subgroup

To: Rachel Hemphill, Chair
The Life Actuarial (A) Task Force

Subject: The Report of the Longevity Risk (E/A) Subgroup to the Life Actuarial (A) Task Force

The Longevity Risk (E/A) Subgroup has not met since the Summer National Meeting. The subgroup will resume the meetings once the currently exposed VM-22 PBR methodology is finalized and adopted to develop and recommend longevity risk factor(s) for the product(s) that were excluded from the application of the current longevity risk factors.

November 29, 2023

From: Pete Weber, Chair
The Variable Annuities Capital and Reserve (E/A) Subgroup

To: Rachel Hemphill, Chair
The Life Actuarial (A) Task Force

Subject: The Report of the Variable Annuities Capital and Reserve (E/A) Subgroup (VACR SG) to the Life Actuarial (A) Task Force

The VACR SG has not met since the Summer National Meeting. At the request of LATF, the Chair has made a request to the Society of Actuaries to expand the work they are currently carrying out for the VM-22 Standard Projection Amount Mortality DG to include variable annuities. More specifically, to develop mortality rates to be used as prescribed assumptions within the VM-21 Standard Projection Amount. Work continues on this project and a report and recommendations are expected after the 2023 Fall NAIC National Meeting.

Agenda Item 2

Report of the Valuation Manual (VM)-22 Subgroup

Draft: 11/17/23

Valuation Manual (VM)-22 (A) Subgroup
Virtual Meeting
November 15, 2023

The VM-22 (A) Subgroup of the Life Actuarial (A) Task Force met Nov. 15, 2023. The following Subgroup members participated: Ben Slutsker, Chair (MN); Elaine Lam (CA); Lei Rao-Knight (CT); Vincent Tsang (IL); Mike Yanacheak (IA); Nicole Boyd (KS); William Leung (MO); Seong-min Eom (NJ); Bill Carmello (NY); Rachel Hemphill and Iris Huang (TX); Tomasz Serbinowski (UT); and Craig Chupp (VA).

1. Consider Exposure of VM-31 for Non-Variable Annuities

Slutsker began walking through draft revisions to VM-31, Principle Based Reserve Actuarial Report Requirements for Business Subject to a Principle-Based Valuation, VM-G, Appendix G – Corporate Governance Guidance for Principle-Based Reserves, and the Annual Statement Blank for edits related to VM-22, Requirements for Principle-Based Reserves for Non-Variable Annuities. After discussion of the VM-22 Reserves Supplement addition to the Annual Statement Blank, Chupp asked why only individual payout annuities had a line and whether one would be needed for potential group payout annuities. Slutsker noted that it could be possible that an additional line for group payout annuities would need to be added and should be considered during the exposure period. Carmello 1) asked where deferred income annuities would be included in the VM-22 Reserves Supplement, and 2) suggested that non-pension-risk transfer (PRT) group annuities be added to the reporting line for PRT. The subgroup agreed to make edits to lines 1.3 and 1.5 of the VM-22 Reserves Supplement exposure draft to clarify the appropriate line to report this business.

Tsang made a motion, seconded by Chupp, to expose the draft revisions to VM-31 (Attachment A), VM-G (Attachment B), and the Annual Statement Blank (Attachment C) for a 90-day public comment period ending February 14, 2024. The motion passed unanimously.

2. Discussed Comments Received on the VM-22 SPA Draft

Slutsker then discussed a comment from the American Council of Life Insurers (ACLI) on how standard projection amount (SPA) requirements would be applied to products without cash surrender value or account value - such as payout annuities. Slutsker suggested reusing specific wording from another section that stated that the Guarantee Actuarial Present Value (GAPV) requirements are not applicable for contracts where there is no account value or surrender benefits to which the subgroup agreed.

Slutsker introduced the ACLI's comment that withdrawals for lifetime guaranteed living benefits don't seem to be appropriately addressed in the current VM-22 SPA language. The subgroup agreed to add the ACLI's suggested wording change into the next draft. Slutsker then walked through ACLI's next comment that questioned whether the crediting rate limit section (6.C.11.b) was supposed to apply to all products in scope of VM-22 or just indexed products. The subgroup decided to add wording in the next draft that clarifies that this section applies to all contracts in scope of VM-22 with crediting rates offered after contract issue.

Slutsker discussed an exposure question regarding language that would allow exceptions to the prescription in the crediting rate limit section with approval from regulators in the company's state of domicile. Tsang noted that the provision was added in the case of specific product designs that included persistency bonuses. Carmello suggested removing the language to avoid non uniformity. Hemphill also suggested removing the language since

it does not have clear expectations for regulators about exactly when or what would qualify. Lam agreed and suggested removing the language because it is vague.

Lam made a motion, seconded by Tsang, to remove the language allowing for exemption from the crediting rate limit section and add an exposure question for commenters to discuss specific products where the draft language would be challenging. The motion passed unanimously.

Having no further business, the VM-22 (A) Subgroup adjourned.

SharePoint/NAIC Support Staff Hub/Member Meetings/A CMTE/LATF/2023-3-Fall/VM-22 Calls/11 15/Nov 15 Minutes.docx

Draft: 11/17/23

Valuation Manual (VM)-22 (A) Subgroup
Virtual Meeting
November 08, 2023

The VM-22 (A) Subgroup of the Life Actuarial (A) Task Force met Nov. 8, 2023. The following Subgroup members participated: Ben Slutsker, Chair (MN); Elaine Lam (CA); Lei Rao-Knight (CT); Nicole Boyd (KS); William Leung (MO); Seong-min Eom (NJ); Bill Carmello (NY); Rachel Hemphill and Iris Huang (TX); Tomasz Serbinowski (UT); and Craig Chupp (VA).

1. Discussed Comments Received on the VM-22 SPA Draft

Slutsker said that the group would be discussing comments received on the VM-22, Requirements for Principle-Based Reserves for Non-Variable Annuities, standard projection amount (SPA) draft. Brian Bayerle (American Council of Life Insurers – ACLI) spoke to the ACLI's comment questioning whether the SPA would be determined in aggregate for a block of business or if the calculation would need to be done at the reserving category level. Slutsker noted that the current intention of the language would have the SPA be calculated at the reserving category level. Hemphill noted that the SPA is currently envisioned to be a binding floor (consistent with VM-21) rather than a disclosure item, Requirements for Principle-Based Reserves for Variable Annuities, but that could be revisited after the field test. After Eom asked whether the ACLI's position on the level of aggregation for the SPA calculation would change depending on the decision of floor vs disclosure, Bayerle replied that it would make sense to calculate the SPA in aggregate if it were disclosure only, but potentially within a reserving category if it were a binding floor.

Bayerle then introduced the ACLI's next comment noting that the requirements were unclear on whether an SPA would need to be calculated for contracts that pass stochastic exclusion testing but still require a deterministic reserve (DR) to be calculated. Bayerle stated that it is not necessary to calculate the SPA for the DR, but if it was required then additional specifications would be necessary to define the calculations. Hemphill asked Bayerle to explain why the ACLI thought it wasn't necessary for DR calculation, Bayerle commented that part of the rationale for the SPA in VM 21 is to identify outlier assumptions which is far more complicated to do in a stochastic setting. Bayerle further stated that the behavior of the individual assumptions should be a lot more transparent to the regulators within the DR. After several regulators noted support for requiring an SPA to be determined for contracts only subject to a DR, the group decided to make clarifying enhancements to future VM-22 language to fully define the SPA calculation for a DR.

Slutsker then brought up an exposure question in the draft regarding the historical expense inflation assumption and whether to use a simple static annual rate or instead use the actual inflation that occurred. The group decided to leave this as a static rate but reserved the possibility of revisiting the assumption at a later discussion.

Slutsker then walked through the American Academy of Actuaries' (Academy's) comment that some of the prescription in the determination of the Guarantee Actuarial Present Value (GAPV) should be reduced as the current framework does not consider waiting for benefits to become more valuable before exercise. Andrew Jenkins (Academy) added that the GAPV was well defined for variable annuities (VAs) but could cause anomalous outcomes if left in there for fixed and index products with living benefits. After discussion, Slutsker asked for the Academy to draft language to improve the language for discussion on a future call.

Slutsker discussed the Academy's next comment that noted an integrated GAPV may produce more reasonable outcomes and be easier to calibrate when there are multiple benefits present. Jenkins added that the comment

is more intended for ease of maintenance of this regulation as there is innovation over time potentially if companies develop multiple living benefits and death benefits in non-variable annuity products. The subgroup members decided to include this integrated benefit edit.

Slutsker stated that the ACLI's next comment on GAPV asked whether they are only applicable to deferred annuities. Slutsker suggested a wording change regarding contracts for which there is no account value, such as those within the payout annuity reserving category or longevity reinsurance reserving category, that the GAPV requirements are not applicable. Jenkins noted that some payout annuity contracts do have optionality features that can be exercised with discretion by the policy holder even if they don't have account value. After discussion, the subgroup decided to include language that says account value or surrender benefit or option to surrender for the next exposure.

Slutsker said that the Academy's next comment was the SPA should not use the very worst-case assumptions such as policyholders withdrawing 100% of the available amount as currently defined. Reedy commented that we use this to identify outliers and the AAA has brought up some good points. The subgroup decided to include the language suggested by the Academy and to request that the Academy look into any disclosure requirements that could help regulators understand some of the different assumption paths for the determination of the GAPV.

Having no further business, the VM-22 (A) Subgroup adjourned.

SharePoint/NAIC Support Staff Hub/Member Meetings/A CMTE/LATF/2023-3-Fall/VM-22 Calls/11 08/Nov 08 Minutes.docx

November 29, 2023

From: Ben Slutsker, Chair
The VM-22 (A) Subgroup

To: Rachel Hemphill, Chair
The Life Actuarial (A) Task Force

Subject: The Report of the VM-22 (A) Subgroup to the Life Actuarial (A) Task Force

The NAIC VM-22 (A) Subgroup has been focusing on the Standard Projection Amount (SPA) methodology, liability assumptions, and VM-31 disclosure requirements over the past few months.

Comment letters for the SPA structure were received in late October and discussed during two calls in early November, with an additional upcoming call scheduled for December. The primary topics are aggregation, deterministic reserve, dynamic lapse formula, and limits on investment spread in the SPA calculation. In addition, the SOA will continue to present proposed mortality and policyholder behavior assumptions for the VM-22 SPA in early 2024, which will then be exposed for public comment.

VM-31 requirements for non-variable annuities was exposed for 90 days during the call on November 15. The VM-31 draft builds on the current variable annuity disclosure requirements, with the same VM-31 sections applying to both variable and non-variable annuities. Additions to the current annuity disclosure requirements include sections related to non-guaranteed elements, VM-22 exclusion testing, and riders/supplemental benefits. The exposure also included a VM-22 Supplement Blank for the NAIC Annual Statement, as well as edits to VM-G.

The project plan going forward is to target a VM-22 field test for July 2024, using the most up-to-date scenarios from the proposed NAIC generator. Companies are encouraged to begin implementation and project planning now if they would like to participate in the field test and influence the VM-22 PBR framework. The field test results would be presented by early February 2025, leaving five months to make remaining modifications for the VM-22 draft. The key outstanding items to resolve from the field test are the stochastic exclusion ratio test threshold, reinvestment guardrail mix, and impact of the proposed SPA assumptions. After addressing those items and any other modifications for unintended impacts observed during the field test, the Subgroup will vote on its final recommendation for LATF.

The target timing for adopting VM-22 is July 2025, with an effective date of 1/1/2026 for new business going forward. There would be a three year optional implementation period up until 1/1/2029, after which all prospective non-variable annuity business would be valued under VM-22 PBR going forward.

PBR VM-22 Project Draft Timeline

EFFECTIVE DATE GOALS

1/1/2026

#	DRAFT TIMELINE	11 23	12 23	1 24	2 24	3 24	4 24	5 24	6 24	7 24	8 24	9 24	10 24	11 24	12 24	1 24	2 24	3 25	4 25	5 25	6 25	7 25	8 25
11	Discuss Comments on SPA Structure Exposure																						
12	VM-31 Exposure																						
13	Discuss Comments on VM-31 Structure Exposure																						
14	ESG Field Test #2																						
15	ESG Field Test #2 Presentations																						
16	VM-22 and C3P1 Field Test																						
17	Compile/analyze Field Test results																						
18	Discuss field test results on public calls																						
19	Resolve outstanding items and changes from field test																						
20	LATF exposure and discussion																						
21	LATF Adoption																						
22	A Committee Adoption																						
23	NAIC Exec & Plenary Adoption																						

Agenda Item 3

Receive an Update from the VM-22
Policyholder Behavior Drafting Group
(Materials Pending)

Agenda Item 4

Hear an Update on Mortality Experience Data Collection and Consider Adoption of the Experience Reporting (A) Subgroup

Update on Mortality Experience Data Collection

Pat Allison, FSA, MAAA

November 29, 2023

Agenda

- Participating Companies Trend
- Valuation Manual Changes
- Status of Reporting Year 2021 (Observation Years 2018 & 2019)
- Status of Reporting Year 2022 (Observation Year 2020)
- Challenges
- Status of Reporting Year 2023 (Observation Year 2021)

Participating Companies

Reporting Year	Observation Year	Number of Companies*	Record Count (approx.)
2021	2018	108	95 million
2021	2019	108	97 million
2022	2020	105	98 million
2023	2021	103	TBD

The number of companies has decreased over the years, but this is due to mergers and companies falling below VM-51's $10 million premium threshold for exemption.

* Two companies involved in a novation are counted separately (these are combined in the aggregated data file provided to the SOA).

Valuation Manual Changes

Reporting Year 2022 (Observation Year 2020)

- Added additional field to allow for reporting of data by a reinsurer or third-party administrator
- Introduced new plan codes for Paid-Up Additions and One-Year Term purchased with dividends (voluntary for 2020 observation year)
- Introduced Death due to Covid-19 termination cause (voluntary for 2020 observation year)

Reporting Year 2023 (Observation Year 2021)

- Plan codes for PUAs and One-year Term purchased with dividends became mandatory
- Death due to Covid-19 termination cause became mandatory
- Final deadline for submissions was officially changed to 2/28/2024

Reporting Year 2024 (Observation Years 2022 & 2023)

- Reporting lag was removed
- One-time collection of 2 Observation Years to catch up

Status of Reporting Year 2021
(Observation Years 2018 & 2019)

- Each company received a spreadsheet from the NAIC showing Actual to Expected (A/E) mortality ratios calculated based on their data. Sign-offs were requested on the reasonableness of the A/Es.
  - This exercise identified data exceptions for a number of companies that required resubmissions.
  - As of 10/31/23 all but 1 small company had approved their A/E ratios. The decision was made to include their data in the final aggregated data file delivered to the Society of Actuaries.
- Currently the Individual Life Experience Committee (ILEC) is working with the NAIC to review and analyze the final aggregated data file.
- Now that company data submissions are final, reports for regulators can be prepared as desired.

Status of Reporting Year 2022
(Observation Year 2020)

- The NAIC is continuing to work with companies whose data is not yet acceptable. We expect this to be resolved with data resubmissions.
- The A/E analysis has been sent to most companies and many have responded. The NAIC will be reaching out to those not responding to determine if additional information is needed.
- Although reporting of COVID-19 deaths was optional, many companies used the new code on a voluntary basis.

Challenges

- There has been a significant amount of turnover of company contacts preparing the data submissions.
  - This has resulted in confusion regarding the requirements and the process.
  - In some cases, it has required new training of company personnel.

- There have been inconsistencies regarding the data quality from year to year.
  - Companies that had clean data one year may have numerous data exceptions the next year.
  - There have been inconsistencies with the coding of certain fields.

Status of Reporting Year 2023
(Observation Year 2021)

- The NAIC has received data submissions from approximately 68 companies.
  - In the near future, the NAIC will be reaching out to those companies that have not submitted an initial data file.
- In addition to the feedback provided in prior years, the NAIC will be providing a 4-year trend of key data fields.
- A/E spreadsheets will be provided for each data submission.
- Field Distribution PowerPoint slides will be provided with the initial data validation review.

NAIC

NATIONAL ASSOCIATION OF INSURANCE COMMISSIONERS

Agenda Item 5

Discuss Comments Received on the Generator of Economic Scenarios (GOES) Corporate Model Decision

NATIONAL ASSOCIATION OF INSURANCE COMMISSIONERS

Life Actuarial (A) Task Force and Life RBC (E) Working Group
Exposure 10/18/23:
GOES Corporate Model Decision

The questions below regarding the GOES corporate model are being released for a public comment period. Please send comments to Scott O'Neal (soneal@naic.org) by close of business 11/7/2023.

1. Bearing in mind that there will be updated quantitative comparisons of the corporate models[1], please indicate whether you are currently supportive of utilizing the Conning GEMS® corporate model, the American Academy of Actuaries Economic Scenario Subcommittee's corporate model (see Attachment A), and/or believe either model may be appropriate. Please provide a rationale, including what you see as the relative strengths and weaknesses of each of the models.
2. Please note and explain any material deficiencies in the current documentation provided for the Conning GEMS® corporate model see (Attachments B and C). Straightforward, specific illustrations of the practical impact of any deficiencies are encouraged. Additional documentation is available at https:\naic.conning.com/scenariofiles.

[1] The Conning GEMS® model is currently being recalibrated to align with the exposed acceptance criteria that were developed by the American Academy of Actuaries Economic Scenario Subcommittee and later modified by regulators from the Life Actuarial (A) Task Force and Life RBC (E) Working Group. Quantitative comparisons of the two corporate models will be provided once the recalibration of the Conning GEMS® is completed.

Attachment A

Corporate Credit & Bond Fund Returns —

Stylized Facts, Acceptance Criteria, and a Simplified Model

Jason Kehrberg, MAAA, FSA
Chairperson, Economic Scenario Generator Work Group (ESGWG)

Hal Pedersen, MAAA, ASA
Member, Economic Scenario Generator Work Group (ESGWG)

Iouri Karpov, MAAA, FSA
Member, Economic Scenario Generator Work Group (ESGWG)

National Association of Insurance Commissioners (NAIC) Life Actuarial (A) Task Force (LATF)
December 11, 2022

American Academy of Actuaries

Agenda —Corporate Credit & Bond Fund Returns

1. Background
2. Stylized Facts
3. Acceptance Criteria
4. A Simplified Model
5. Discussion and Q&A
6. Appendices

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1.

Background

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Background

LATF asked the ESGWG to deliver a series of presentations focused on proposing qualitative **Stylized Facts** and quantitative **Acceptance Criteria** for the three major components of an ESG used for statutory reporting purposes: **Interest Rates**, **Equity Returns**, and **Corporate Bond Fund Returns**

Prior presentations in this series:

- A Framework for Working with ESGs (8/8/22)
- ESG Governance Considerations (8/8/22)
- Equity Returns—Stylized Facts (8/9/22)

This and future presentations in this series:

- **Corporate Credit & Bond Fund Returns—Stylized Facts, Acceptance Criteria, and a Simplified Model**
- Interest Rates—Stylized Facts and Acceptance Criteria
- Equity Returns—Acceptance Criteria

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Background (continued)

This presentation proposes **Stylized Facts** and **Acceptance Criteria** for Corporate Credit Spreads and Bond Index Fund Returns that (a) are independent of any specific ESG model, (b) can be used to identify and evaluate candidate ESG models, and (c) can be used to evaluate a set of stochastic scenarios.

In addition to Stylized Facts and Acceptance Criteria, this presentation also proposes a **Simplified Model**.

- Regulators expressed interest in the ESGWG proposing an alternative corporate bond fund return model that is **fully documented** so that the model can be appropriately reviewed and understood.
- Like GEMS, the simplified model simulates **four** U.S. corporate bond fund indices.

Label	Bond Fund Index
IG 1-5	U.S. Corp. Investment Grade 1-5 year
IG 5-10	U.S. Corp. Investment Grade 5-10 year
IG Long	U.S. Corp. Investment Grade Long (>10 year)
HY	U.S. Corp. High Yield (Below Investment Grade)

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A framework for developing, implementing, and evaluating ESGs and the scenario sets they produce

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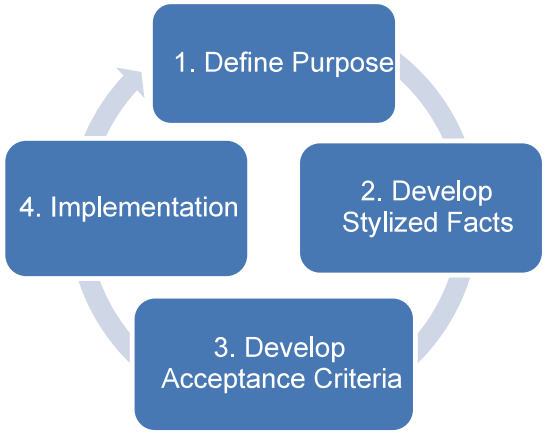

1. **Define Purpose** The intended purpose of the ESG informs the economic variables to be simulated and the relative importance of their "stylized facts."
2. **Develop Stylized Facts** Stylized facts describe properties of the economic variables to be simulated. They are based on historical market data and economic theory and are prioritized relative to the defined purpose at hand. The establishment of stylized facts is critical for selecting candidate ESG models and a key prerequisite for the development of acceptance criteria.
3. **Develop Acceptance Criteria** A set of quantitative metrics or target values at different time horizons or in different economic conditions used to ensure the scenarios produced by the ESG are consistent with defined stylized facts.
4. **Implementation** : ESG models are selected based on their ability to reflect defined stylized facts, then calibrated in accordance with acceptance criteria. Scenario sets are validated against defined acceptance criteria. This is an iterative process. It is important to periodically review and recalibrate the ESG as market conditions change over time.

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2.

Stylized Facts

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Groupings for Stylized Facts

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Stylized Facts have been grouped into 6 categories with 1 to 3 Stylized Facts each:

- 3 categories for **Corporate Credit Spreads**
- 3 categories for **Bond Index Fund Returns**

Corporate Credit Spreads

1. General nature of credit markets and credit spreads
2. Relation across qualities and maturities
3. Relation to other market variables

Bond Index Fund Returns

4. General nature of bond index funds
5. Bond index fund return dynamics
6. Relation to other asset classes

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1. Corporate Credit Spreads —General nature of credit markets and credit spreads

a. Credit markets tend to be cyclical with elevated defaults and migrations at the end of credit cycles. Credit-related losses tend to be "lumpy" or episodic.

b. Credit spreads are positive and have a strong tendency to revert to long-term normative levels (generally within three to four years).

c. Credit spreads exhibit volatility clustering (i.e., regimes of high and low volatility), and volatility has a strong tendency to revert to long-term normative levels.

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2. Corporate Credit Spreads —Relation across qualities and maturities

a. As a bond's credit quality decreases credit spreads, spread volatility, and the risk of loss increase.

b. Longer maturity bonds generally have higher credit spreads than shorter maturity bonds. However, the credit spreads on shorter maturity bonds are more sensitive to current market conditions, so during market stresses credit spreads on shorter maturity bonds may increase more than credit spreads on longer maturity bonds.

c. Credit spreads for different qualities and maturities tend to be strongly correlated (e.g., 80% or more).

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3. Corporate Credit Spreads —Relation to other market variables

a. Credit spreads tend to be higher and more volatile in equity bear markets (i.e., strong positive correlation to equity volatility, strong negative correlation to equity returns).

b. Credit spreads tend to be negatively correlated with Treasury rates (i.e., flight to quality during market stress).

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4. Bond Index Fund Returns —General nature of bond index funds

a. A corporate bond fund is generally actively managed (regularly rebalanced) to meet defined maturity and quality targets (e.g., 5- to 10-year investment grade bonds) by trading individual bonds into and out of the fund. Such trading tends to increase when the corporate bond market experiences high levels of credit migration.

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5. Bond Index Fund Returns —Bond index fund return dynamics

a. Bond index fund total returns reflect the impact of risk-free rates (and changes in risk-free rates) as well as credit-related returns in "excess" of risk-free rates.
   - **Total return** = Risk free return + Excess return
   - **Excess return** = Spread-based return - Frictional costs
   - **Spread-based return** reflects credit spread income and price returns (i.e., changes in market price due to spread movement).
   - **Frictional costs** reflect costs due to defaults (net of recoveries), migrations (e.g., selling downgraded bonds at a loss when they no longer meet the fund's quality targets), and rebalancing.

b. Bond index fund returns vary with the credit cycle.
   - **Spread-based return** tends to decline significantly when spreads explode but then recover as spreads mean revert and migrations/defaults occur (i.e., the portfolio is purged).
   - **Frictional costs** (which are generally not recoverable) tend to cluster and accumulate rapidly as bonds migrate/default, with severity depending on the magnitude and duration of the credit cycle.

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6. Bond Index Fund Returns —Relation to other asset classes

a. Bond funds have risk/reward relationships that are generally consistent with other asset classes over long horizons.

b. Credit spreads for bond funds held in the separate account should be consistent with economic assumptions for bonds held in the general account.

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Goals related to bond fund scenarios from Conning/NAIC 12/17/20 presentation to LATF

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Goals relating to equity and bond fund scenarios:

1. Returns should be provided for funds representative of those offered in U.S. insurance products.
2. The ESG should be calibrated using an appropriate historical period.

Goals relating to the bond fund scenarios:

8. The same model should be used to produce bond fund returns for the Basic and Robust Data Sets*, and the returns should reflect credit rating transitions, defaults, and dynamic spreads.
9. Separate yield curves should be generated by rating, and they should be linked to each other.
10. The spread between Treasuries and corporate bonds should be stochastic.
11. The ESG should include bond credit rating transitions and they should be dynamic.

* *Only goals that were related to the bond fund scenarios are listed above (goals 3 were only related to the equity scenarios).*

- These goals are generally consistent with the stylized facts presented on the prior two slides.
- Note that stylized facts are generally *prioritized* based on the intended application, but the stylized facts themselves are generally independent of the intended application (largely based on historical data, sometimes supplemented with forward looking views).
- Note that stylized facts and their prioritization are generally independent of the model since models differ in their ability to reflect the various market properties described by stylized facts.

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3.

Acceptance Criteria

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Given the intended purpose, acceptance criteria should be consistent with the Valuation Manual

VM-20 Section 9.F. prescribes deterministic tables of baseline defaults, current spreads, and ultimate spreads for projecting general account **individual bonds**.

- VM-20 prescribed spreads grade from current to ultimate over the first four years of the projection.
- VM-20 prescribed baseline default costs represent the annualized average default cost over the remaining life of a bond given its credit rating and weighted average life at the start of the projection.

The ESG produces bond fund returns for projecting separate account **bond funds**.

- These bond fund return scenarios should be consistent with VM-20's prescribed tables of spreads and defaults for use when projecting individual bonds in the general account.
- Bond fund indices experience significant frictional costs compared to individual bonds that are bought and held (largely from having to periodically rebalance bonds in the fund as they move outside the fund's target range for credit quality, or maturity).

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Credit spread steady -state targets and mean reversion should be consistent with VM -20

Steady state credit spread targets:

- Determined by averaging VM-20 general account fixed income ultimate spreads at [12/31/21].

Steady state credit spread targets	IG 1-5	IG 5-10	IG Long	HY
Quality range	[Aa3/AA to Baa1/BBB+]	[Aa3/AA to Baa1/BBB+]	[Aa3/AA to Baa1/BBB+]	[Ba3/BB- to B1/B+]
Maturity (WAL) range	[1 to 5 years]	[>5 to 10 years]	[>10 to 30 years]	[1 to 10 years]
Target (avg. VM-20 ult. spread at [12/31/21])	**107 bps**	**141 bps**	**163 bps**	**448 bps**

Mean reversion of credit spreads:

- VM-20 prescribes a 4-year grading period for general account fixed income spreads.
- Let "m" = the number of months into the projection when the average modeled credit spread is **halfway** between initial and steady state levels.
- Acceptance criteria: "m" should be between [22] and [26] (i.e., around two years).

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Target excess returns are derived from average VM -20 spreads and the historical relationship between excess returns and Option -Adjusted Spread (OAS)

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Historical averages (1999 to 2021) from Bloomberg *(bps)*	IG 1-5	IG 5-10	IG Long	HY
Option Adjusted Spread *(OAS)*	124	156	1.80	534
Spread Return *(determined from OAS and duration series)*	129	168	1.95	559
Excess Return	98	100	88	311
Frictional Cost *(Spread Return–Excess Return)*	31	68	107	248

Historical OAS split –Frictional Cost vs. Excess Return	IG 1-5	IG 5-10	IG Long	HY
Frictional Cost % of OAS	25%	44%	60%	46%
Excess Return % of OAS	75%	56%	40%	54%

Steady state targets *(bps)*	IG 1-5	IG 5-10	IG Long	HY
Target OAS *(avg. VM-20 ult. spread at [12/31/21])*	107	141	163	448
Target Excess Return *(Target OAS * Excess Return % of OAS)*	80	79	66	240
Criteria for avg. annualized Excess Return in years [20-30]	80 ±[10]	79 ±[10]	66 ±[10]	240 ±[20]

- Frictional Cost % of OAS increases with fund maturity, as longer debt incurs higher migration costs in the IG corporate universe.
- IG 5-10 and HY both have maturities of about seven years as well as similar Frictional Cost % of OAS.
- Documentation on Bloomberg's excess return definitions/calculations (pp. 85-88 of linked doc)

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Proposed cap on maximum excess return

The acceptance criteria on the previous slide ensures **average** (across all scenarios) modeled excess return in years [20-30] is close to the target excess return.

The additional guardrail below protects against overly optimistic risk/reward relationships in an individual scenario.

- Rationale: The high spreads observed during periods of market stress have generally been offset by increased frictional costs and decreased performance of bond index funds (especially for IG Long and HY). Over the long term the upside on credit returns appears limited (capped).
- Let "a" = Target OAS (i.e., average VM-20 ultimate spread at [12/31/21]) + [50 bps].
- Let "b" = any one scenario's annualized excess return over years [0-30] of the projection, where initial spread level was set equal to ultimate target OAS
- "b" should not exceed "a".

Illustrative application of additional guardrail *(bps)*	IG 1-5	IG 5-10	IG Long	HY
Target OAS *(avg. VM-20 ult. spread at [12/31/21])*	107	141	163	448
Target OAS + 50 bps *("a")*	157	191	213	498
Max annualized excess return over years [20-30]:				
Scenario Set *ABC ("b")*	190	160	200	660
Scenario Set *XYZ ("b")*	140	120	160	350

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Bond fund returns are correlated with equity returns and interest rates (and with other bond fund indices)

Modeled Spreads for bond indices should reflect a strong relationship to equity (SPX).

- Positive correlation of [60% ± 10%] to SPXVariance
- Negative correlation of [-60% ± 10%] to SPXReturn

Credit risk tends to increase during volatile bear markets, which increases credit spreads.

Note: Acceptance criteria for the correlation of ***total*** bond index fund returns to equity and interest rates could also be developed.

Modeled Excess Returns for bond indices should also reflect a strong relationship to equity; but directionally inverse to Modeled Spreads.

- Negative correlation to SPXVariance
- Positive correlation to SPXReturn

Frictional costs tend to increase during volatile bear markets, which also decreases excess returns.

Modeled Spreads and Excess Returns should reflect a very strong relationship across bond indices.

- Very similar dynamics → Correlations between bond fund indices should be greater than [80%].

Supporting Data:

Historical Correlations between Spread and Equity/Interest Rate Markets

	Int Rate Level	SPX Variance	SPX Return	IG 1-5 Spread	IG 5-10 Spread	IG Long Spread	HY Spread	Data Period
Int Rate Level	1.00							12/1960–12/2021
SPX Variance	0.02	1.00						12/1960–12/2021
SPX Return	-0.09	-0.68	1.00					12/1960–12/2021
IG 1-5 Spread	-0.18	0.52	-0.54	1.00				1/1990–12/2021
IG 5-10 Spread	-0.27	0.59	-0.63	0.92	1.00			1/1999–12/2021
IG Long Spread	-0.30	0.57	-0.60	0.82	0.94	1.00		1/1990–12/2021
HY Spread	-0.32	0.62	-0.67	0.80	0.87	0.84	1.00	11/1995–12/2021

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4.

A Simplified Model

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A simplified model for returns on corporate bond fund indices

The simplified model is consistent with Conning's previously presented goals and the ESGWG's recommended stylized facts and acceptance criteria.

The simplified model is fully documented, specified, and calibrated. It has been peer reviewed and is ready for implementation.

The model simulates excess returns on the same four corporate bond fund indices.

- Excess return = Spread-based return – Frictional costs.
- Ultimately, Total return (Treasury return + Excess return) would be simulated by adding excess returns to appropriately calculated and internally consistent returns on government bond funds of similar maturity profiles.

The model is simplified in that it implicitly reflects the impact of credit migration and defaults.

- For each of the funds in GEMS, the simplified model derives excess credit returns using stochastic credit spreads by rating but reflects the impact of credit migration, defaults, and recoveries as simplified frictional costs.
- The historically implied frictional cost is fitted using a linear functional relationship between the trailing OAS and the costs to rebalance the fund. This fitting approach ensures the frictional cost is positive and increases with the spread.

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A simplified model for returns on corporate bond fund indices (cont.)

Steady-state credit spread targets and mean reversion speeds are consistent with 20YM general account fixed income spreads.

Duration is estimated as a function of bond maturity and bond yield.

- The model captures fluctuations in long maturity fund durations observed when the level of yield changes.

Modeled relationship between credit spreads

- We propose a single random driver for all the indices to ensure rational behavior of credit spreads and capture 90% of spread variation across the indices.

Relationship to Equity and Interest Rates

- Using a simplified correlation matrix, the model captures relationships between credit spreads, equity volatility, equity return, interest rate level, and interest rate volatility.
- This correlation matrix approach can be used to generate stochastic bond index fund excess returns which are consistent with any underlying stochastic interest rate and/or equity model.

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Simplified decomposition of bond index excess return into spread return and frictional cost

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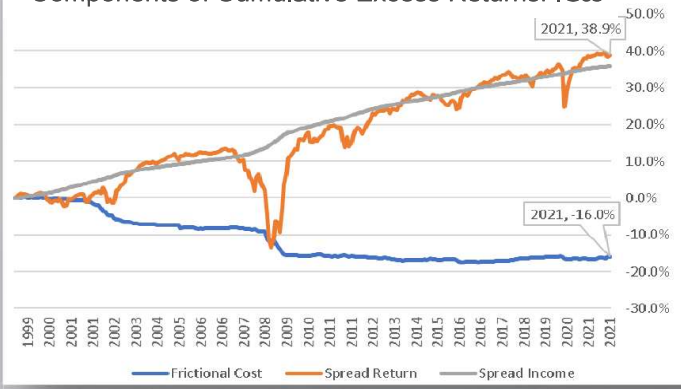
$Excess\ Return = Spread\ Return - Frictional\ Cost$, where:

- $Spread\ Return_t = Spread_{t-1}\Delta t - Duration_{t-1}(Spread_t - Spread_{t-1})$ reflects the earned credit spread as well as the change in market price due to spread movement.
- $Frictional\ Cost$ reflects the effects of defaults, migrations, and otherwise forced rebalancing that occurs within the index fund.

Components of Cumulative Excess Returns: IG05



- Cumulative Excess Return from 1999 to 2021 was 22.9% (100bps/year), as a combination of 38.9% in spread return (average OAS of 168bps) offset by frictional losses of 16% (70bps/year).
- Spread Return was calculated using Bloomberg OAS and duration time series, while the implied Frictional Cost was calculated as Excess Return less Spread Return.
- Spread Return varies with level of spreads, but ultimately reverts to earned spread income.
- Frictional Cost tends to be relatively stable, with costs accruing aggressively in early 1990s, 2000s (.com bubble) and in 2008 (financial crisis) as defaults and migrations punctuate the end of a credit cycle.

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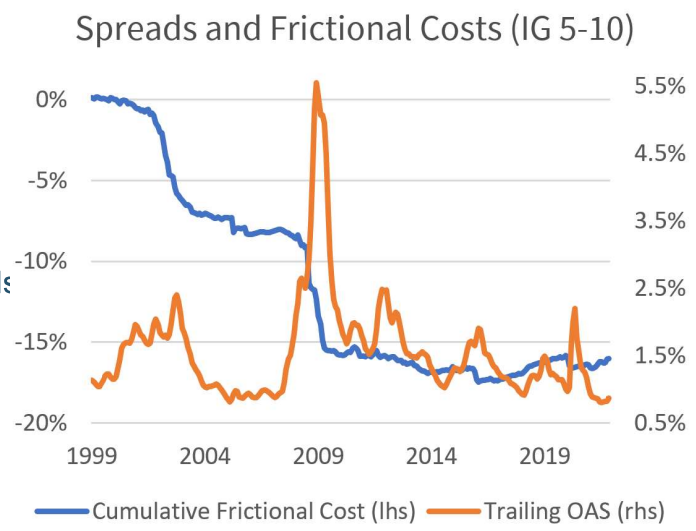
Spread and frictional cost dynamics —Historical behavior

OAS exhibits strong mean reversion, zero bound, and clustering. These dynamics, which drive the volatility of Excess Return, are native to a lognormal Ornstein-Uhlenbeck "OU" process

Cumulative Frictional Cost exhibits a relatively smooth step-like progression with most of the costs occurring during periods of elevated spreads (e.g., during breaks in the credit cycle).

Note: The relationship between spreads, equity returns, and interest rates is captured by correlating the random factors based on the historical correlation of spread residuals.



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Spread and frictional cost dynamics —Simplified modeling

Credit Spreads: Simplified model based on mean reverting stochastic processes for each credit rating.

$ls_t = \min(ls_{t-1} + \beta(\ln(\tau) - ls_{t-1}) + \sigma Z_{ls,t}, max\_spread)$ where $spread_t = e^{ls_t}$ subject to reasonable cap, $ls_0 = \ln(init\_spread)$, *tau* (τ) = Target OAS (adj), and *beta* (β) = mean reversion.

Frictional Cost: Simplified model based on trailing 3-month credit spreads.

$cost_t = a + m_1 \min(\bar{s}_t, \kappa) + m_2 \max(\bar{s}_t - \kappa, 0)$ where $\bar{s}_t = \frac{1}{3}\sum_{i=1..3} spread_{t-i}$ is the 3-month trailing avg spread, and a = drift.

Excess Return: Simplified model based on Excess Return = Spread Return – Frictional Cost.

$Excess\ Return_t = [spread_{t-1}\,\Delta t - \frac{1}{2}(Dur_t + Dur_{t-1})\,(spread_t - spread_{t-1})] - cost_t$ where:

Dur_t is duration of the underlying fund based on its assumed maturity and semi-annual coupon determined as $coup_t = UST_{t,mat} + spread_t$.

Dur_t is determined using the closed-form approximation $Dur_t = .5\,(cS_n + nx^n)$ where c = $\max\left(\frac{1}{2}coup_t, .000001\right)$, $n = 2 \times maturity$, $x = \frac{1}{1+c}$, and $S_n = \frac{x-(n+1)x^{n+1}+nx^{n+2}}{(1-x)^2}$ is the partial sum representing par-coupon durations, while nx^n represents the duration of the principal payment.

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Calibration of the Spread component

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The Spread component is calibrated to monthly historical OAS data sourced from relevant Bloomberg indices using Maximum Likelihood Estimation (MLE).

Index	Bloomberg Ticker	Data Period	Avg. Quality	Avg. Maturity (years)	Avg. OAS (basis points)	Avg. VM-20 Ultimate Spreads at 12/202 (basis points)
U.S. Corp. IG 5	BUC1TRUU	1/1990- 12/2021	A2- Baa1	3	112	107
U.S. Corp. IG 10	BCR5TRUU	1/1999- 12/2021	A2- Baa1	7	156	141
U.S .Corp. IG Long (30)	LD07TRUU	1/1990- 12/2021	A2- Baa1	23	152	163
U.S. Corp. HY	LF98TRUU	11/1995- 12/2021	Ba3– B2	7	509	448

- A single shared random factor is used for all four indices to ensure reasonable relationships between indices (captures 90% of spread variation across the indices).
- Spread mean reversion (β) was set to 3% for all four bond fund indices to ensure reasonable relationships between indices and consistency with VM-20's 4-year grading period.
- Spread volatility (σ) was adjusted accordingly to preserve historical steady state process variance.
- Spread targets (τ) were adjusted to ensure average modeled spreads align with Target OAS (average VM-20 ultimate spread at [12/31/21]).

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Calibration of the Frictional Cost component

The Frictional Cost component is calibrated to implied 3-month trailing frictional costs:

- Uses the same Bloomberg index data used to calibrate the Spread component.
- Implied frictional cost is determined as the difference between Bloomberg's excess return data and a spread return calculated using Bloomberg's historical duration and OAS data.

The calibration is performed using least squares optimization with constraints:

- Constraint: Drift (a) $\geq .0001$ (ensures a minimum cost).
- Constraint: Multipliers $m1 \geq 0$ for IG and $m1 \geq .001$ for HY (ensures dynamic behavior when spreads are low).
- A penalty function is used to constrain cumulative estimated cost to equal historical Frictional Cost during the calibration period (ensures modeled costs will be in line with historical spread levels).

Adjustment to drift in order to meet average Excess Return criteria:

- Drift parameter (a) was adjusted to directly match the middle of the excess return criteria band on slide 19.

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Proposed parameter values

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Parameters for the simplified model of excess returns on bond index func

Spread Model

	IG 1-5	IG 5-10	IG Long	HY
tau (τ, spread target)	0.00920	0.01298	0.01493	0.04134
beta (β, mean rev.)	0.03	0.03	0.03	0.03
sigma (σ, volatility)	0.13557	0.09756	0.10181	0.09565
maturity	3.0	7.0	23.0	7.0
max_spread	0.06900	0.05900	0.05000	0.18329
init_spread (12/31/20)	Market based inputs			
VM-20 spread target	0.01069	0.01408	0.01627	0.04475

Frictional Cost Model

	IG 1-5	IG 5-10	IG Long	HY
drift (a)	0.00012	0.00018	0.00019	0.00034
kappa (κ)	0.01239	0.01362	0.01556	0.03650
mult1 (m_1)	0.00000	0.00000	0.00448	0.00100
mult2 (m_2)	0.06265	0.13773	0.18706	0.12111

Parameters (correlations) for implementing the simplifi model alongside existing interest and equity models.

Simplified Corr. Matrix based on ACLI v1.3 & SLV Equity

	Rate Log Vol	Log Long Rate	SPX Log Vol	SPX Return	Credit Spread
Rate Log Vol	1.00				
Log Long Rate	0.00	1.00			
SPX Log Vol	0.00	0.00	1.00		
SPX Return	0.00	0.00	-0.63	1.00	
Credit Spread	0.20	-0.35	-0.55	-0.60	1.00

Simplified Corr. Matrix based on GEMS GFF rates & Heston Equity

	CIR ("level")	SPX Variance	SPX Return	Credit Spread
CIR ("level")	1.00			
SPX Variance	0.00	1.00		
SPX Return	0.00	-0.68	1.00	
Credit Spread	-0.25	0.60	-0.60	1.00

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Excess return cumulative wealth factors —comparison to GEMS

The simplified model satisfies the acceptance criteria by design (its parameters were explicitly set to meet the criteria).

However, since GEMS results were readily available, and as an additional reasonableness check, the next four slides provide a comparison to GEMS.

- GEMS excess returns were determined by taking total returns from the four corporate bond fund indices and subtracting total returns from government bond fund indices with similar maturity profiles.

Summary

- **IG 1-5** and **IG 5-10**: Simplified model and GEMS cumulative excess return distributions are relatively similar.
- **IG Long** Simplified model cumulative excess return distribution is generally lower than GEMS.
- **HY**: Simplified model cumulative excess returns are significantly lower than GEMS in the right tail of the distribution.

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Excess return cumulative wealth factors —IG 1-5

IG 1-5: Simplified

	Proj. year 1	5	10	15	20	25	30
Min	0.93	0.91	0.93	0.94	0.98	1.01	1.07
0.5%	0.97	0.96	0.99	1.01	1.04	1.08	1.11
1.0%	0.98	0.97	1.00	1.02	1.05	1.08	1.12
2.5%	0.98	0.98	1.01	1.04	1.06	1.10	1.13
5.0%	0.99	0.99	1.02	1.04	1.08	1.11	1.15
10.0%	0.99	1.00	1.03	1.05	1.09	1.13	1.17
25.0%	1.00	1.01	1.04	1.07	1.11	1.15	1.20
50.0%	1.00	1.02	1.05	1.09	1.14	1.19	1.23
75.0%	1.00	1.02	1.07	1.11	1.17	1.22	1.27
90.0%	1.01	1.03	1.08	1.13	1.19	1.25	1.30
95.0%	1.01	1.03	1.09	1.15	1.20	1.26	1.33
97.5%	1.01	1.04	1.09	1.16	1.22	1.28	1.34
99.0%	1.01	1.04	1.10	1.17	1.24	1.30	1.36
99.5%	1.01	1.04	1.11	1.17	1.25	1.31	1.38
Max	1.01	1.06	1.14	1.23	1.29	1.38	1.46

IG 1-5: GEMS

	Proj. year 1	5	10	15	20	25	30
Min	0.92	0.91	0.93	0.96	0.98	1.00	1.03
0.5%	0.96	0.96	0.99	1.02	1.04	1.07	1.10
1.0%	0.97	0.97	1.00	1.03	1.05	1.08	1.12
2.5%	0.97	0.98	1.01	1.04	1.07	1.10	1.13
5.0%	0.98	0.99	1.02	1.05	1.08	1.11	1.14
10.0%	0.99	1.00	1.03	1.06	1.09	1.12	1.16
25.0%	1.00	1.01	1.04	1.07	1.11	1.14	1.18
50.0%	1.00	1.02	1.05	1.09	1.12	1.16	1.20
75.0%	1.00	1.03	1.06	1.10	1.14	1.19	1.23
90.0%	1.01	1.03	1.07	1.11	1.16	1.21	1.27
95.0%	1.01	1.03	1.07	1.12	1.17	1.23	1.29
97.5%	1.01	1.03	1.08	1.13	1.19	1.25	1.32
99.0%	1.01	1.04	1.08	1.14	1.20	1.28	1.35
99.5%	1.01	1.04	1.09	1.15	1.22	1.30	1.38
Max	1.01	1.05	1.11	1.21	1.33	1.53	1.75

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Excess return cumulative wealth factors —IG 5-10

IG 5-10: Simplified

	Proj. year 1	5	10	15	20	25	30
Min	0.85	0.76	0.75	0.80	0.84	0.92	0.93
0.5%	0.93	0.88	0.91	0.93	0.96	1.00	1.06
1.0%	0.94	0.90	0.93	0.95	0.99	1.03	1.08
2.5%	0.95	0.93	0.95	0.99	1.02	1.06	1.10
5.0%	0.96	0.95	0.97	1.01	1.05	1.09	1.13
10.0%	0.97	0.97	1.00	1.03	1.07	1.12	1.16
25.0%	0.99	1.00	1.03	1.07	1.11	1.15	1.20
50.0%	1.00	1.02	1.06	1.10	1.14	1.19	1.23
75.0%	1.01	1.04	1.08	1.12	1.17	1.21	1.26
90.0%	1.02	1.05	1.09	1.13	1.18	1.23	1.28
95.0%	1.02	1.05	1.10	1.14	1.19	1.24	1.30
97.5%	1.03	1.06	1.10	1.15	1.20	1.25	1.31
99.0%	1.03	1.06	1.11	1.16	1.21	1.26	1.32
99.5%	1.03	1.07	1.11	1.16	1.21	1.27	1.33
Max	1.04	1.08	1.13	1.18	1.24	1.29	1.37

IG 5-10: GEMS

	Proj. year 1	5	10	15	20	25	30
Min	0.86	0.81	0.78	0.83	0.87	0.89	0.91
0.5%	0.91	0.88	0.92	0.95	0.98	1.02	1.06
1.0%	0.92	0.91	0.94	0.97	1.00	1.04	1.08
2.5%	0.94	0.93	0.96	1.00	1.03	1.07	1.12
5.0%	0.95	0.95	0.98	1.02	1.06	1.10	1.14
10.0%	0.97	0.97	1.01	1.04	1.08	1.13	1.17
25.0%	0.99	1.00	1.04	1.08	1.13	1.17	1.22
50.0%	1.00	1.03	1.07	1.12	1.17	1.22	1.28
75.0%	1.01	1.04	1.09	1.14	1.20	1.26	1.32
90.0%	1.02	1.05	1.10	1.16	1.22	1.29	1.36
95.0%	1.02	1.06	1.11	1.17	1.24	1.31	1.38
97.5%	1.02	1.06	1.12	1.18	1.25	1.32	1.40
99.0%	1.02	1.06	1.12	1.19	1.26	1.34	1.43
99.5%	1.02	1.06	1.13	1.20	1.27	1.36	1.45
Max	1.02	1.07	1.16	1.25	1.36	1.45	1.62

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Excess return cumulative wealth factors —IG Long

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IG Long: Simplified

	Proj. year						
	1	5	10	15	20	25	30
Min	0.61	0.57	0.56	0.59	0.55	0.65	0.63
0.5%	0.77	0.68	0.70	0.71	0.74	0.76	0.81
1.0%	0.80	0.71	0.73	0.75	0.78	0.80	0.84
2.5%	0.84	0.76	0.79	0.81	0.84	0.87	0.90
5.0%	0.87	0.82	0.84	0.86	0.89	0.92	0.95
10.0%	0.90	0.87	0.89	0.92	0.95	0.99	1.02
25.0%	0.95	0.96	0.98	1.01	1.04	1.08	1.11
50.0%	1.01	1.03	1.07	1.10	1.13	1.17	1.21
75.0%	1.05	1.09	1.13	1.16	1.21	1.25	1.29
90.0%	1.09	1.14	1.18	1.21	1.26	1.31	1.36
95.0%	1.11	1.16	1.20	1.24	1.29	1.34	1.39
97.5%	1.12	1.18	1.22	1.26	1.32	1.36	1.42
99.0%	1.14	1.20	1.25	1.29	1.34	1.39	1.45
99.5%	1.15	1.21	1.26	1.30	1.36	1.41	1.48
Max	1.19	1.27	1.31	1.39	1.43	1.49	1.58

IG Long: GEMS

	Proj. year						
	1	5	10	15	20	25	30
Min	0.73	0.63	0.60	0.68	0.71	0.78	0.78
0.5%	0.82	0.77	0.81	0.86	0.88	0.93	0.97
1.0%	0.84	0.80	0.84	0.89	0.92	0.98	1.02
2.5%	0.87	0.85	0.89	0.94	0.98	1.03	1.08
5.0%	0.90	0.88	0.93	0.98	1.03	1.08	1.13
10.0%	0.93	0.93	0.97	1.03	1.08	1.13	1.19
25.0%	0.97	0.99	1.04	1.10	1.15	1.22	1.28
50.0%	1.00	1.04	1.10	1.17	1.23	1.30	1.38
75.0%	1.03	1.08	1.15	1.22	1.30	1.38	1.46
90.0%	1.04	1.11	1.19	1.27	1.36	1.44	1.53
95.0%	1.05	1.12	1.21	1.29	1.38	1.48	1.57
97.5%	1.06	1.13	1.22	1.31	1.40	1.50	1.60
99.0%	1.06	1.14	1.24	1.33	1.43	1.54	1.64
99.5%	1.07	1.16	1.25	1.35	1.45	1.56	1.66
Max	1.08	1.19	1.30	1.41	1.55	1.63	1.80

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Excess return cumulative wealth factors —HY

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HY: Simplified

	Proj. year						
	1	5	10	15	20	25	30
Min	0.62	0.52	0.53	0.65	0.72	0.94	0.96
0.5%	0.81	0.74	0.82	0.90	1.00	1.13	1.33
1.0%	0.83	0.78	0.87	0.96	1.08	1.20	1.39
2.5%	0.87	0.84	0.94	1.04	1.17	1.32	1.49
5.0%	0.90	0.90	0.99	1.11	1.25	1.40	1.58
10.0%	0.92	0.95	1.06	1.19	1.34	1.50	1.69
25.0%	0.97	1.04	1.16	1.30	1.46	1.65	1.85
50.0%	1.02	1.12	1.25	1.40	1.59	1.79	2.01
75.0%	1.06	1.18	1.33	1.49	1.69	1.91	2.15
90.0%	1.09	1.22	1.38	1.55	1.76	2.00	2.26
95.0%	1.11	1.24	1.40	1.59	1.80	2.05	2.31
97.5%	1.12	1.26	1.43	1.61	1.83	2.08	2.36
99.0%	1.14	1.27	1.45	1.64	1.87	2.12	2.41
99.5%	1.14	1.28	1.46	1.66	1.89	2.15	2.44
Max	1.18	1.33	1.51	1.73	1.98	2.24	2.60

HY: GEMS

	Proj. year						
	1	5	10	15	20	25	30
Min	0.81	0.88	0.96	1.07	1.20	1.40	1.58
0.5%	0.90	0.97	1.10	1.22	1.36	1.53	1.72
1.0%	0.92	0.99	1.11	1.24	1.40	1.57	1.76
2.5%	0.94	1.02	1.15	1.29	1.44	1.63	1.83
5.0%	0.97	1.04	1.17	1.32	1.48	1.68	1.90
10.0%	0.99	1.07	1.20	1.35	1.54	1.74	1.98
25.0%	1.02	1.11	1.25	1.42	1.62	1.86	2.13
50.0%	1.05	1.14	1.30	1.50	1.74	2.02	2.35
75.0%	1.06	1.17	1.37	1.62	1.91	2.25	2.64
90.0%	1.07	1.21	1.46	1.77	2.12	2.52	2.99
95.0%	1.07	1.24	1.54	1.89	2.28	2.74	3.26
97.5%	1.08	1.27	1.63	2.04	2.44	2.98	3.59
99.0%	1.08	1.33	1.76	2.19	2.70	3.28	4.02
99.5%	1.08	1.38	1.87	2.35	2.92	3.57	4.38
Max	1.09	1.66	2.41	3.19	4.13	5.63	7.16

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5.

Discussion and Q&A

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Thank You

Contact:

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

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6.1

Appendix 1:
Support for Stylized Facts

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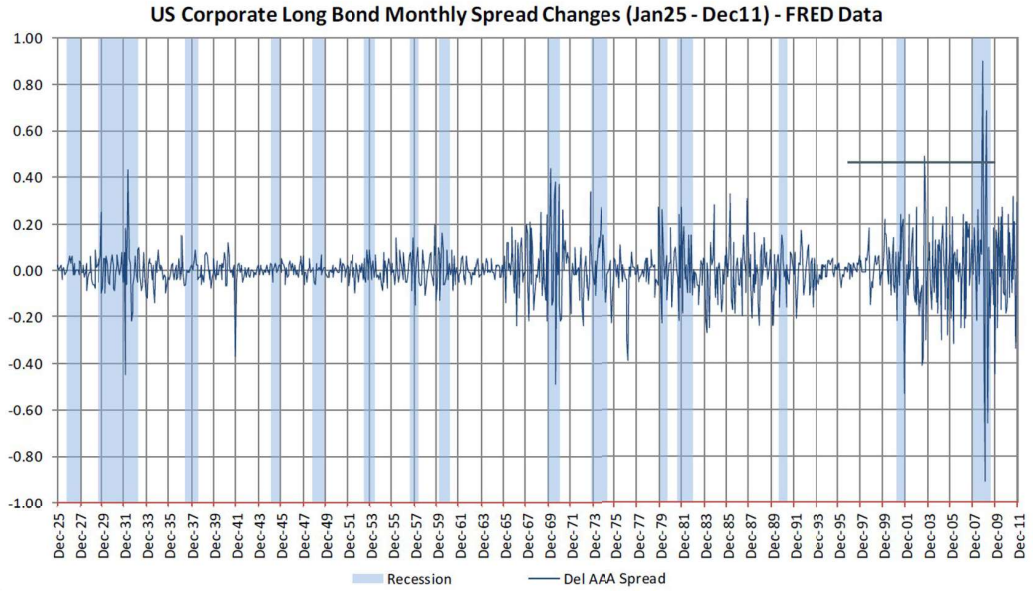
Support for Stylized Facts:
Monthly changes in U.S. credit spreads, 1925 –2011

39



Source Economic Scenario Generators: A Practical Guide (SOA, 2016)

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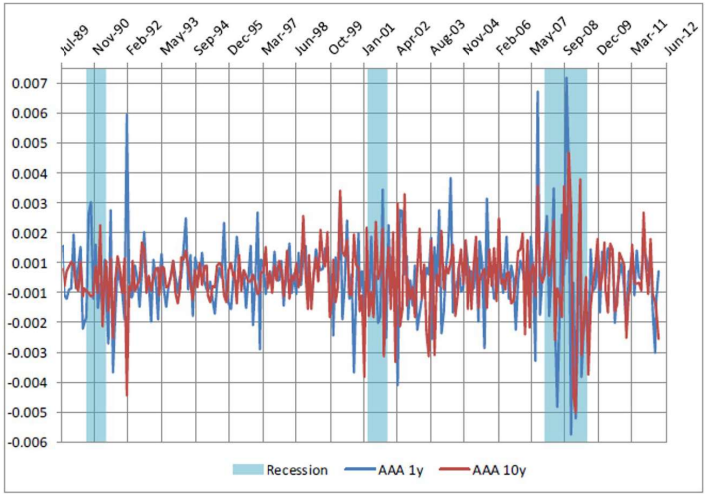
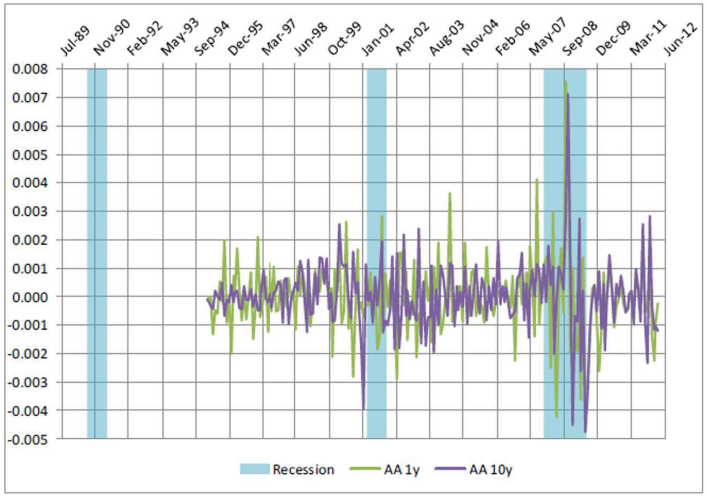
Support for Stylized Facts:
Monthly changes in U.S. credit spreads, 1989 –2012 (AAA, AA)

40





Source Economic Scenario Generators: A Practical Guide (SOA, 2016)

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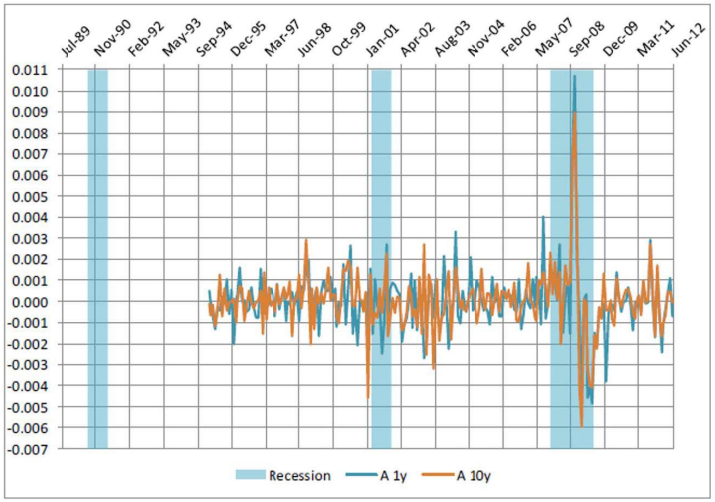
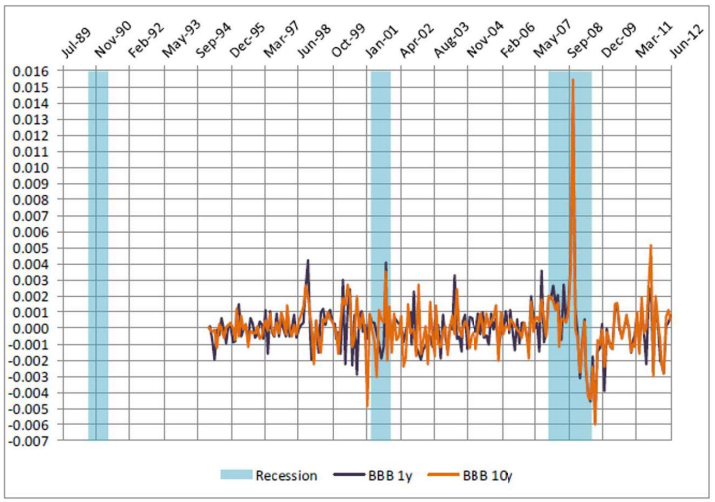
Support for Stylized Facts:
Monthly changes in U.S. credit spreads, 1989 –2012 (A, BBB)

41





Source Economic Scenario Generators: A Practical Guide (SOA, 2016)

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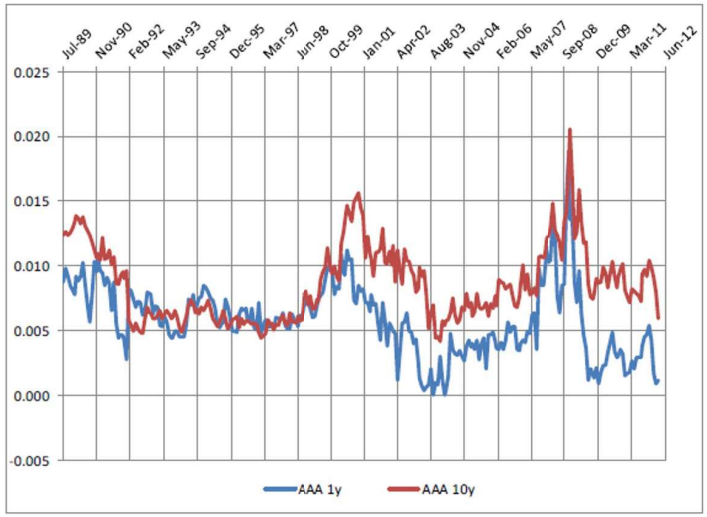
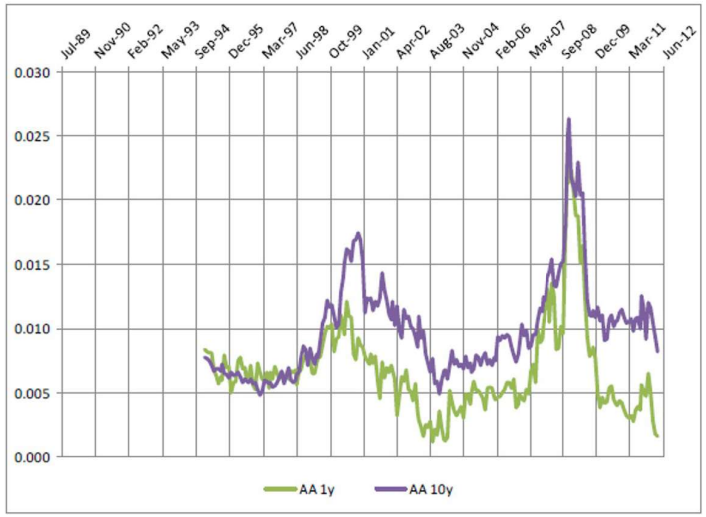
Support for Stylized Facts: Spreads for U.S. industrial zero -coupon bonds, 1989 –2012 (AAA, AA)





Source Economic Scenario Generators: A Practical Guide (SOA, 2016)

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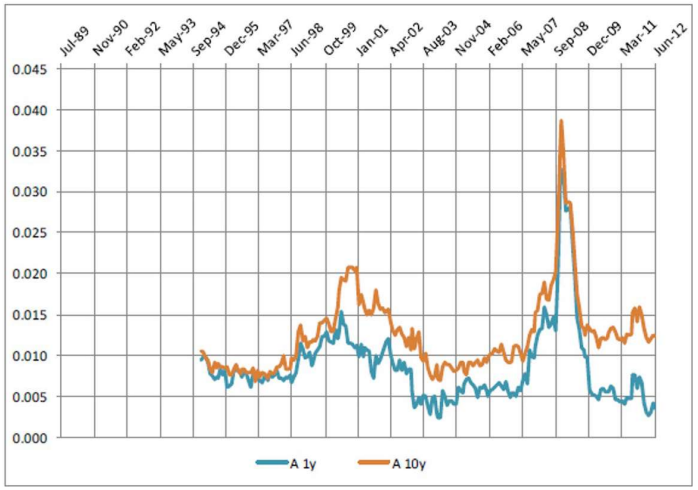
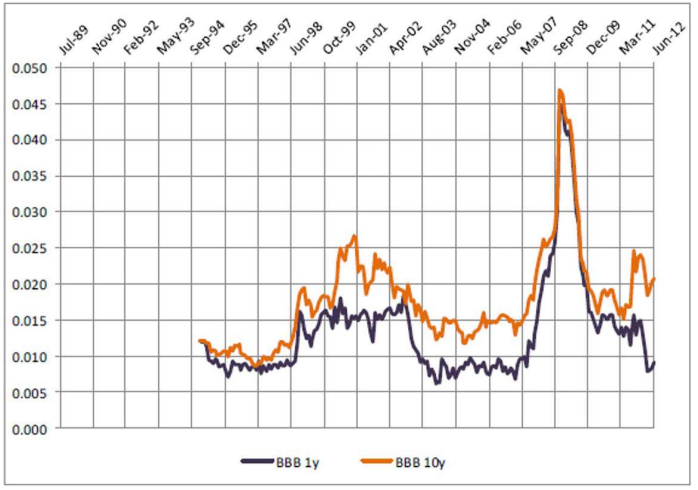
Support for Stylized Facts: Spreads for U.S. industrial zero -coupon bonds, 1989 –2012 (A, BBB)

43





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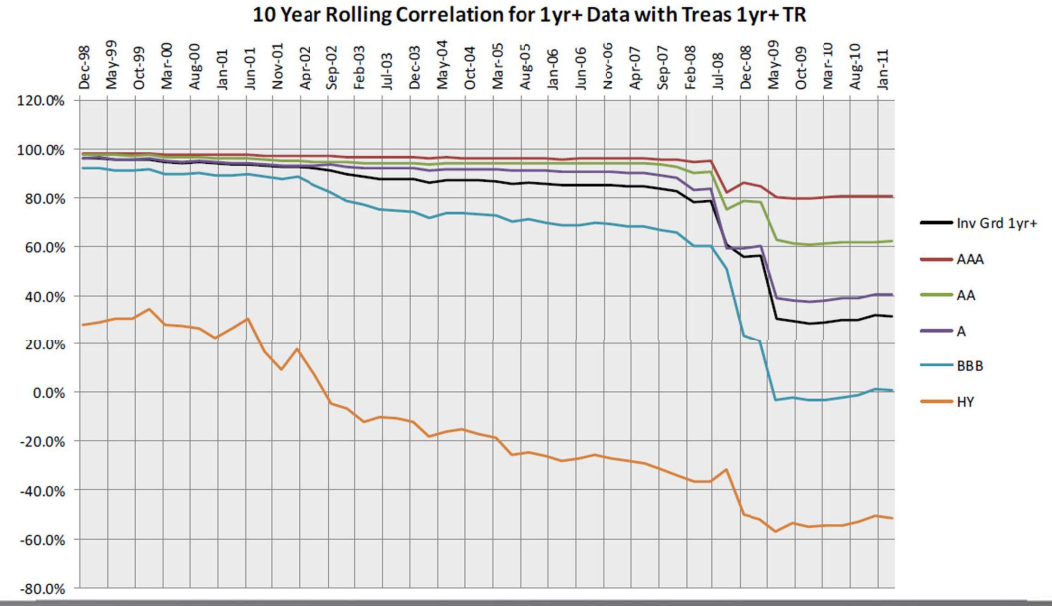
Support for Stylized Facts:
Correlations between corporate bonds and Treasuries, 1998 –2011



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6.2

Appendix 2:
Support for Acceptance Criteria

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Determining targets from VM -20 steady state spreads at 12/31/21

WAL	Aaa AAA	Aa1 AA+	Aa2 AA	Aa3 AA-	A1 A+	A2 A	A3 A-	Baa1 BBB+	Baa2 BBB	Baa3 BBB-	Ba1 BB+	Ba2 BB	Ba3 BB-	B1 B+	B2 B	B3 B-	Caa1 CCC+	Caa2 CCC	Caa3 CCC-	Ca CC
1	37.01	46.90	56.78	64.93	73.08	81.23	98.73	116.22	133.72	218.70	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
2	42.33	53.95	65.58	74.14	82.69	91.25	109.41	127.57	145.72	224.70	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
3	47.64	61.01	74.38	83.35	92.31	101.27	120.09	138.91	157.73	230.71	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
4	52.96	68.07	83.18	92.55	101.92	111.29	130.77	150.25	169.73	236.71	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
5	59.45	74.31	89.17	99.51	109.85	120.19	140.42	160.65	180.88	242.28	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
6	65.94	80.55	95.16	106.47	117.78	129.08	150.07	171.05	192.03	247.86	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
7	68.50	84.18	99.86	110.50	121.14	131.79	152.75	173.72	194.69	249.19	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
8	71.07	87.81	104.55	114.53	124.51	134.49	155.44	176.39	197.34	250.51	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
9	73.63	91.44	109.25	118.56	127.88	137.19	158.12	179.06	199.99	251.84	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
10	75.37	93.27	111.17	120.30	129.44	138.58	159.70	180.83	201.95	252.82	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
11	77.11	95.10	113.08	122.05	131.01	139.97	161.28	182.59	203.90	253.79	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
12	78.85	96.92	115.00	123.79	132.57	141.36	162.86	184.36	205.86	254.77	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
13	80.59	98.75	116.92	125.53	134.14	142.75	164.44	186.12	207.81	255.75	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
14	82.33	100.58	118.84	127.27	135.70	144.14	166.01	187.89	209.77	256.73	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
15	84.07	102.41	120.76	129.01	137.27	145.53	167.59	189.66	211.72	257.70	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
16	85.81	104.24	122.68	130.76	138.84	146.92	169.17	191.42	213.68	258.68	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
17	87.54	106.07	124.59	132.50	140.40	148.31	170.75	193.19	215.63	259.66	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
18	89.28	107.90	126.51	134.24	141.97	149.70	172.33	194.96	217.59	260.64	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
19	91.02	109.73	128.43	135.98	143.53	151.09	173.90	196.72	219.54	261.61	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
20	92.76	111.56	130.35	137.73	145.10	152.47	175.48	198.49	221.50	262.59	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
21	94.50	113.39	132.27	139.47	146.67	153.86	177.06	200.26	223.45	263.57	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
22	96.24	115.21	134.19	141.21	148.23	155.25	178.64	202.02	225.41	264.55	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
23	97.98	117.04	136.11	142.95	149.80	156.64	180.22	203.79	227.36	265.52	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
24	99.72	118.87	138.02	144.69	151.36	158.03	181.79	205.56	229.32	266.50	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
25	101.46	120.70	139.94	146.44	152.93	159.42	183.37	207.32	231.27	267.48	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
26	103.20	122.53	141.86	148.18	154.49	160.81	184.95	209.09	233.23	268.46	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
27	104.94	124.36	143.78	149.92	156.06	162.20	186.53	210.86	235.18	269.43	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
28	106.68	126.19	145.70	151.66	157.63	163.59	188.11	212.62	237.14	270.41	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
29	108.42	128.02	147.62	153.40	159.19	164.98	189.68	214.39	239.09	271.39	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32
30	110.16	129.85	149.53	155.15	160.76	166.37	191.26	216.15	241.05	272.37	303.68	361.21	418.74	476.27	533.79	688.10	842.40	996.71	1151.02	1305.32

	Quality Range	WAL Range	Avg. Spread
IG 1-5	[9□ Å– 99□]	[1 to 5 yrs]	107
IG 5-10	[9□ Å– 99□]	[>5 to 10 yrs]	141
IG Long	[9□ Å– 99□]	[>10 to 30 yrs]	163
HY	[B9□ Å– □]	[1 to 10 yrs]	448

Source: VM-20 Tables H & I at 12/31/21

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Simulated Excess Returns compared to Targets

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Average excess returns (from 20 to 30yr in the projection) are aligned with historically implied targets and meet acceptance criteria for average annualized Excess Return. Note that the cost drift parameters, *a*, have been adjusted to directly match the midpoint of the criteria range.

The standard deviation (volatility) of monthly excess returns in the scenarios scale with maturity and lower quality (as expected).

Steady state Targets *(bps)*	IG 1-5	IG 5-10	IG Long	HY
Target OAS *(avg. VM20 ult. spread at [12/31/21])*	107	141	163	448
Target Excess Return *(Target OAS * Excess Return % of OAS)*	80	79	66	240
Criteria for avg. annualized Excess Return in years [20-30]	80 ±[10]	79 ±[10]	66 ±[10]	240 ±[20]

Simulation results (10,000 scenarios)	IG 1-5	IG 5-10	IG Long	HY
Avg. annualized Excess Return (bps)	80	79	66	240
Std. dev. annualized Excess Return (bps) (over entire proj.)	1.61%	3.06%	8.57%	8.63%

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Distribution of Annualized Returns vs. Maximum Target

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Annualized cumulative excess returns over 30 years were simulated by setting initial spread level to target OAS (based on VM20 guidance).

Based on this "steady-state" simulation, the maximum excess return across 10k scenarios in the Simplified Model is well within the proposed Excess Return Cap.

Annualized Cummulative Excess Return over 30 years

	min	1%	10%	50%	90%	99%	max	Excess Return Cap	Target OAS
IG 1-5	0.22%	0.38%	0.51%	0.70%	0.89%	1.03%	1.26%	1.57%	1.07%
IG 5-10	-0.25%	0.24%	0.49%	0.70%	0.83%	0.92%	1.05%	1.91%	1.41%
IG Long	-1.56%	-0.58%	0.05%	0.63%	1.01%	1.23%	1.52%	2.13%	1.63%
HY	-0.12%	1.09%	1.75%	2.33%	2.71%	2.93%	3.19%	4.98%	4.48%

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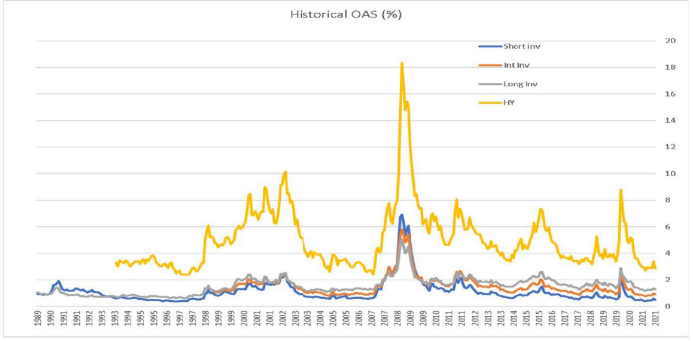
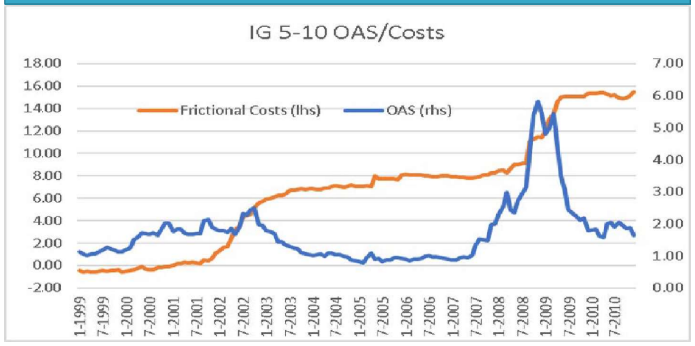
Spread and frictional cost dynamics —History

- OAS exhibits mean reversion, bound and clustering (OU process).
- Excess Return exhibits volatility driven by spread dynamics.



- Frictional Cost exhibits spikes at the break of the credit cycle when spreads are elevated.



Simplified Decomposition of Bond Fund Excess Return:

Excess Return = Spread Return – Frictional Cost where $Spread\ Return = Spread_{t-1} \Delta t - Duration_{t-1} (Spread_t - Spread_{t-1})$

- *Spread Return* reflects the earned credit spread as well as the change in market price due to spread movement.
- *Frictional Cost* reflects the effects of defaults, migrations, and otherwise forced rebalancing that occurs within the bond fund.

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Appendix 3: Additional Detail on Simplified Model

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Adjustments to spread parameters

Adjustments:

- Beta (β, mean reversion) set to 3% to ensure reasonable spread relationships between indices.
- Sigma (σ, volatility) adjusted to preserve steady state process variance: $\sigma^2/(2\beta-\beta^2)$.
- Tau (τ, spread target) is adjusted to ensure the steady state mean aligns with the VM-20 target and accounts for the convexity in the log-OU process.

Unadjusted (Historical) Parameters

	IG 1-5	IG 5-10	IG Long	HY
tau (τ)	0.01069	0.01408	0.01627	0.04475
beta (β)	0.02927	0.03613	0.01951	0.03443
sigma (σ)	0.13394	0.10690	0.08231	0.10235
maturity	3.0	7.0	23.0	7.0
max_spread	0.06900	0.05900	0.05000	0.18329
VM-20 target	0.01069	0.01408	0.01627	0.04475

Adjusted Parameters

	IG 1-5	IG 5-10	IG Long	HY
tau (τ)	0.00920	0.01298	0.01493	0.04134
beta (β)	0.03000	0.03000	0.03000	0.03000
sigma (σ)	0.13557	0.09756	0.10181	0.09565
maturity	3.0	7.0	23.0	7.0
max_spread	0.06900	0.05900	0.05000	0.18329
VM-20 target	0.01069	0.01408	0.01627	0.04475

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Principle Components Analysis (PCA) Analysis

The PCA 1 ("Parallel") factor accounts for 90% of historical variation across modeled indices.

→ Use a single random variable for all four indices to ensure reasonable relationships between indices.

Eigenvector decomposition

	PCA1	PCA2	PCA3	PCA4
IG 1-5	0.4924	0.6729	0.4257	-0.3515
IG 5-10	0.5192	0.1522	-0.1594	0.8258
IG Long	0.5007	-0.1262	-0.7382	-0.4340
HY	0.4871	-0.7128	0.4985	-0.0787
Eigenvalue	3.5943	0.2093	0.1638	0.0325
R^2	89.9%	5.2%	4.1%	0.8%

Historical correlations between indices

	IG 1-5	IG 5-10	IG Long	HY
IG 1-5	1.000			
IG 5-10	0.920	1.000		
IG Long	0.822	0.938	1.000	
HY	0.797	0.871	0.836	1.000

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A simplified correlation matrix

Correlations between spread and equity/interest rate drivers are based on the historical correlation of spread residuals.

- Correlations between the bond indices were derived using overlapping historical periods from 1/1999 to 12/2021.
- Correlations with equity and interest rate factors were derived based on all available data above.
- Correlations below 11% were set to 0% for brevity.
- Correlations between credit and other market factors were averaged and rounded to nearest 5% for simplicity.

Historical Correlation Matrix

	CIR 1	CIR 2	CIR 3	SPX Var	SPX Ret	IG 1-5	IG 5-10	IG Long	HY
CIR 1	1.00								
CIR 2	0.00	1.00							
CIR 3	0.00	0.00	1.00						
SPX Var	0.00	0.00	0.00	1.00					
SPX Ret	0.00	0.00	0.00	-0.68	1.00				
IG 1-5	0.00	0.00	-0.18	0.52	-0.54	1.00			
IG 5-10	0.00	0.00	-0.27	0.59	-0.63	0.92	1.00		
IG Long	0.00	0.00	-0.30	0.57	-0.60	0.82	0.94	1.00	
HY	0.00	0.00	-0.32	0.62	-0.67	0.80	0.87	0.84	1.00

Simplified Correlation Matrix

	CIR 1	CIR 2	CIR 3	SPX Var	SPX Ret	Spread
CIR 1	1.00					
CIR 2	0.00	1.00				
CIR 3	0.00	0.00	1.00			
SPX Var	0.00	0.00	0.00	1.00		
SPX Ret	0.00	0.00	0.00	-0.68	1.00	
Spread	0.00	0.00	-0.25	0.60	-0.60	1.00

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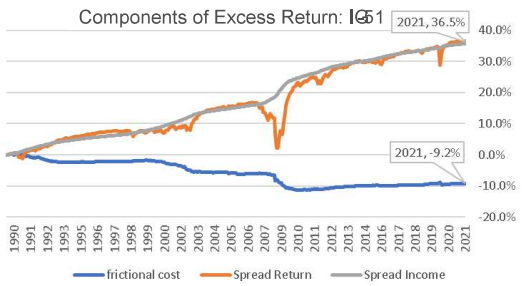
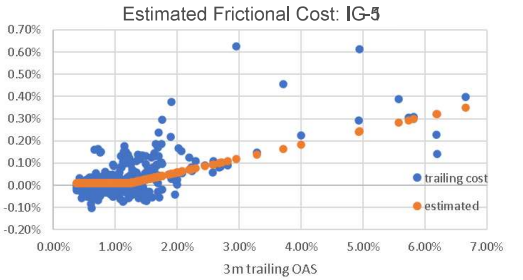
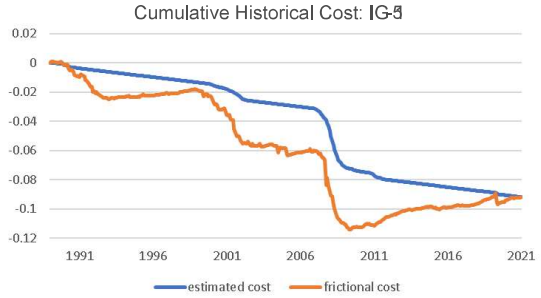
Historical statistics: IG 1 -5







Frictional Cost Model Parameters: IG 1-5

	IG 1-5
min_cost (α)	0.00010
kappa (κ)	0.01239
mult1 (m_1)	0.00000
mult2 (m_2)	0.06265

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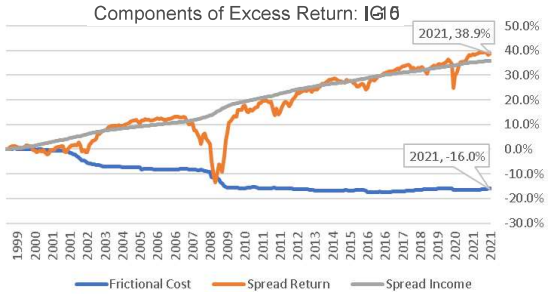
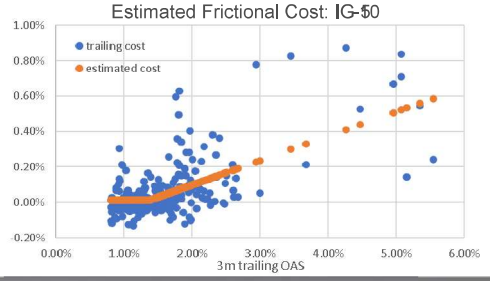
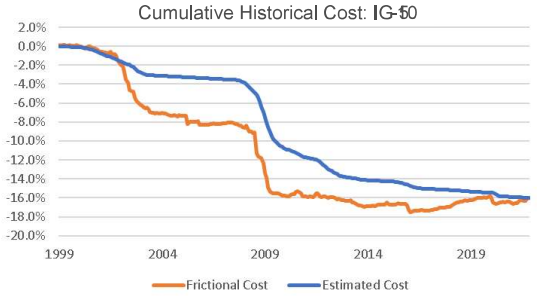
Historical statistics: IG 5 -10







Frictional Cost Model Parameters: IG 5-10

	IG 5-10
min_cost (α)	0.00010
kappa (κ)	0.01362
mult1 (m_1)	0.00000
mult2 (m_2)	0.13773

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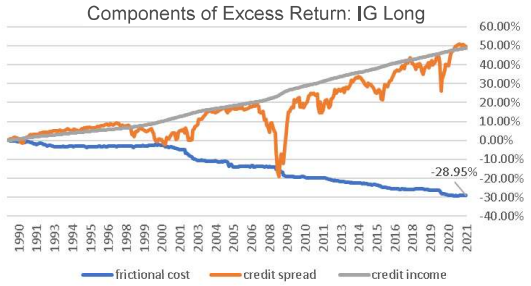
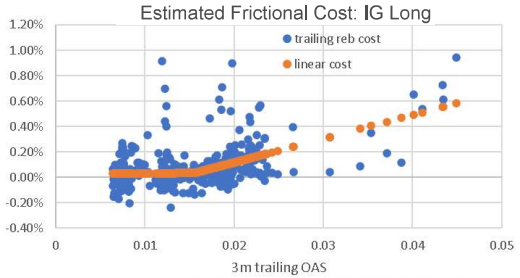
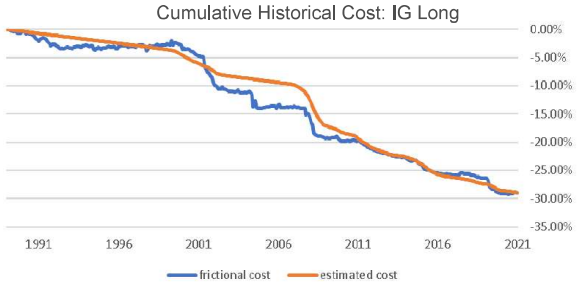
Historical statistics: IG Long

56







Frictional Cost Model Parameters: IG Long

	IG Long
min_cost (a)	0.00010
kappa (κ)	0.01556
mult1 (m_1)	0.00448
mult2 (m_2)	0.18706

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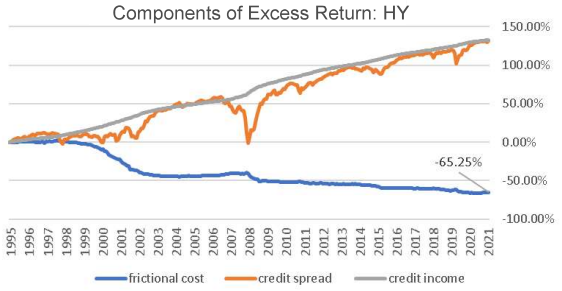
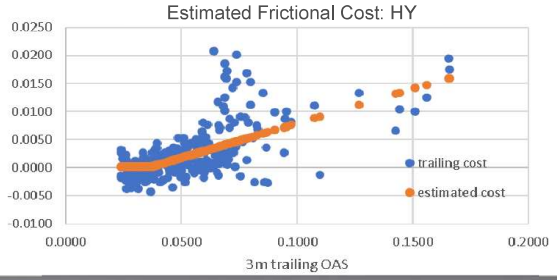
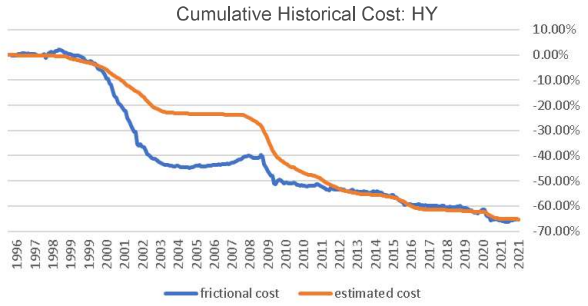
Historical statistics: HY

57







Frictional Cost Model Parameters: HY

	HY
min_cost (a)	0.00010
kappa (κ)	0.03650
mult1 (m_1)	0.00100
mult2 (m_2)	0.12111

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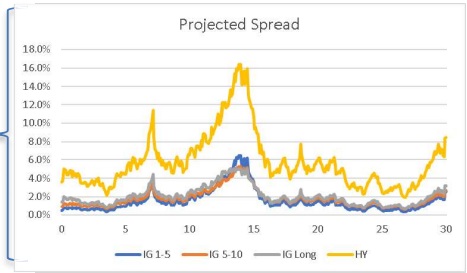
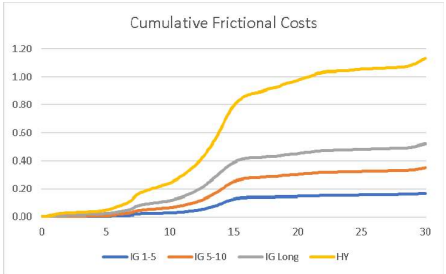
Two sample scenarios: Tail 1% and Median

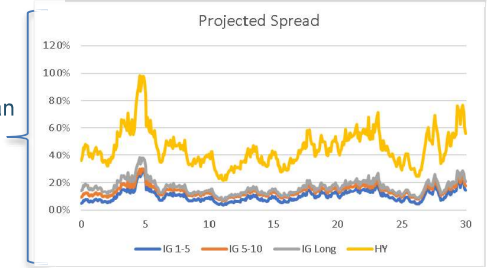
58

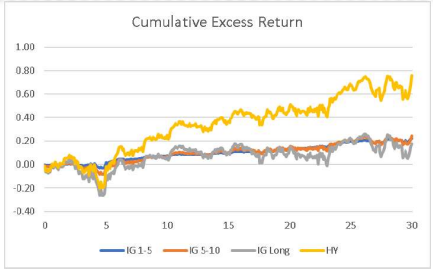
Tail 1% Scen #6187

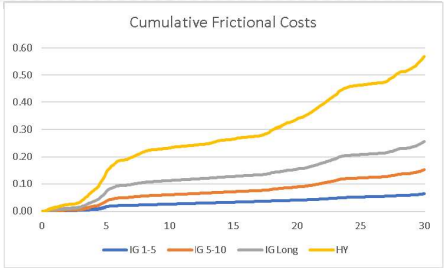




Median Scen #6731







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Attachment B

NAIC Scenario Set Technical Documentation

Corporate Yield Model

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Table of Contents

1 NAIC Basic Data Set

The Basic Data Set provided free of charge to insurers is the standard scenario file set delivered as part of the NAIC scenario service. Users can access the scenarios online by downloading a file containing stochastic scenarios from the GEMS® Economic Scenario Generator (ESG) for real-world interest rates, equity and bond fund returns. The typical application for these scenarios is in calculations of life and annuity Statutory reserves according the Valuation Manual (e.g., VM-20, VM-21) and capital under the NAIC RBC requirements (e.g., C3 Phase 1, C3 Phase 2).

In this document the technical specification of the underlying stochastic model of the ESG used for producing corporate bond yields, spreads and returns on corporate bond funds for the Basic Data Set are described.

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2 Corporate Yield Model

Corporate bonds have become an increasingly important asset class in the past decade. The drive into corporate debt has been driven in part by a sustained period of low yields. Scenarios for the yields and spreads on corporate bonds as well as corporate bond fund returns are simulated using a multi-factor model referred to as the Corporate Yield Model.

The model incorporates the following important features:

- Stochastic spreads
- Stochastic transition and default dynamics
- Real World and Risk Neutral versions
- Ability to produce the jump like behavior in spreads
- Mechanism for fitting the initial yield curves of corporate bonds across multiple ratings and tenors
- Pricing of bonds within an arbitrage free framework

2.1 Corporate Bond Spread – Stylized Facts

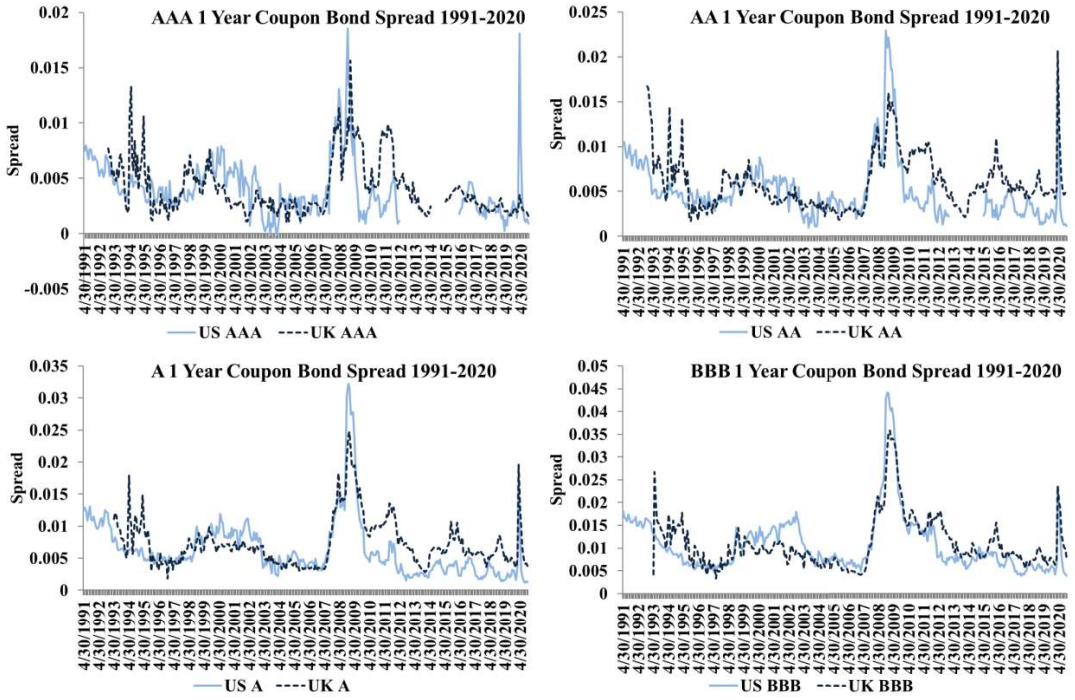

Figure 1 Spreads for US and UK AAA, AA, A and BBB rated bonds of 1-year maturity from 1991-2020, showing the sudden and rapid increases in spread experienced in 2008/2009 and early in 2020. (Source: Bloomberg/Conning)

The events of 2008 and several market events since were characterized by falling equity markets and increasing spreads on corporate bonds. Figure 1 shows the historical spreads on 1-year AAA, AA, A and BBB rated bonds from the United States and United Kingdom. While periods of high volatility had been observed before, the events of 2008 were unprecedented in

the albeit short historical record. During this period spreads increased rapidly in most cases to levels which were over twice the highest levels previously experienced, and between 4 and 5 times the historical mean. Figure 1 also supports the argument that corporate bond spreads are stochastic and capable of exhibiting dislocations similar, but evolving more slowly, than those observed in the equity markets.

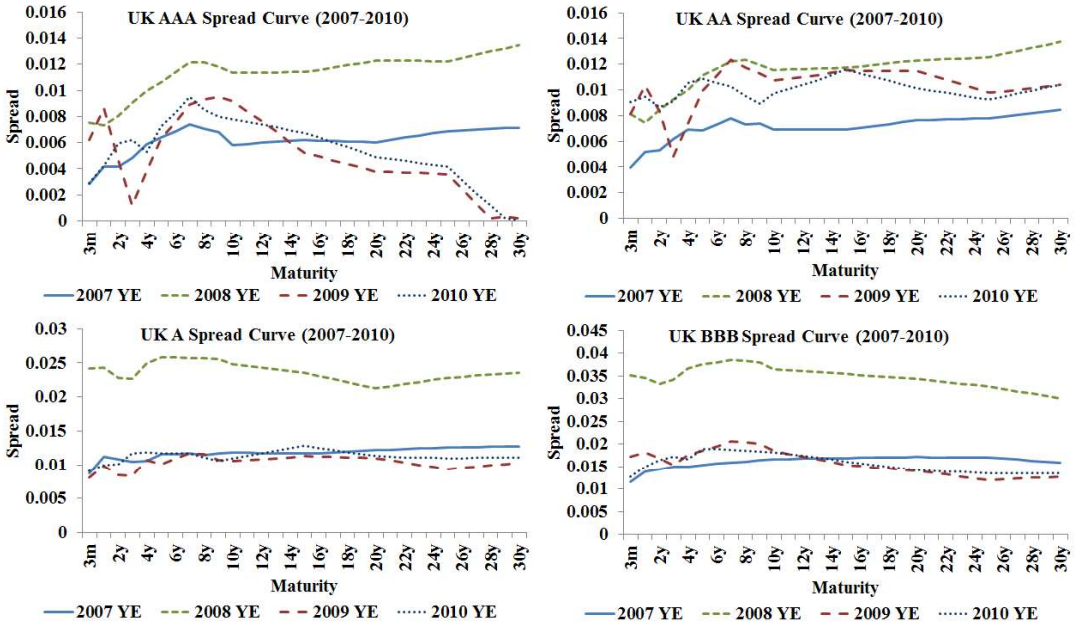

Figure 2 Spreads curves for UK AAA, AA, A and BBB rated bonds at year end 2007-2010, showing the extent of the difference between 2008 and other years. Also obvious is the extent to which market spread curves exhibit a range of shapes and are not smooth. (Source: Bloomberg/Conning)

Another important feature of the market is the correlation of credit spreads with other market sectors, in particular equities. Empirical evidence indicates that the lower the rating of a bond the more the bond behaves like an equity instrument. Consequently, one expects there to be an increasing correlation between corporate bond spreads and equity returns as ratings decline. This is indeed what is observed in the market data, in particular for lower credit ratings of corporate bonds.

Figure 2 shows the term structure of credit spreads for UK AAA, AA, A and BBB rated bonds at year end 2007, 2008, 2009 and 2010. Here again we can observe that the movement in spreads between 2007 and 2008 effected all ratings and tenors simultaneously. We also observe some possible liquidity effects in these curves, such as the AAA curve in 2009. Such discontinuities in the spread curves for some tenors require a special consideration, particularly in the context of fitting initial yield curves for the corporate bond markets.

This summarizes some of the main features of the market that a model of corporate bond yields and spreads would ideally exhibit.

2.2 Corporate Yield Model Specification

The GEMS Corporate Yield Model is a multifactor reduced form model allowing for the production and simulation of corporate bond yields, spreads, bond prices, transitions between rating classes and defaults. As a starting point for the model we assume that there are K rating classes {1, 2, . . . , K-1, K} where the absorbing state K is default. The rating classes used for the Basic Data Set are {AAA, AA, A, BBB, HIGH YIELD, DEFAULT}.

Two primary inputs govern the dynamics of the model.

1) K × K-generator matrix, $\mathcal{L}(t)$, for the rating transition and default.
2) A stochastic modulator μ(t) which multiplies the generator matrix $\mathcal{L}(t)$ at each time step.

The form of the generator matrix $\mathcal{L}(t)$ can be written as:

$$\mathcal{L}(t) = \begin{bmatrix} \lambda_{1,1}(t) & \lambda_{1,2}(t) & \lambda_{1,3}(t) & \cdots & \lambda_{1,K}(t) \\ \lambda_{2,1}(t) & \lambda_{2,2}(t) & \lambda_{2,3}(t) & \cdots & \lambda_{2,K}(t) \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \lambda_{K-1,1}(t) & \lambda_{K-1,2}(t) & \lambda_{K-1,3}(t) & \cdots & \lambda_{K-1,K}(t) \\ 0 & 0 & 0 & \cdots & 0 \end{bmatrix}$$

With the dynamics of the model governed by the stochastic generator:

$$\mathcal{L}(t)\mu(t)$$

The generator matrix is a transformation of the corporate bond transition matrix which everyone familiar with the corporate bond markets knows. The relationship between the real-world transition matrix Q^{RW} and the generator matrix is:

$$Q^{RW} = e^{\mathcal{L}(t)}$$

The properties of the generator matrix are that the rows sum to zero, the diagonal elements are negative, and the off-diagonal elements take positive values. The generator matrix has useful properties in the context of stochastic modeling. In particular a generator matrix multiplied by a scalar, such as μ(t) is still a generator matrix. The same is not true of a transition matrix because the rows sum to 1.

In addition to the above the model incorporates the following characteristics.

1) A recovery of market value assumption for each rating class, defining the proportion of a bond's price prior to default that is recovered on default.
2) A mechanism for fitting the initial yield curves of corporate bonds for different ratings and tenor.
3) A jump process as one element of the stochastic modulator μ(t) allowing for the simulation of rapid increases in corporate bond spreads.
4) A correlation between the stochastic modulator μ(t) and the model of equity returns.

Figure 3 shows the GEMS simulated 1-year maturity spread for AAA, AA, A, BBB and High Yield bonds over a 30 year simulation horizon in quarterly time steps. The spread jump is clearly visible in this path, and as with real credit crises the shock is systemic, affecting assets of all ratings simultaneously. Models which do not incorporate such a jump process have difficulty in producing these levels of spreads without large increases in the overall volatility of spreads to unrealistic levels.

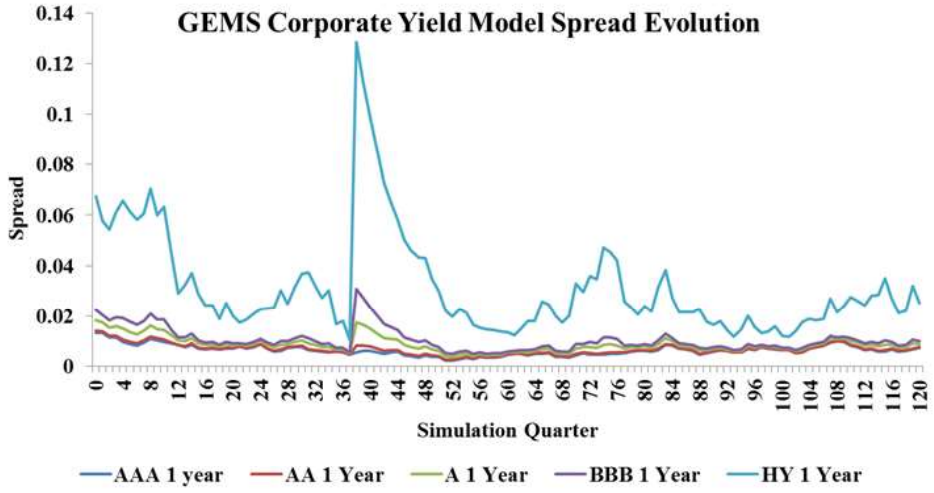

Figure 3 Simulated path from the GEMS Corporate Yield Model showing spreads on bonds of 1 year maturity for AAA, AA, A, BBB and High Yield rating classes. (source: Conning GEMS® ESG)

This jump process leads to bond returns which are fat tailed, capturing the types of extreme losses that can occur through spread movements as well as defaults. Figure 4 shows a Q-Q plot for A rated bond returns with maturity 3 to 5 years based on the output from the corporate yield model. If the returns were normally distributed, then the Q-Q plot would show a straight line. However, the left tail of the plot is observed to deviate significantly from a straight line, indicating a significantly heavy loss tail in the return distribution of the model.

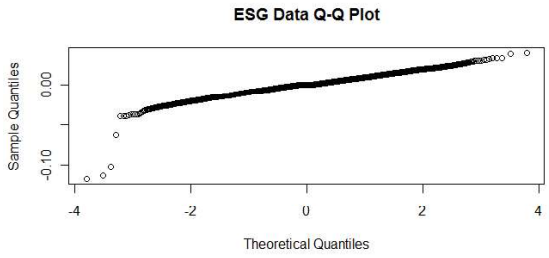

Figure 4 Q-Q Plot of A rated 3-5 year corporate bond returns. (Source: Conning GEMS® ESG).

3 Calibration Criteria

The calibration criteria for the models consists of a set of target values for the distributional properties of nominal interest rates at future time horizons. The precise methodology and final

calibration targets are currently under discussion. More information will be added to this section when the details are known.

4 Summary

In this document the technical specification and the properties of the corporate spread and corporate bond fund returns model used to produce the NAIC Basic Data Set have been described. The GEMS® corporate yield model described represents an advanced modeling structure for this asset class which enables more realistic modeling of real world effects than is possible with a simpler model. Prior to scenario production the model is approximately fit to the initial market yield curve of corporate bonds across the five modelled rating categories for maturities 1 to 10 years. The statistical properties of the simulated model can also be customized to take account of specified or changing calibration criteria.

5 Additional Reading

Duffie and Singleton, ***Modeling Term Structures of Defaultable Bonds***, The Review of Financial Studies, 1999.

Lando, D. (2004). ***Credit Risk modeling***. Princeton University Press

6 Appendices

6.1 Appendix I – Relevant Tickers

The following tickers may be relevant as validation benchmarks for the stochastic output of the GEMS® interest rate model. Conning does not supply, distribute or directly derive the models from this data and is supplied here for guidance only.

Description	Ticker
AAA Industrial Coupon Yield, 3 month	BVCVPO3M Index
AAA Industrial Coupon Yield, 6 month	BVCVPO6M Index
AAA Industrial Coupon Yield, 1 year	BVCVPO01 Index
AAA Industrial Coupon Yield, 2 year	BVCVPO02 Index
AAA Industrial Coupon Yield, 3 year	BVCVPO03 Index
AAA Industrial Coupon Yield, 4 year	BVCVPO04 Index
AAA Industrial Coupon Yield, 5 year	BVCVPO05 Index
AAA Industrial Coupon Yield, 7 year	BVCVPO07 Index
AAA Industrial Coupon Yield, 8 year	BVCVPO08 Index
AAA Industrial Coupon Yield, 9 year	BVCVPO09 Index
AAA Industrial Coupon Yield, 10 year	BVCVPO10 Index
AAA Industrial Coupon Yield, 15 year	BVCVPO15 Index
AAA Industrial Coupon Yield, 20 year	BVCVPO20 Index
AAA Industrial Coupon Yield, 25 year	BVCVPO25 Index

AAA Industrial Coupon Yield, 30 year	BVCVPO30 Index
AA Industrial Yield, 3 month	IGUUID3M Index
AA Industrial Yield, 6 month	IGUUID6M Index
AA Industrial Yield, 1 year	IGUUID01 Index
AA Industrial Yield, 2 year	IGUUID02 Index
AA Industrial Yield, 3 year	IGUUID03 Index
AA Industrial Yield, 4 year	IGUUID04 Index
AA Industrial Yield, 5 year	IGUUID05 Index
AA Industrial Yield, 7 year	IGUUID07 Index
AA Industrial Yield, 8 year	IGUUID08 Index
AA Industrial Yield, 9 year	IGUUID09 Index
AA Industrial Yield, 10 year	IGUUID10 Index
AA Industrial Yield, 15 year	IGUUID15 Index
AA Industrial Yield, 20 year	IGUUID20 Index
AA Industrial Yield, 25 year	IGUUID25 Index
AA Industrial Yield, 30 year	IGUUID30 Index
A Industrial Yield, 3 month	BVCSUP3M Index
A Industrial Yield, 6 month	BVCSUP6M Index
A Industrial Yield, 1 year	BVCSUP1 Index
A Industrial Yield, 2 year	BVCSUP2 Index
A Industrial Yield, 3 year	BVCSUP3 Index
A Industrial Yield, 4 year	BVCSUP4 Index
A Industrial Yield, 5 year	BVCSUP5 Index
A Industrial Yield, 7 year	BVCSUP7 Index
A Industrial Yield, 8 year	BVCSUP8 Index
A Industrial Yield, 9 year	BVCSUP9 Index
A Industrial Yield, 10 year	BVCSUP10 Index
A Industrial Yield, 15 year	BVCSUP15 Index
A Industrial Yield, 20 year	BVCSUP20 Index
A Industrial Yield, 25 year	BVCSUP25 Index
A Industrial Yield, 30 year	BVCSUP30 Index
BBB Industrial Yield, 3 month	IGUUAD3M Index
BBB Industrial Yield, 6 month	IGUUAD6M Index
BBB Industrial Yield, 1 year	IGUUAD01 Index
BBB Industrial Yield, 2 year	IGUUAD02 Index
BBB Industrial Yield, 3 year	IGUUAD03 Index
BBB Industrial Yield, 4 year	IGUUAD04 Index
BBB Industrial Yield, 5 year	IGUUAD05 Index
BBB Industrial Yield, 7 year	IGUUAD07 Index
BBB Industrial Yield, 8 year	IGUUAD08 Index
BBB Industrial Yield, 9 year	IGUUAD09 Index
BBB Industrial Yield, 10 year	IGUUAD10 Index
BBB Industrial Yield, 15 year	IGUUAD15 Index
BBB Industrial Yield, 20 year	IGUUAD20 Index
BBB Industrial Yield, 25 year	IGUUAD25 Index
BBB Industrial Yield, 30 year	IGUUAD30 Index
BB Industrial Yield, 3 month	IGUUI53M Index

BB Industrial Yield, 6 month	IGUUI56M Index
BB Industrial Yield, 1 year	IGUUI501 Index
BB Industrial Yield, 2 year	IGUUI502 Index
BB Industrial Yield, 3 year	IGUUI503 Index
BB Industrial Yield, 4 year	IGUUI504 Index
BB Industrial Yield, 5 year	IGUUI505 Index
BB Industrial Yield, 7 year	IGUUI507 Index
BB Industrial Yield, 8 year	IGUUI508 Index
BB Industrial Yield, 9 year	IGUUI509 Index
BB Industrial Yield, 10 year	IGUUI510 Index
BB Industrial Yield, 15 year	IGUUI515 Index
BB Industrial Yield, 20 year	IGUUI520 Index
BB Industrial Yield, 25 year	IGUUI525 Index
BB Industrial Yield, 30 year	IGUUI530 Index

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Conning (www.conning.com) is a leading investment management firm with a long history of serving the insurance industry. Conning supports institutional investors, including pension plans, with investment solutions and asset management offerings, award-winning risk modeling software, and industry research. Founded in 1912, Conning has investment centers in Asia, Europe and North America.

Attachment C

GEMS® Expert View Parameterization

United States Corporate Credit Targets

Prepared for the NAIC

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Table of Contents

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1 Introduction

Target-setting is the process of defining a range of desirable statistical properties (e.g., mean, standard deviation, skewness etc.) for the output of a model. These targets are used as guiding constraints during model estimation and help to ensure that model output and parameters are stable through time. In the GEMS® Expert View Parameterization, these targets are based upon historical behavior as well as a defined process of applying expert judgment. This document covers the methodology for setting corporate bond credit spread and transition and default probabilities for the United States economy.

Before defining a specific target-setting methodology for each asset class, a number of principles and requirements were set to guide the process. Ideally, any methodology would satisfy the following principles:

1) Enable the setting of long-term or steady-state targets for the mean and standard deviation of key variables
2) Any target-setting methodology should lead to targets that remain stable through time
3) The target-setting methodology should be consistent across economies and, by extension broadly applicable irrespective of geographic, economic, or other differences
4) The lack of availability of data should ideally not overly impede the setting of targets
5) Methodology should be justifiable based on the data available and the latest thinking in the academic literature
6) The methodology should lead to targets that are appropriate and meet the expectations of the many markets the GEMS® product serves
7) As much as possible, the methodology should be prescriptive, allowing targets to be set by following a well-defined procedure

While it may not always be possible to satisfy these requirements, they serve as useful guidance when differentiating between different target-setting methodologies.

2 GEMS® Expert View US Credit Spread Target-Setting Methodology

2.1 Choice of Data Window

In the case of corporate credit spreads, there is significantly less historical data than for many other asset classes (e.g., government bonds or equity). For the US, data is available from April 1991 and, with the exception of AAA ratings, is relatively complete for all rating classes through the 2008 financial crisis.

Due to the relative paucity of data, we use all credit spread data available to us for the analysis and inference of credit targets.

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3 Corporate Credit Target-Setting Methodology

3.1 United States Credit Spread Targets

The process of setting corporate credit spread targets follows a well-prescribed methodology.

The first step in this process is to set targets for United States credit spread mean and standard deviation targets. Figure 1 shows US spread data from 1991 to 2018.

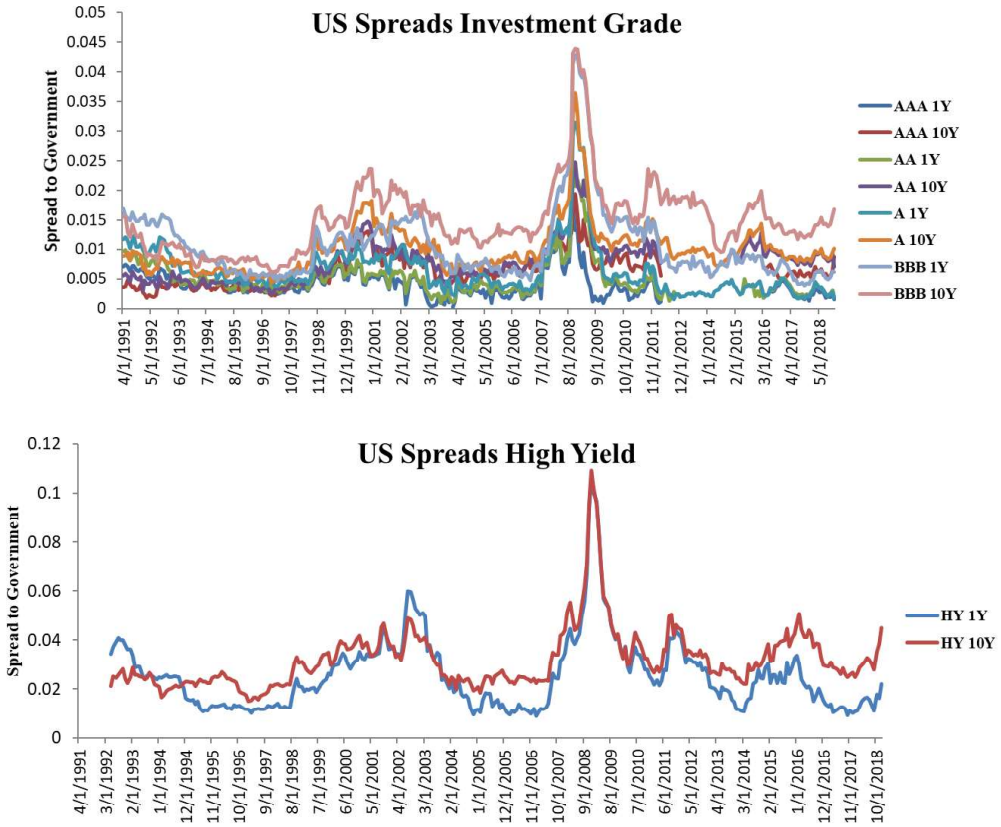

Figure 1: Historical US credit spreads on corporate bonds of different ratings and tenors separated by Investment Grade and High Yield (BB). Prepared by Conning, Inc. Source: ©2019 Bloomberg, L.P.

Looking at the data in Figure 1, we might split the historical data into 4 distinct periods:

1. A low-volatility period at the start of the available history from 1991–1998
2. A medium-volatility period prior to the 2007/2008 crisis between 1998–2006
3. A "jump" period characterized by rapidly increasing spreads, high spread levels, and high volatility between year-end 2006 and mid-2010
4. A second medium-volatility period which appears on inspection similar to the first. This period is from mid-2010 to the end of the historical series

It is our view that the targets for the mean should reflect the average expected behavior of credit spreads over the medium to long term. Given our observations 2 and 4 above, it would seem that the two medium-volatility periods are representative of what we might consider to be a "normal" market environment. If we look at the statistics for these two periods in Figure 2, we observe that the mean values were also broadly similar during these two periods.

		AAA 1Y	*AAA 10Y*	*AA 1Y*	*AA 10Y*	*A 1Y*	*A 10Y*	*BBB 1Y*	*BBB 10Y*	*HY 1Y*	*HY 10Y*
June 2010-2018	***Mean***	0.0028	0.0068	0.0033	0.0094	0.0035	0.0102	0.0083	0.0158	0.0225	0.0335
"Post Jump"	***Stdev***	0.0011	0.0014	0.0011	0.0013	0.0014	0.0018	0.0031	0.0031	0.0086	0.0068
	Max	0.0054	0.0100	0.0064	0.0129	0.0076	0.0152	0.0155	0.0237	0.0437	0.0507
Dec 1998-Dec 2006	***Mean***	0.0037	0.0073	0.0044	0.0081	0.0064	0.0105	0.0102	0.0155	0.0266	0.0312
"Ex-Low Vol Period"	***Stdev***	0.0019	0.0023	0.0017	0.0025	0.0024	0.0032	0.0033	0.0034	0.0128	0.0075
	Max	0.0074	0.0132	0.0082	0.0148	0.0111	0.0183	0.0176	0.0237	0.0601	0.0488

Figure 2: Statistical properties of US Credit spreads in two historical periods, 2010–2018 and 1998–2006. Prepared by Conning, Inc. Source: ©2019 Bloomberg, L.P.

This is particularly true for the 10-year tenor. For the 1-year tenor. the A-rated spreads show the most significant differences.

Taking this into account, the following methodology is applied to form targets for the mean spreads:

1. Investment-grade mean spreads are set at the midpoint between the measured values in the two "normal" periods.
2. 10-year HY spreads are set at the midpoint between measured values in the two "normal" periods.
3. The 1-year HY spreads are set at 65bps below the 10-year High Yield spread. This is close to the difference between the BBB 1-year and 10-year tenor (64bps) and ensures that the High Yield spread curve is not too steep relative to the steepness we observe in the data.

Applying this method leads to the following targets:

	Target Mean
AAA 1Y	0.00326
AAA 10Y	0.00706
AA 1Y	0.00385
AA 10Y	0.00875
A 1Y	0.00496
A 10Y	0.01033
BBB 1Y	0.00929
BBB 10Y	0.01566
HY 1Y	0.02584
HY 10Y	0.03234

Figure 3: Target mean credit spreads for US industrial sector corporate bonds of different ratings and tenors. Prepared by Conning, Inc.

Next, we move to the setting of targets for the standard deviation or volatility. For this we use the broadest possible view and take account of all the available data, setting the target at the historical value. This also requires the least amount of expert judgment and is perhaps the most justifiable approach to take in the absence of any evidence to the contrary. Including the 2008 crisis in the volatility measure will ensure that a reasonable and wide range of values is recreated by the simulation, including the moderate extremes (with tail events generated separately by the inclusion of a jump process in some of the models). The values have been checked for consistency (e.g., that the volatility increases with rating) and appear reasonable. The final mean and standard deviation targets are shown in Figure 4 below.

US Spread Targets	***Target Mean***	**Target Stdev**	**GEMS Official Target Mean**	**GEMS Official Target Stdev**
AAA 1Y	0.00326	0.00237	0.0043	0.0023
AAA 10Y	0.00706	0.00288	0.0064	0.0025
AA 1Y	0.00385	0.00322	0.0056	0.0031
AA 10Y	0.00875	0.00362	0.0075	0.0032
A 1Y	0.00496	0.00441	0.0076	0.0041
A 10Y	0.01033	0.00428	0.01	0.0041
BBB 1Y	0.00929	0.00632	0.012	0.006
BBB 10Y	0.01566	0.00607	0.0145	0.0057
HY 1Y	0.02584	0.01490	0.0431	0.0197
HY 10Y	0.03234	0.01244	0.0503	0.0176

Figure 4: Target mean and standard deviations for US credit spreads (industrial sector) on corporate bonds of different ratings and tenors. Prepared by Conning, Inc.

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7 World Trade Center
250 Greenwich Street
New York, NY 10007
moodys.com

November 7, 2023

To: Scott O'Neal

From: Jack Cheyne, Senior Director - Scenario Generator Product Management

Subject: Comments and Feedback on the "GOES Corporate Model Decision"

Moody's Analytics appreciates the opportunity to provide comments on the questions regarding the GOES corporate model "GOES Corporate Model Decision Exposure 101823.pdf".

This note directly addresses the questions set out by the NAIC below:

» Bearing in mind that there will be updated quantitative comparisons of the corporate models, please indicate whether you are currently supportive of utilizing the Conning GEMS® corporate model, the American Academy of Actuaries Economic Scenario Subcommittee's corporate model (see Attachment A), and/or believe either model may be appropriate. Please provide a rationale, including what you see as the relative strengths and weaknesses of each of the models

» Please note and explain any material deficiencies in the current documentation provided for the Conning GEMS® corporate model see (Attachments B and C). Straightforward, specific illustrations of the practical impact of any deficiencies are encouraged.

Background on Corporate Bond Asset Return Modeling

At Moody's Analytics, we possess extensive experience in supporting a variety of modeling and calibration approaches. These approaches are used for the stochastic projections of credit-risky asset returns, corporate spreads, defaults, and transitions at both broad market and individual issuer levels. It is important to note that credit modeling is one of the more complex risk factors to model comprehensively. It is generally viewed as requiring more scrutiny than nominal rates or equity return modeling due to the fact there can be a variety of components contributing to the asset returns. For users to be comfortable and confident in using these models they require transparency and clarity on the model and its calibration. Furthermore, an understanding of the known limitations of the model and its outputs is key.

When selecting a model, the use-case should be a primary consideration. It is important to choose an appropriate level of model-complexity, granularity (e.g. broad market versus issuer-level dynamics), and robustness of methodology. While more complex models can offer some advantages, they can also, in certain instances, lead to a lack of visibility or understanding when applied to simpler use-cases.

In the fields of insurance (both Life and P&C), pensions, and asset management, the need for stochastic projections can span a variety of use-cases. We could consider categorizing these into the following high-level descriptions:

» **Asset returns only:** Projection of portfolios (on an asset-class level) for a range of risk and return analysis. The focus is generally on portfolio level metrics of expected return and risk (vol, VaR, cVaR, etc…).

» **Asset and Liabilities**: This is similar to the use-case above but also includes a stochastic projection of liabilities. Focus is generally on portfolio level metrics of expected return and risk (vol, VaR, cVaR, etc…) both on an absolute basis and relative to liabilities. This also entails analysis of capital and reserving metrics. Here a focus on the correlation of asset returns with liability risk factors is important, and also the joint behavior of these variables in the tails of the distribution. **This level of analysis is aligned with the typical requirements for the regulatory Principles Based Reserves and capital calculations.**

» **Asset and Liabilities with credit-sensitive liabilities:** This use-case requires the projection of an asset portfolio in conjunction with liabilities that are sensitive to either credit defaults or credit spreads. The focus is generally on portfolio level metrics of expected return and risk (vol, VaR, cVaR, etc…) both on an absolute basis and relative to liabilities. It is necessary to have the coherent modeling of liabilities and assets on a trial-by-trial basis with granular control of spreads, defaults and transitions. In this use-case the direct interaction between the credit risky asset returns, credit spreads and default/transition risk factors are critical to the risk analysis.

» **Advanced investment strategy design:** This use-case looks at a range of investment strategies that incorporate assets with credit risk (and their alignment with liabilities e.g. duration matching). As part of this analysis, consideration can be given for long/short portfolios, variation in credit risk/rating and dynamic rebalancing strategies. The aim here is to identify beneficial risk and return trade-offs across different credit quality and durations of assets. This can involve going beyond asset-class or index level analysis to focus on dynamic and time varying strategies. Furthermore, this can include the investigation and development of these strategies to align with liability portfolios and key liability risk drivers.

» **Credit portfolio management**: This use-case focuses on the selection of securities or the understanding of credit and market risk within an asset portfolio. Here understanding individual issuer risk and correlation across issuers is absolutely critical. Alignment and correlation with equity (and other risky assets) and the ability to model these alongside the liability risk factors such as yield curves is also a key requirement.

For these use-cases, insurers typically consider three types of models to tackle these problems:

» **Simple models focused on asset returns**: These are similar to the AAA type model or variation of model proposed by the American Academy of Actuaries Economic Scenario Subcommittee. The focus is on having a direct relationship between the model parameters and the asset returns that are produced. These models do not typically model explicit spread curves (by maturity and rating), defaults or transition dynamics but may have stochastic processes that capture a credit spread type risk driver.

» **Reduced Form Models**: These are similar models to the NAIC proposed model from Conning. These models generally capture credit spreads, transitions and defaults. They are used in pricing assets and can be coupled with asset rebalancing strategies to produce credit risky asset returns.

» **Issuer Based Models**: These models capture granular correlation dynamics between issuer defaults and asset price changes. These models can be considered "bottom-up" in the sense that individual holdings/issuers are modeled and are grouped into an asset portfolio for the purpose of asset projections. These models track market values and the credit quality/status of all issuers thus allowing very granular risk analysis. For example, this can provide details of which holdings are contributing to the key risk and capital metrics of the portfolio.

A summary of the typical choice of model for each use-case is shown below. This mapping is not exhaustive, but provides some insight into the typical approaches insurers, pension firms and asset managers consider in practice.

Model to Use-Case Mapping	Asset Returns Only	Assets and Liabilities	Assets and Liabilities with credit sensitive liabilities:	Advanced investment strategy design	Credit portfolio management
Simple Asset Return Model	✔	✔	✕	✕	✕
Reduced Form Model	✕	✔	✔	✔	✕
Issuer Based Model	✕	✕	✔	✔	✔

It is important to note that the choice of model is typically driven by three key areas of focus:

» The strengths and weakness of the model in relation to the use-case

» The importance of accurate and granular credit risk models to the key metrics that the use-case considers. For some risk analysis the dominant dynamics will be interest rate and equity risk. In these instances, the choice of credit modeling approach could have minimal impact on key risk metrics.

» The ability of the users and key stakeholders (internal and external) to understand the models and key model dynamics. Users of these models have to invest significant time to understand the models and communicate them. In many instances the investment to understand credit risk modeling can exceed that of the other less complex risk factors, e.g. interest rate and equity risk. If the importance of this risk factor on the overall results is not high enough, then users can feel they are spending a disproportionate amount of time in understanding, educating and communicating these models to their stakeholders. This generally leads to users balancing model complexity with its importance in the use-case. For use-cases that are less "credit-sensitive", users will generally opt for simpler modeling approaches.

In the next section we highlight the strengths and weaknesses of some of the modeling approaches that are considered when choosing an appropriate model. The Issuer Based Modeling approach (popular in credit portfolio management applications) goes beyond the requirements discussed by the NAIC, so we exclude this from the following discussion.

Strengths & Weaknesses of the Proposed Modeling Approaches

The following table provides some insight into the relative strengths and weaknesses of the types of models suggested by the NAIC. **It is important to note that we are not able to comment directly on the Conning model as the NAIC has not provided detailed documentation on this model.** There are many parameters, model dynamics and calibration methods that have not yet been disclosed.

Our summary below is not meant as a model to model comparison, but instead compares the types of models that we have implemented at Moodys Analytics and have supported with hundreds of insurers for a wide range of use-cases.

Model Relative Strengths and Weaknesses	Simple Asset Return Model	Reduced Form Model
Direct link of the model parameter to asset return outputs	✔	✘
Model has a small number of parameters and is relatively concisely documented	✔	✘
Model is straightforward to recalibrate to simple alternative views on asset returns	✔	✘
Calibration of the model involves a focus on historical asset return behavior	✔	✘
Model can produce non-zero correlations between different corporate bond fund asset returns and different risk factors	✔	✔
Model can capture initial market spread levels (and links this to asset returns)	✔	✔
Model can capture appropriate long term spread level (and links these to asset returns)	✔	✔
Model can be configured to be arbitrage free w.r.t asset prices	✘	✔
Model can capture a term structure of credit spreads by rating and maturity	✘	✔
Model can capture explicit default and transition dynamics (and links these to asset returns)	✘	✔
Model can capture different recovery rate assumptions (and links these to asset returns)	✘	✔
The model has many parameters covering credit spreads, recovery rates, transition, default that can provide different views on each of these dimensions of credit risk	✘	✔
Model capture tail risk between equity returns and credit defaults	✘	✔
Direct modeling of defaults and credit rating changes for issuers	✘	✔
Ability to model a wide range of asset rebalancing strategies	✘	✔
Model can be easily reconfigured to model funds of different credit ratings and maturities or rebalancing strategies	✘	✔

Ability to capture cashflows related to defaults and different assumptions for recovery rates on default	✗	✔
Ability to correlate default risk between issuers. This can have a big impact on tail risk in credit-risky asset portfolios.	✗	✔
The model can separate returns into capital returns (price changes) and income returns (coupon/cashflow payments).	✗	✔

As can be seen above, both models have strengths and weaknesses. Our conclusion regarding the support of NAIC adopting these modeling approaches is as follows:

- Either model type could potentially provide an appropriate choice for the NAICs stated requirements. However, this is based on the assumption that the models and, most importantly, the calibration of the models, is sufficiently well documented and justified.
- The NAIC has not provided sufficient documentation on the reduced form model from Conning to assess how the model is implemented (i.e. if it can align with the strengths/weaknesses highlighted in the table above). In addition, there is not enough information on how the model is calibrated for each of the key components – spreads, transitions, defaults, recovery rates, asset pricing and asset strategy (fund index) rebalancing.
- The limitations of the calibration and model dynamics need to be transparent and well documented. The American Academy of Actuaries Economic Scenario Subcommittee have provided some detail on this with their simplified model, but unfortunately this information is not currently available for the alternative reduced form model from Conning.
- The reduced form model from Conning has potentially many advantages over the American Academy of Actuaries Economic Scenario Subcommittee simplified model, as highlighted in the table above. This reduced form model can be more widely used for a larger set of use-cases and the additional modeling complexity allows it to capture more accurately and granularly different areas of credit risk. We have seen this type of model used very successfully by insurers globally when this model and calibration are supported by clear documentation.
- We would encourage the NAIC to focus on a model choice that meets their stated requirements and is transparently documented. This may mean the model may not be appropriate for more complex modeling use-cases for insurers, but it will meet the needs of regulatory reserves and capital calculations. With this in mind we would encourage the NAIC to significantly increase the level of detail of documentation related to the reduced form model including its limitations. In the absence of any additional information on the reduced form models and their calibration, the American Academy of Actuaries Economic Scenario Subcommittee's corporate model may be the relevant choice.

In the next section, we discuss the additional documentation that could be useful in supporting insurers understanding the reduced form type models.

Documentation Extensions

The level of documentation published by the NAIC on the Conning credit model is at a high level. The documentation published by the NAIC regarding the modeling of nominal rates and equity returns has significantly more detail on the nature of the model and how it is calibrated.

It is important to note that the reduced form model that the NAIC has proposed appears similar in nature to other credit models adopted by Moody's Analytics (and other modeling providers). These types of models are significantly more complex than the nominal interest rate or equity models. The interest rate and equity models benefit from a relatively close alignment between the stochastic models and key outputs that users are consuming in their reserve and capital calculations, e.g. yield curves or equity asset returns.

In the reduced form credit model, there are several components that play a role in the generation of asset returns:

- Underlying transition matrix and default assumptions
- Choice of the number of credit rating buckets to be modeled
- Stochastic process for spreads
- Stochastic process for defaults and upgrades/downgrades

» Recovery rates or assumptions on what happens when a bond defaults.

» Correlation of spreads with other risk factors

» Correlation of defaults with other risk factors

» Correlation of default/downgrade/upgrade of different issuers in an index/portfolio/fund

» The rebalancing strategy for the buying and selling of bonds in the portfolio over each timestep

In addition we are aware from the documentation published by the NAIC on the nominal interest rate model that there are references to adjustments to the classical implementation of the CIR process. These enable the outputs of the model to better fit the initial yield curve. These adjustments can lead to arbitrage in the model or other unexpected consequences, and it is important they are clearly documented and understood.

With the implementation of the reduced form models, it is important that documentation cover these model overlays or adjustments to the model dynamics. A few examples of such adjustments are mentioned below:

» Adjustment of the model to better fit the initial spreads curves

» Adjustment of the model to stabilize long term distributions

» Adjustment of the model to better fit historical default or transition levels

We are not aware if any of these are relevant in the Conning model the NAIC is considering, but these are the kinds of adjustments and variations we have seen in our own experience of developing and using the reduced form credit models.

In our experience of working with insurers, they will request and require documentation on all of the points above.

Below we provide some explicit examples of the level of documentation that has been requested of us by our users for these types of credit model:

» Model documentation covering the mathematics behind the stochastic processes driving the model e.g. the stochastic equations. These need to cover the spread and the transition/default dynamics of the model.

» Pricing formula covering how the stochastic models are used in pricing assets. In addition, details on how the risk-premia in the models are related to the model parameters and key asset return outcomes.

» Details on how the model is calibrated, including:

  - The data, assumptions and methods used to set the transition matrix and default assumptions of the model
  - The data, assumptions and methods used to set the recovery rates of the model
  - The data, assumptions and methods used to set the long term spread dynamics – level, volatility etc… of credit spreads of different rating and maturities
  - The data, assumptions and methods used to set correlations between spreads and other risk factors
  - The data, assumptions and methods used to set correlations between transition/defaults and other risk factors
  - The data, assumptions and methods used to set correlations between the upgrade/downgrade/default of different issuers
  - The data, assumptions and methods used to set the initial spread levels from the model
  - The data, assumptions and methods used to set the initial level of defaults from the model

» Detail on how asset rebalancing or fund/index level modeling is achieved through the re-pricing of assets or asset portfolios throughout the stochastic projection

» Validation of the model outcomes including

  - Stability of the model and calibrations under different initial conditions and market environments
  - Alignment of the models spreads, defaults rates and asset returns with reasonable historical behavior

- Alignment of the models spreads, defaults rates and asset returns with any stylized-facts or expert judgement assumptions
- Validation of the asset returns produced by the model for a wide range of investment strategy e.g. different rebalancing strategies and an assessment of asset returns relative to other asset classes e.g. cash, treasury returns, equity returns etc.…
- Back testing and stress testing of the model under a variety of economic conditions

» Details on how the input model parameters relate to asset return outputs.

» Insight into how quarter-on-quarter changes in spreads can affect asset prices and hence fund returns from the model.

In our experience this has involved hundreds of pages of documentation and analysis that is updated and maintained to support these models across a wide range of use-cases.

In the next section, we highlight the practical impacts of choosing a model with limited documentation and transparency with regard to its methods, calibration and assumptions.

Practical Impacts of Corporate Bond Modeling with Documentation Deficiencies

This section provides some examples of challenges that insurers may face if the NAIC proceeds with a corporate bond model with limited documentation.

» As the market conditions change (e.g. spreads levels change, equity volatility changes, etc…) the corporate bond fund returns will change and adapt. If there is insufficient documentation on the model and calibration, then users will not be able to understand why bond returns are increasing/decreasing in level or in risk/variability from one valuation date to the next. The level of insight into the model will be very limited, and this will prevent users from fully communicating why their results are changing from one valuation date to the next.

» A static set of real world scenarios published on the NAIC website might be sufficient for official valuation purposes, but it is insufficient for projecting how these scenarios would change in the future under different economic conditions. The ability to dynamically regenerate scenarios under any starting conditions is extremely important for pricing, planning, and calculating risk sensitivities under the Principle-Based Reserving (PBR) framework. These types of analysis are possible under the currently prescribed and publicly available Academy Interest Rate Generator (AIRG), and we have observed an expectation in the industry that this will continue under the new economic scenario generator. This situation would remain unchanged under the Academy's proposed simplified corporate model, which is also fully documented and reproducible. However, if a "black box" proprietary model were prescribed, it would limit insurers' ability to perform this important analysis. The likely result would be potentially less accurate pricing and less robust risk management practices, reducing the clarity and insight the industry has regarding its financial performance.

» Although we are aware that Conning has an Application Programming Interface (API) that has been suggested as a potential solution to the previous concern, we are generally concerned about its flexibility, speed, and ease of integration. Many of our questions about the API from the initial exposure period in early 2021 were never fully answered, so we do not have full details. However, we appreciate there are still open questions on some of the fundamental modeling topics that have yet to be clarified. From a runtime perspective, we can generally comment that models tend to be much faster when scenarios are generated natively (as is currently possible under the fully documented and easily replicated AIRG) than when calls to an external API are required. This raises the possibility that the API may be too slow to be practically useful to the increasingly demanding needs of the life insurance industry. Finally, reliance on API's are notoriously troublesome from a software licensing and installation perspective, especially when distributing large runs to an internal grid or the cloud. A fully documented model would allow insurers to implement appropriate models natively in their solutions. This provides them with flexibility on the technology and integration approach of the models into their workflows and calculation frameworks. This can be particularly important when optimizing runtime in the cloud, as firms will generally be paying directly for the computational cost. Inefficiencies in these processes can have a direct financial impact on their cloud budgets if these runs are significant in scale and runtime. We are aware when firms are constrained on runtime and budget, then they will likely reduce the level of sensitivity analysis. This limits the insights and understanding they have in relation to these key reserve and capital metrics.

» In the absence of complete and detailed documentation, for any products with significant sensitivities to corporate bond funds, companies might feel compelled to license Conning's API for accurate PBR analysis for any purpose that extends beyond current period valuations. This is in contrast to the current landscape, where parties are free to implement or replicate the fully public AIRG model as needed. By publishing full documentation this allows companies to optimize the model implementation to align with their existing models, workflows and technology/integration requirements.

» Insurers apply a range of credit modeling approaches in different use-cases. With lack of documentation on the corporate model used in the reserves and capital calculation, insurers will have difficulty in identifying where their credit risk assumptions and models are aligned or mis-aligned across their different use-cases.

» The value and effectiveness of a regulatory reporting model is limited if the model is not well aligned with the company's internal risk management and pricing practices. If the model is not well documented, understood, and accepted by the industry, companies may develop other models for pricing and managing their business which will create a disconnect between how the regulators view the financial position of a company and how management sees it.

These examples are not meant to be comprehensive but highlight where we have seen insurers raise questions on the practical limitations they may face if only limited documentation and knowledge of the model dynamics and calibrations are provided.

Summary

In conclusion, robust documentation is critical to the use of any corporate bond return or credit model. Both the models considered appear to be potentially appropriate for the NAIC's desired application. However, in the absence of any additional detailed documentation, a simple asset return model, that is comprehensively documented, such as the corporate model proposed by the American Academy of Actuaries Economic Scenario Subcommittee, could be well suited for the purpose at hand within a Principles-Based Reserving framework. While the Conning corporate model may have greater flexibility and granularity due to its more complex dynamics for analyzing credit risk, the level of documentation is currently insufficient to provide a conclusion regarding its appropriateness.

If regulators decide to proceed with the Conning corporate model despite this extra complexity, then we highly recommend for additional documentation to be released that addresses the deficiencies listed in this letter. If this does not occur, then the impact of the limited documentation could cause significant practical challenges to the U.S. life insurance industry.

Sincerely,

Jack Cheyne PhD
Senior Director - Scenario Generator Product Management,
Moody's Analytics

Dear Mr. O'Neal:

Here are my comments on the Life Actuarial (A) Task Force and Life RBC (E) Working Group Exposure 10/18/23: GOES Corporate Model Decision.

1. I favor use of the American Academy of Actuaries Subcommittee's corporate model. Not only is it a good model, it is completely documented and reproducible. It is no more complex than necessary. Conning's model may or may not be a reasonable model, but it's reasonableness does not even come into consideration because it is not fully documented and reproducible, as required under the original RFP of the NAIC. As was understood when the RFP was prepared, It is not in the interest of regulators or the public to mandate use of a black box model that is not fully documented and independently reproducible.

2. The practical impact of Conning's unwillingness to provide full documentation is that their model cannot be independently tested and verified. It cannot be independently evaluated on a theoretical level, and the many professional judgments made in its design and implementation and calibration cannot be discussed or debated in detail nor can sensitivity to alternatives be determined. Because of this, use of the model does not meet the standards of practice adopted by the Actuarial Standards Board and currently binding on the actuaries that would be required to use the model.

There is no need to even consider use of an undocumented model because the Academy of Actuaries Subcommittee has provided a good model for the purpose that is fully documented, reproducible, and not unnecessarily complex.

If, by chance, Conning were to provide full documentation of their model, I would still prefer the Academy of Actuaries model because the class of models Conning has said they are using are in my view much more complex than needed for the purpose. Mandating the use of such a complex model places an unnecessary burden on actuaries that use it because they must understand and evaluate every part of it. There are contexts where the complexity of Conning's model may be useful, but those contexts are inside individual companies. In the GOES project we are using the same generated results (scenarios) across companies. The GOES project is therefore a different use case and a different (simpler) model is appropriate and preferred.

Regards,

Stephen J. Strommen FSA, CERA, MAAA

Follow up Question from a Regulator to Steve Strommen: I would like more details on what seems to be his pivotal view here, which is how complex of a model is "needed" for statutory purposes. Why is a given degree of complexity in the corporate model not necessary for statutory reserving?

Steve Strommen Response to Follow-up Question:

The complexity of Conning's corporate model is due to the level of detail in the information it uses and the level of detail in the simulation used to generate scenarios. This level of detail may be appropriate in the context of an individual company where that detailed level of information is available and might make a difference. When generating a single set of scenarios to be used by all companies, we do not have such detailed information, we have only a general description of the kind of portfolio to be simulated. A simpler model that deals only with information at that level of detail is sufficient and preferred to avoid unnecessary complexity.

The unnecessary complexity in Conning's model is in two forms.

1. The model works with a detailed list of securities to be simulated. In the NAIC context there is only a general description of the portfolio, so the model generates a detailed list based on that description. Details of how this is done are undocumented.
2. To simulate the effect of downgrades and defaults, the model uses a detailed model for credit migration, default, and recovery of each security in the list it is simulating. Details of the model and assumptions used for migration, default, and recovery are undocumented.

The Academy model is simpler in both aspects. Since the portfolios to be simulated are described by credit quality and duration, the model uses a portfolio consisting of a single security having the desired quality and duration. That security is simulated as purchased at the beginning of each month and sold at the end of the month. Then to simulate the costs of credit downgrades and defaults, it uses a simple stochastic process for "frictional costs" in the aggregate rather than simulating credit migration, defaults, and recoveries separately. The "frictional costs" are calibrated to reproduce both the normal level and the volatility of costs due to credit downgrades and defaults at the portfolio level.

The Academy model works with information at the level of detail we have when given only a general description of the portfolio to be simulated. Conning's model implicitly creates more detailed information and then deals with it in a more detailed way, but all those details are undocumented and unnecessary in this context.

Note – my comments on the Academy model are based on reviewing it several months ago. I am not aware of any significant changes since then.

Regards,
Steve Strommen

November 20, 2023

Ms. Rachel Hemphill, Chair, Life Actuarial (A) Task Force (LATF)
Mr. Philip Barlow, Chair, Life Risk-Based Capital (E) Working Group (Life RBC)
Mr. Mike Yanacheak, Chair, Generator of Economic Scenarios (E/A) Subgroup (GOES Subgroup)
National Association of Insurance Commissioners (NAIC)

Dear Ms. Hemphill, Mr. Barlow, and Mr. Yanacheak,

On behalf of the Economic Scenario Generator Subcommittee (ESGS) of the American Academy of Actuaries,[1] I appreciate the opportunity to comment on the Generator of Economic Scenarios (GOES) Corporate Model Decision[2] as it relates to the prescribed economic scenario generator for the purpose of determining statutory reserves and capital on long duration life and annuity products.

Summary Comments

The ESGS supports the use of the Academy's Alternative Corporate Model presented to LATF on 10/27/22. The Model is fully and publicly documented and meets the proposed stylized facts and acceptance criteria. Publicly available model documentation enables public analyses and transparent discussion and feedback, which can strengthen model governance. Public documentation also supports small companies with limited resources, as it allows them to leverage the public analyses performed by academia and the broader profession.

The ESGS would not support GEMS™ Corporate Model for this particular purpose because its documentation is intentionally and knowingly largely incomplete due to its proprietary nature. The lack of documentation fails to comply with the NAIC's original request for proposal (RFP) for this project[3] and would require actuaries to deviate from best practice, since the model's internal workings cannot be understood, nor can its results be reasonably reproduced or independently tested. Without adequate documentation, it is impossible to know if the model is appropriate for the intended purpose, as it is unclear if the model's behavior will change as economic conditions evolve. Acceptance criteria alone won't be

[1] The American Academy of Actuaries is a 19,500-member professional association whose mission is to serve the public and the U.S. actuarial profession. For more than 50 years, the Academy has assisted public policymakers on all levels by providing leadership, objective expertise, and actuarial advice on risk and financial security issues. The Academy also sets qualification, practice, and professionalism standards for actuaries in the United States.

[2] Life Actuarial (A) Task Force and Life RBC (E) Working Group Exposure 10/18/23: GOES Corporate Model Decision.

[3] Deliverable I in the NAIC's RFP is "Full documentation on the ESG specifications, calibration, and tools."

enough to evaluate the model and its calibration when so little is known about it.[4]

It is not necessary that model documentation allows knowledgeable actuaries to exactly replicate the model's parameters and scenario sets. However, it should allow actuaries to have sufficient understanding of the model and its behavior under different, initial conditions to recover the essence of the statistical distribution the model is designed to produce (e.g., percentiles and other statistical metrics) and opine on that distribution, its dynamics, and fitness for purpose. [5]

Detailed Comments

Should an assumption be important enough to be prescribed in PBR, it follows that the relevant actuarial standards of practice (ASOPs) and best practices be followed in the assumption's development, documentation, and application. Assumed stochastic returns on corporate bond funds may be prescribed and/or produced with commercially available software, but many PBR actuaries would still consider whether the prescribed assumption is reasonable or has material limitations that could understate reserves. At the risk of losing credibility, the framework for PBR should allow for PBR actuaries to be able to explain to a company's Board, rating agencies, and others exactly how and why the PBR corporate assumptions behave differently from the assumptions the company used in its own economic views, risk management analysis, etc. This is especially true should those assumptions drive materially different results. Both situations require underlying model information beyond what's available for GEMS™.

While we believe the GEMS™ corporate model documentation provided to date is inadequate for evaluating whether the model is fit for the purpose at hand, it does suggest more broadly that the model may be overly complex. Models can require considerable work by actuaries to understand and could complicate future efforts by the NAIC to rationalize and establish consistent treatment of credit spreads and default costs through statutory regulation (e.g., general account vs. separate account, reserves vs. capital vs. asset adequacy testing). Using such a sophisticated model to simulate returns on a few corporate bond funds (e.g., one that models a universe of individual bonds migrating over dozens of credit ratings) is akin to using a multi-state long-term care model to simulate deaths on traditional life insurance policies. As we continue to work towards a solution, it is important to keep in mind that some solutions may lead us towards an answer, but they may not be the most efficient means to get there. A compounding factor in this scenario rests on the idea that the model employs overly sophisticated components to simulate returns for a few corporate bond funds, while those same sophisticated components are also most likely to be considered proprietary and not publicly documented.

[4] The documentation provided for GEMS™ Treasury and Equity models, while not enabling exact replication of results, does provide enough information on formulas, parameters, etc., that when combined with other Conning statements gives us enough to understand the model's dynamics, strengths, and limitations so that we can implement an approximate replication and evaluate fit for purpose.

[5] For example, Actuarial Standard of Practice (ASOP) No. 56, Modeling, provides guidance to actuaries when performing actuarial services with respect to using, reviewing, or evaluating models. Section 3.1.2 of ASOP No. 56 states actuaries "evaluating the model … should confirm that, in the actuary's professional judgment, the model reasonably meets the intended purpose." Section 3.1.3 of ASOP No. 56 states that "[w]hen using the model, the actuary should make reasonable efforts to confirm that the model structure, data, assumptions, governance and controls, and model testing and output validation are consistent with the intended purpose."

The limited documentation provided on the GEMS™ Corporate Model reflects a stochastic spread process that allows for spreads to blow out, correlations between corporate spreads and equity returns, and a stochastic process involving a transition matrix for ratings migration. It also conceptually describes how long-term spread targets are set. What is missing are equations for any of the stochastic processes, including the spread jump process, information on the form or parameters of the statistical distributions, the strength and direction of relationships underlying the spreads and transition probabilities, and a description of how migrations, spreads, defaults, recoveries, transaction costs, and bond returns are calculated. The appendix includes a list of sample documentation components for a corporate bond ESG model, the majority of which are currently not publicly available for the GEMS™ Corporate Model.

The NAIC adopted Actuarial Guideline (AG) 53 last year, which raised expectations for company actuaries and regulators in terms of how they understand asset risk/return relationships in Asset Adequacy Testing (AAT). A limited, one-sided discussion of spreads, without an understanding of corresponding migration/default costs, would be concerning for both AAT and PBR. Without understanding how the model works, including its formulaic relationships and calibration, evaluating the risk/reward relationships as well as the reasonableness and fit for purpose of model/calibration is impossible.

As a liability analogy, a VM-31 PBR report would likely be considered inadequate if it stated a dynamic lapse assumption that varies by in-the-money (ITM) was used and only provided a high-level description of how base at-the-money (ATM) ultimate lapse rates are set, with no information about the form of the dynamic function (e.g., linear vs. S-curve) or its parameters, the definition of ITM used (nominal guarantee amount vs. present value, any rate definition), the other drivers of the assumption (e.g., if it varies by withdrawals or not), and the base ATM rates (and how they're set) prior to the ultimate period.

While we can compare a few excess return statistics between the GEMS™ and Academy corporate models, or between the GEMS™ model and the acceptance criteria, the utility of this is limited without an adequate understanding of the GEMS™ model structure, relationships, and calibration. For example, without such understanding we cannot properly determine (e.g., for risk management and/or pricing purposes) how model performance, scenarios, and reserve and capital levels will change from one period to the next as the market environment changes, e.g., whether differences are due to the model's structure and relationships or its calibration. If under certain market environments the two models produce similar excess returns, there is not enough known to determine if excess returns will remain similar under different market environments, e.g., different equity levels, equity volatilities, interest rate levels, interest rate volatilities, or any other factors that could be part of the undocumented stochastic processes.

From the limited scenario sets and comparisons we have seen, the GEMS™ High Yield excess returns seem overly optimistic. The possibility of spreads blowing out further in adverse, but short of worst-in-history, credit markets appears potentially understated. However, there is no way to determine if this is due to the underlying model or the calibration of the spread jump process, migration probabilities, loss given default assumptions, or something else.[6]

[6] Although some limited information has been provided for the spread component of the model, we cannot analyze the distribution of spreads because only total returns (i.e., not spreads) are provided in the basic data set.

The formulas and relationships in the Academy corporate model for spreads and migration/default/transaction costs are fully documented and all implementation details are available in both a spreadsheet and in Python code. The relatively simple model structure is not overly complex, facilitates understanding, meets the stylized facts proposed for the purpose at hand, and can be calibrated to meet the acceptance criteria. With inadequate model documentation, it is not clear that the GEMS™ corporate model can meet the same threshold. Without such documentation we support the use of the Academy's Alternative Corporate Model.

Closing Remarks

The ESGS appreciates the opportunity to comment on the proposals and looks forward to our continued collaborative efforts with regulators on this important issue. Please direct any questions to Amanda Barry-Moilanen, life policy analyst at barrymoilanen@academy.org.

Sincerely,

Jason Kehrberg
Chair, Economic Scenario Generator Subcommittee

Appendix—Sample documentation components for a corporate bond ESG model

1. Model overview
2. Comparison to other model forms (e.g., trade-offs)
3. Model limitations and risks
4. Stochastic process equations (e.g., stochastic modulator, jump process, information on how volatility decays over time, volatility clustering process under low vs. high spreads, functional definitions, relationships between market variables)
5. Credit migration/transition process
6. Default and recovery rate assumptions/behavior
7. Correlation assumptions (e.g., correlations between spread targets, applicability of non-consistent correlation matrices for producing real-world scenarios)
8. Calibration targets (e.g., benchmarks and time periods used, sources and use of historical data, derivation approach)
9. Calibration process (e.g., for spreads, for defaults, role of judgment)
10. Tail calibration
11. Parameter values, bounds, and estimation process
12. Frequency of parameter updates
13. Fitting/estimation process (e.g., to initial term structure, to time-varying targets)
14. Spread initialization process (e.g., fitted vs. interpolated tenors)
15. Total return calculation (e.g., yield curves/bond universe used, Treasury tenors used, process for which bonds remain in the fund)
16. Validation methodology/results (e.g., performance vs. targets and acceptance criteria)
17. Distribution statistics (e.g., volatility, dispersion, skew)

Mathematical Finance Company
QTSM CIR Green's Function Multifactor CIR and Affine Options SIRP ESG RS-ESG DMRP RS-DMRP

Nov 6, 2023

Honorable Rachel Hemphill
Chair, Life Actuarial (A) Task Force (LATF)
Re: Generator of Economic Scenarios (GOES) Corporate Model Decision

Dear Ms. Rachel Hemphill,

Please accept this comment on the Generator of Economic Scenarios (GOES) Corporate Model Decision.

Sincerely yours,

Mark S. Tenney

4313 Lawrence Street, Alexandria, VA 22309-1235
(703) 799-0581 • Fax: (703) 799-4964 • marktenneymfc@gmail.com • mfcesg.com

1 Choice of model

The Academy corporate model is preferable to the GEMS Corporate model for use by LATF. The Academy model explicitly handles and documents correlation. See page 53 of the Academy handout.

GEMS is built on the 3 factor Cox, Ingersoll, and Ross treasury model. Because of the square root process on each factor, they are uncorrelated. This makes correlation a problem within treasuries as well as between treasuries and corporates. How the choices made for treasures carry over into corporates has to be considered carefully. Correlation includes yield to maturity as a dimension.

GEMS has not disclosed sufficiently how it handles this correlation problem. This is a very critical problem in the entire GEMS based system. It is important to document correlation for spreads, whole yields, bond prices, and bond portfolio returns among themselves and other asset classes.

The GEMS corporate model has some elements addressed to systemic risk and perhaps others more to bond trading in calm markets. The relative merits of these are difficult to ascertain from the disclosed documentation. GEMS could provide value to customers if it helped pick bonds in calm markets. This could justify use of GEMS by customers even if its systemic risk part was weak. For regulators, the reverse would be true.

2 Documentation

The GEMS corporate spread model documentation is very limited. This is true both in absolute terms as well as relative to the documentation of the Academy model. Academy documentation is 58 pages. GEMS documentation in the exposure is 17 pages.

The 3 state variables of the Cox, Ingersoll, and Ross model are not correlated. It is therefore important to disclose how correlation is handled in the corporate model. How is correlation to treasuries handled? Are corporates correlated among themselves but not correlated to treasuries?

It is important to distinguish the type of correlation. The correlation of the levels of the yields and their differences are to be distinguished, as well as the logs and differences of logs. The same applies to spreads and price changes and changes in logs of prices.

Each of the documents, GEMS and Academy, would benefit from a section in which the complete model is written using standard mathematical notation for these types of models.

The evidence based regulation trend in regulation is one factor to consider in documentation. This trend achieved a step in progress in 2018 with the "Foundations for Evidence-Based Policymaking Act of 2018". Support for evidence based regulation can be found in different groups. Some states may adopt some type of evidence based statute themselves. Over time, courts may recognize a trend and adopt it as required under due process of law. Federal courts might impose a due process requirement on states for evidence based regulation. Some states might construe a lapse in evidence based regulation as a taking.

Some states have voter initiated referendums, which could pass a broad rule on evidence based regulation as well. An example is as follows.

> Regulations of this state shall be evidence based. Evidence based shall be whatever the rules of evidence are in the courts of this state.

In the case of the compact, the Colorado Supreme Court has ruled that where Colorado state law is explicit, it overrides the compact. This was in the case of Amica Life Insurance Company v. Wertz where Colorado specifies a one year exclusion for suicide and the compact specifies two years.

In the area of the corporate model, the GEMS public disclosure is weak. The two standards in evidence law are Daubert and Frye. GEMS public disclosure are not adequate for either of these two evidence standards.

What obligation is Conning under to disclose known weaknesses or limitations in GEMS? This may be or become important to evidence based regulation and the related issues of due process of law or regulatory takings. These matters are brought up in the spirit of issue spotting and not of attempting to determine the current or future state of the law on these matters.

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Colin Masterson
Policy Analyst
202-624-2463
ColinMasterson@acli.com

November 13, 2023

Rachel Hemphill,
Chair, National Association of Insurance Commissioners (NAIC) Life Actuarial (A) Task Force (LATF)

Craig Chupp
Vice-Chair, NAIC LATF

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

Re: Generator of Economic Scenarios Corporate Model Decision

Dear Chair Hemphill, Vice-Chair Chupp, and Chair Barlow:

The American Council of Life Insurers (ACLI) appreciates the opportunity to submit comments on the Generator of Economic Scenarios (Generator) Corporate Model Decision document, which was exposed on October 18.

Based on the documentation currently available for the generator, ACLI supports the use of the American Academy of Actuaries corporate model (Academy Model) over the use of the GEMS corporate model (GEMS Model). The Academy Model is technically comparable to the GEMS Model and provides significantly more documentation to understand the behavior of the model in various market conditions, which is necessary for robust and accurate risk management. The complexity of the GEMS Model creates additional challenges that necessitate a greater level of documentation than is currently available.

ACLI appreciates that significant time and resources have been spent to develop the new Generator. The Generator is critically important to support key life insurance industry practices

including financial reporting requirements and internal company capital planning. The Generator needs to be robust, subject to a measurable, quantifiable, and transparent set of acceptance criteria, and fully transparent with respect to model features and operation.

The Generator has far-reaching implications for companies. In addition to impacting the level of reserves and capital, understanding the level and volatility of statutory reserves and capital is critical for sound risk management and capital planning, setting RBC targets, hedging, new business pricing, and dividend decisions.

We believe the Generator should be as transparent as possible so practitioners can understand its various features and implications. The absence of full transparency increases uncertainty and risk for the life insurance industry, which serves to diminish the capacity for effective risk management.

While the corporate model is typically not the largest driver of reserves or capital, it could still have material impacts if actual results are significantly different from expectations. Industry wants to be able to reliably predict how the scenarios for the corporate model will respond in different market conditions, just as we would expect for the equity returns and interest rates models.

However, should adequate documentation as previously requested by ACLI be provided for the GEMS Model and an appropriate level of understanding be attained via further review, we will revisit our position.

Detailed technical comments and a supporting example are presented in Appendix A.

Thank you once again for your consideration of our comments. We look forward to discussing our feedback at a future session of LATF.

Sincerely,

Colin Masterson

cc: Scott O'Neal, NAIC

Appendix A: Technical Comments and Questions

GEMS Model complexity:

The GEMS Model models the fundamental risk factors (credit transition densities with six credit ratings and recovery at default) and translates those risk factors into the resulting credit spreads and bond funds, which is a theoretically sound and flexible approach to model spreads with any combination of rating/tenor.

- The challenge with this approach is that the model may be too complex for this purpose without adding enough corresponding value. If only criteria on the four spread indices are utilized, we believe the model will overfit which diminishes the value of the model as an effective financial risk management tool.
- Specifically, the overfit may allow the resulting scenarios to meet the criteria at the specified terms/tails/starting market conditions but may show unreasonable statistics outside those given terms/tails/starting market conditions.
- The Academy Model directly targets observable risk factors (credit spreads and bond fund returns for four rating/tenor combinations), This targeting makes it easier to calibrate, understand and interpret the results, without the concern of the overfit.

Availability of documentation:

The absence of additional documentation for the GEMS models prevents a practitioner from assessing how the model was calibrated and interpreting the results.

- Lack of transparency into the GEMS Model makes it challenging to get comfortable with the results of the model and accurately predict credit impact on the level and volatility of reserves and capital.
- Funds covered by the corporate model comprise a meaningful portion of separate account assets for products in scope for the new Generator. The first field test suggests approximately 28% of separate account assets for VM-21 / C-3, Phase II are under scope, so the impacts of the uncertainty could be material.
- While some perspective has been provided on the GEMS model, the absence of comprehensive documentation results in a lack of transparency necessary to support appropriately effective risk management.
    - Comprehensive documentation (e.g., stochastic process equations and parameters) is needed to obtain the level of visibility into model dynamics and predict how credit scenarios will evolve over time. This level of documentation will likely be challenging to provide for GEMS due to the proprietary nature of the model.
    - The Academy Model provides transparent documentation to understand these dynamics.
- We do not yet fully understand how much results can differ from the Academy Model over longer time horizons. A recalibrated version of the GEMS Model to have long-term targets to be consistent with the Academy Model has not been shared at this time.
- The Academy Interest Rate Generator is public, so modeling software vendors have been able to integrate it into their software. Thus, scenarios can be generated within insurers' modeling platforms. This integration with modeling software allows companies to 'add on' to the Generator in a customized manner if the default Generator does not meet the company's needs. For instance, a company could integrate separate dividend rates and

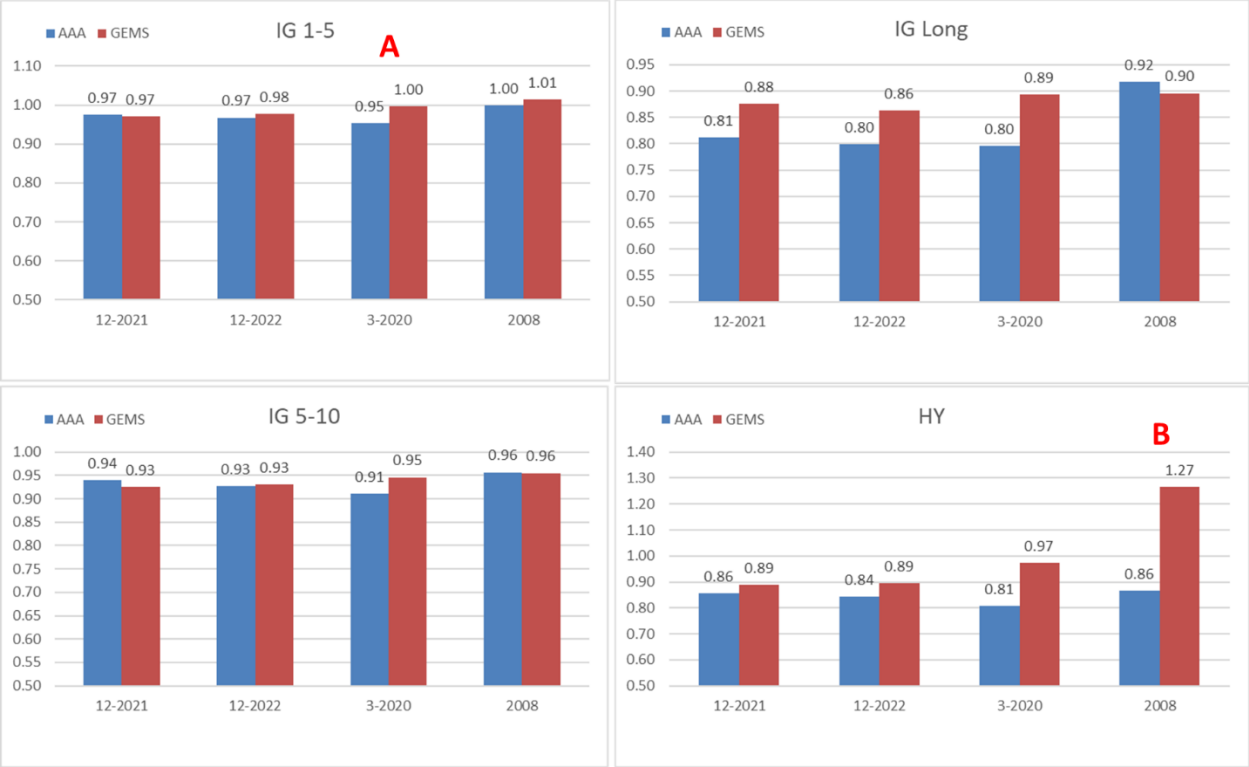
implied volatilities models to calculate index option costs for VM-21 calculations. A lack of public documentation may limit software vendors achieving this level of integration. This could create operational challenges for insurers, such as forcing insurers to navigate how to add these assumptions for each scenario.

Example:

A summary of key comparisons between the Academy Model and the GEMS Model is in the graphs below. A high-level observation is that the difference over the short term (1-Year) horizon is driven by different form in the spread process, whereby the GEMS Model projects lower potential spread widening relative to 3/2020 spreads which results in higher tail outcomes in excess return. Thus, 1% of the excess distribution under the GEMS Model would produce no loss for IG 1-5, compared to 5% loss under the Academy Model (red A in graph below). For HY there appears to be a tangible difference in implied frictional cost relative to elevated rate levels, such that in 2008 even the worst 1yr HY return under GEMS is +27% at 1% severity, compared to a 14% loss from the Academy Model (red B in graph below).

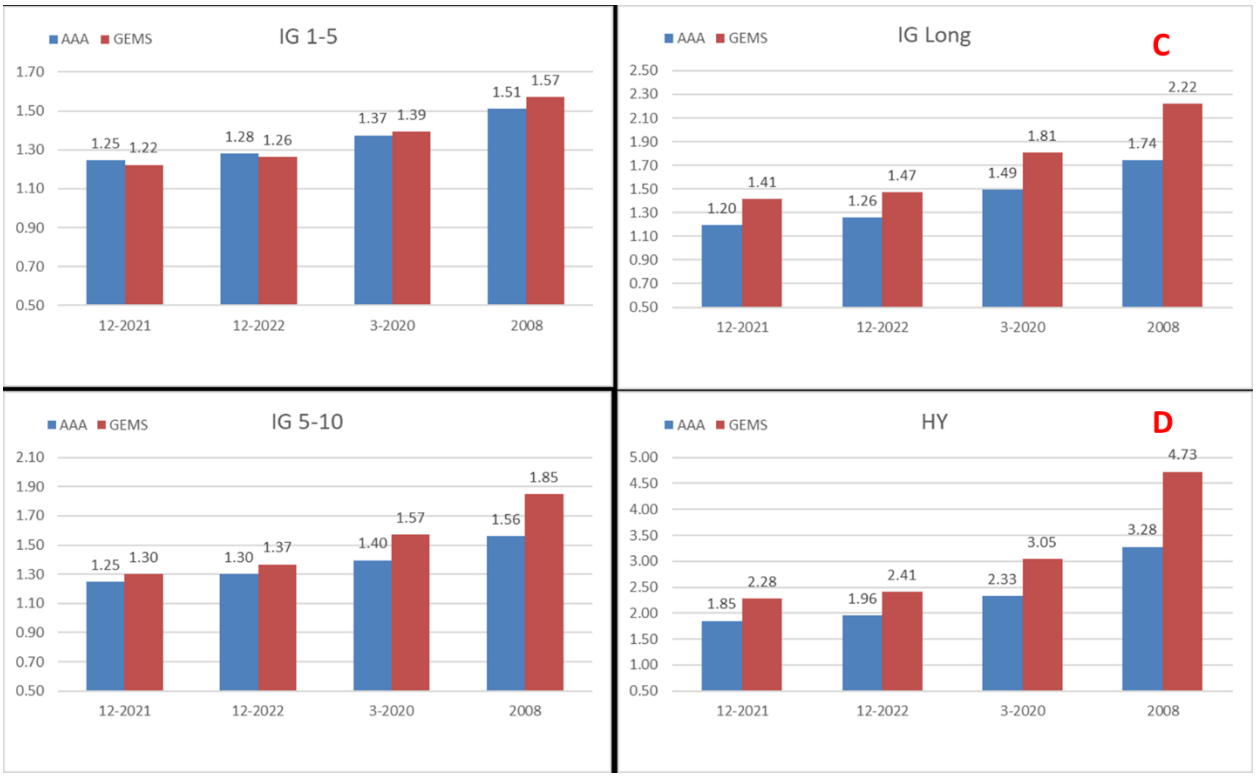
Given the lack of transparency regarding the GEMS Model, it is not possible to make an appropriate comparison.

GWF Comparison: 1% severity over 1 year



The difference continues to be an issue at the 30-Year horizon. Looking at the comparison, in 2008 even the worst 30-Year IG Long cumulative return under GEMS Model is +227% compared against +174% for the Academy Model (red C in graph below). HY has even more severe differences, with +373% cumulative return under GEMS Model compared to 228% in Academy Model (red D in graph below).

GWF Comparison: Median over 30 years


AAA
GEMS
IG 1-5
1.70
1.50
1.30
1.10
0.90
0.70
0.50
1.25
1.22
1.28
1.26
1.37
1.39
1.51
1.57
12-2021
12-2022
3-2020
2008
AAA
GEMS
IG Long
C
2.50
2.30
2.10
1.90
1.70
1.50
1.30
1.10
0.90
0.70
0.50
1.20
1.41
1.26
1.47
1.49
1.81
1.74
2.22
12-2021
12-2022
3-2020
2008
AAA
GEMS
IG 5-10
2.10
1.90
1.70
1.50
1.30
1.10
0.90
0.70
0.50
1.25
1.30
1.30
1.37
1.40
1.57
1.56
1.85
12-2021
12-2022
3-2020
2008
AAA
GEMS
HY
D
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
1.85
2.28
1.96
2.41
2.33
3.05
3.28
4.73
12-2021
12-2022
3-2020
2008

Item #	Submitter	Category	Issue	Planned Response	Documentation Delivery Owner	Expected Delivery
1	ACLI, Moody's	Sensitivities	What is the procedure for receiving economic sensitivity scenario sets?	Add to Q&A Document	NAIC/Conning	1Q 2024
2	ACLI, Moody's	Sensitivities	Will Conning/NAIC be providing these on a standard or ad hoc basis?	Add to Q&A Document	NAIC/Conning	1Q 2024
3	ACLI, Moody's	Sensitivities	Are companies required to license GEMS to produce their own sensitivities?	Add to Q&A Document	NAIC/Conning	1Q 2024
4	ACLI, Moody's	Sensitivities	Are the procedures to produce sensitivities clearly defined in order to mimic the scenarios that would be produced if the sensitivity actually evolves?	Add to Q&A Document	NAIC/Conning	1Q 2024
5	ACLI	Update Process	Are there economic conditions where we'd expect in advance that the routine update process will fail? Some will be quantitative, e.g., if rates drop below, say, -5% (not sure exactly where things fully floor out) the calibration process can't replicate those conditions. Others will be more qualitative, e.g., if the Treasury stops issuing sufficiently long-dated debt there eventually won't be the assumed points to calibrate to. Our thought here isn't so much that these will be things we'll necessarily worry about month to month. It's more for re-evaluating the fitness of the model however many years down the road. If we know the model is based on critical assumption X and X becomes false or is close to doing so, that gives us useful, objective criteria to point to. (Super low interest rates for the AIRG is a good example of what I have in mind.)	Add to Q&A Document	NAIC/Conning	1Q 2024
6	ACLI	Model Governance	Is reparameterization automatically reflected in the Valuation Manual, or does it go through an explicit LATF exposure/adoption process? If the former, every step of the process/decision-making must be clearly specified in advance so companies know exactly how the scenarios will appear in a given economic environment.	Discuss at GOES (E/A) Subgroup	GOES (E/A) Subgroup	Prioritize to discuss at GOES Meetings
7	ACLI	Model Governance	What language is required in the Valuation Manual to clearly define the prescribed scenarios? I wouldn't mind the parameterization being included to ensure that future changes require a more formal process.	Discuss at GOES (E/A) Subgroup	GOES (E/A) Subgroup	Prioritize to discuss at GOES Meetings
8	ACLI	Model Governance	What's the escalation process if issues are discovered – whether by Conning, by regulators, by companies, or by someone else – after scenarios are released?	Discuss at GOES (E/A) Subgroup	GOES (E/A) Subgroup	Prioritize to discuss at GOES Meetings
9	ACLI	Model Governance	What's the governance for deciding whether to try to release revised scenarios for that month (i.e., if they're fatally flawed in some way not contemplated by existing checks) versus just trying to remedy the issue going forward?	Discuss at GOES (E/A) Subgroup	GOES (E/A) Subgroup	Prioritize to discuss at GOES Meetings
10	ACLI, AAA, Moody's	Corporate Model Documentation	Provide an overview of the model	see "NAIC Scenario Set Technical Documentation, Corporate Yield Model"	N/A	Done
11	ACLI, AAA	Corporate Model Documentation	Pros and cons of the model vs other available models (i.e., trade-off analysis)	Decline to provide	N/A	N/A
12	ACLI, AAA, Moody's	Corporate Model Documentation	Provide the stochastic process equations. The current documentation provides high level model description that utilizes transition matrix with a jump process. However, stochastic modulator, jump process, or parameters are not defined. We will need the full list of parameters with functional definition of the model that uses all parameters.	Only Under MNDA Protection	N/A	N/A
13	ACLI, Moody's, AAA	Corporate Model Documentation	How are spreads initialized – all tenors or a few and interpolated?	Add to Corporate Documentation	NAIC/Conning	1Q 2024
14	ACLI, AAA, Moody's	Corporate Model Documentation	Detail the total return calculation (e.g., yield curves / bond universe used, Treasury tenors used, process for which bonds remain in the fund)	Reviewing documentation to see if already provided	NAIC/Conning	1Q 2024
15	ACLI	Corporate Model Documentation	How is volatility clustering being capture (e.g., high spread volatility, low spread volatility)?	Add to Corporate Documentation	NAIC/Conning	1Q 2024
16	ACLI, AAA, Moody's	Corporate Model Documentation	What are the calibration targets?	Defined by Acceptance Criteria	LATF and LRBC WG	
17	ACLI, AAA	Corporate Model Documentation	Can the model fit to time varying targets?	Add to Q&A Document	NAIC/Conning	1Q 2024
18	ACLI, AAA	Corporate Model Documentation	How are targets derived?	See "GEMS® Expert View Parameterization United States Corporate Credit Targets"	N/A	N/A
19	ACLI, AAA	Corporate Model Documentation	What data sources are used to come up with the targets?	see "NAIC Scenario Set Technical Documentation, Corporate Yield Model"	N/A	N/A
20	ACLI, AAA, Moody's	Corporate Model Documentation	Calibration of spreads? defaults?	Only Under MNDA Protection	N/A	N/A
21	ACLI, AAA, Moody's	Corporate Model Documentation	How is credit migration treated? Is there realistic transition behavior?	Only Under MNDA Protection	N/A	N/A
22	ACLI, AAA, Moody's	Corporate Model Documentation	What are the recovery rate assumptions? How are these derived?	Only Under MNDA Protection	N/A	N/A
23	ACLI, Moody's	Corporate Model Documentation	What are the correlation assumptions? How are they derived?	Only Under MNDA Protection	N/A	N/A
24	ACLI, Moody's	Corporate Model Documentation	Which parameters are updated periodically and which are static? How frequent as these updates?	Discuss at GOES (E/A) Subgroup (Model Governance Related)	Discuss at GOES (E/A) Subgroup (Model Governance Related)	Prioritize to discuss at GOES Meetings
25	ACLI, AAA, Moody's	Corporate Model Documentation	How are the tails of the distribution being calibrated if at all?	Only Under MNDA Protection	N/A	N/A
26	ACLI	Corporate Model Documentation	What are the boundaries if any on the parameters?	Only Under MNDA Protection	N/A	N/A
27	ACLI, AAA	Model Validation	Provide evidence that the model is hitting the targets, e.g. acceptance criteria (including tail excess returns, how cyclicity is captured for reasonable tail events)	This will be included in the candidate scenario set review process.	GOES (E/A) Subgroup	Prioritize to discuss at GOES Meetings
28	ACLI, AAA, Moody's	Corporate Model Documentation	Volatility, dispersion, skew, …	Illustrate via scenario statistics	NAIC/Conning	
29	ACLI	Corporate Model Documentation	Does volatility decay over time?	Only Under MNDA Protection	N/A	N/A
30	ACLI, AAA	Model Validation	Is the fit to initial term structure good?	Provide quantitative illustration	NAIC/Conning	1Q 2024
31	ACLI, AAA	Corporate Model Documentation	How closely are the spreads of different targets correlated?	Only Under MNDA Protection	N/A	N/A
32	ACLI, AAA	Corporate Model Documentation	What are the known model limitations?	Add to Q&A Document (see above)	NAIC/Conning	1Q 2024
33	ACLI, AAA	Corporate Model Documentation	Have non-consistent correlation matrices been considered to produce more real-world scenarios?	N/A - don't apply correlation matrices	N/A	N/A
34	ACLI	Treasury Model Documentation	We will need the initial treasury yield curve fitting documentation	Yield curve fitting performance has been demonstrated	N/A	N/A

35	ACLI	Equity Model Documentation	We will need the full functional definition of the equity jump process model	Need more information on what is lacking		
36	ACLI, AAA	General Model Documentation	Currently provided documentation provides general method to estimate the parameters; however, it is not clear which parameters are being fitted to which time series and how targets are incorporated. We will need the parameter values used in the model.	Parameters are provided for the Treasury and Equity models, they will not be provided for the GEMS Corporate model.	N/A	N/A
37	AAA	Model Governance	Frequency of parameter updates	Discuss at GOES (E/A) Subgroup	GOES (E/A) Subgroup	Prioritize to discuss at GOES Meetings
38	Moody's	Corporate Model Documentation	Choice of the number of credit rating buckets to be modeled	Add to Q&A Document	NAIC/Conning	1Q 2024
39	Moody's	Corporate Model Documentation	The rebalancing strategy for the buying and selling of bonds in the portfolio over each timestep	Add to Q&A Document	NAIC/Conning	1Q 2024
40	Moody's	Corporate Model Documentation	Adjustment of the model to: 1. better fit the initial spreads curves 2 .stabilize long term distributions 3. better fit historical default or transition levels	Only Under MNDA Protection	N/A	N/A

Agenda Item 6

Discuss Comments Received on GOES Acceptance Criteria and Stylized Facts (Additional Materials Pending)

Generator of Economic Scenarios (GOES) Stylized Facts and Acceptance Criteria

October 5, 2023

NAIC NATIONAL ASSOCIATION OF INSURANCE COMMISSIONERS

Table of Contents

Treasury Model Acceptance Criteria

Retained Treasury Model Acceptance Criteria

Item	Category	Criteria
T1.	Prevalence of High Rates, Upper Bound on Treasury Rates	a) The scenario set should reasonably reflect history, with some allowance for more extreme high and low interest rate environments b) Upper Bound: i. [20%] is >= [99%]-tile on the 3M yield fan chart, and no more than [5%] of scenarios have 3M yields that go above [20%] in the first 30 years ii. [20%] is >= [99%]-tile on the 10Y yield fan chart, and no more than [5%] of scenarios have 10Y yields that go above [20%] in the first 30 years
T2.	Lower Bound on Negative Interest Rates, Arbitrage Free Considerations	Apply the following guidance for negative rates: a) All maturities could experience negative interest rates b) Interest rates may remain negative for multi-year time periods c) Rates should generally not be lower than -1.5%
T3.	Initial Yield Curve Fit, Yield Curve Shapes in Projection, and Steady State Yield Curve Shape	a) Review initial actual vs. fitted spot curve differences for a sampling of 5 dates representing different shapes and rate levels for the entire curve and review fitted curves qualitatively to confirm they stylistically mimic the different actual yield curve shapes b) The frequency of different yield curve shapes in early durations should be reasonable considering the shape of the starting yield curve (e.g. a flatter yield curve leads to more inversions). c) The steady state curve has normal shape (not inverted for short maturities, longer vs shorter maturities, or between long maturities)

Modified Treasury Model Acceptance Criteria

Item	Category	Criteria
T4.	Low For Long: 12/31/20 Starting Conditions	a) At least 10% of scenarios need a 10-year geometric average of the 20-year UST below **1.45%** b) At least 5% of scenarios need a 30-year geometric average of the 20-year UST below **1.95%** **Note: As part of the model acceptance process, a given calibration of the GOES will be tested at multiple starting dates. This criteria is relevant for the 12/31/20 starting yield curve.**

Additional Treasury Model Acceptance Criteria

Item	Category	Criteria
T5.	Low- and High-For-Long at Varying Starting Conditions	a) For each scenario, calculate the geometric average of the [20-year] UST yield over the first [10] and [30] years of the projection. b) Calculate the [1st] and [99th] percentiles of the distribution of geometric average rates (for both the 10 and 30-year horizons). c) Look up criteria based on the starting level of the 20-year UST yield (interpolate if necessary).

Period	Initial UST20	10-year Geom Avg		30-year Geom Avg	
		1st percentile should be less than:	99th percentile should be greater than:	1st percentile should be less than:	99th percentile should be greater than:
Interim (years 0-10 or 0-30)	1%	0.94%	3.43%	1.50%	6.25%
	2%	1.23%	5.05%	1.68%	7.71%
	3%	1.62%	6.55%	1.86%	8.72%
	4%	2.15%	7.74%	2.06%	9.62%
	5%	2.66%	8.87%	2.26%	10.46%
	6%	3.15%	9.96%	2.50%	11.16%
	7%	3.63%	11.03%	2.78%	11.61%
	8%	4.10%	12.07%	3.06%	11.99%
	9%	4.64%	13.08%	3.34%	12.33%
	10%	5.21%	14.01%	3.65%	12.63%

Note: AAA recommended steady state portion of low- and high-for-long was not included in regulator criteria

Equity Model Acceptance Criteria

Equity Model Acceptance Criteria

Item	Category	Criteria
E1.	Low and High Accumulated Equity Returns	Use the former C3 Phase II equity model Calibration Criteria as a rough placeholder benchmark when evaluating equity scenarios.

Large Cap (S&P 500) Gross Wealth Factors

Percentile	1 year	5 years	10 years	20 years
2.5%	0.78	0.72	0.79	
5.0%	0.84	0.81	0.94	1.51
10.0%	0.9	0.94	1.16	2.1
90.0%	1.28	2.17	3.63	9.02
95.0%	1.35	2.45	4.36	11.7
97.5%	1.42	2.72	5.12	

Corporate Model Acceptance Criteria

Corporate Model Acceptance Criteria

Item	Category	Criteria
C1.	Target Steady State Excess Returns and Average Annualized Excess Returns in Years 20-30	a) Set steady state excess return targets for each bond fund according to the criteria below. b) Average annualized excess returns for each bond fund in years 20 through 30 of the projection should be no greater than the steady state excess returns, but no less than the steady state excess returns minus a buffer.

Historical Data

Historical averages (1999 to 2021) from Bloomberg *(bps)*	IG 1-5	IG 5-10	IG Long	HY
Option Adjusted Spread *(OAS)*	124	156	1.80	534
Spread Return *(determined from OAS and duration series)*	129	168	1.95	559
Excess Return	98	100	88	311
Frictional Cost *(Spread Return - Excess Return)*	31	68	107	248

Historical OAS split –Frictional Cost vs. Excess Return	IG 1-5	IG 5-10	IG Long	HY
Frictional Cost % of OAS	25%	44%	60%	46%
Excess Return % of OAS	75%	56%	40%	54%

Criteria

Steady state targets *(bps)*	IG 1-5	IG 5-10	IG Long	HY
Target OAS *(avg. VM-20 ult. spread at [12/31/21])*	107	141	163	448
Target Excess Return *(Target OAS * Excess Return % of OAS)*	80	79	66	240
Criteria for avg. annualized Excess Return in years [20-30]	80 -[10]	79 -[10]	66 -[10]	240 -[20]

Stylized Facts

Treasury Model Stylized Facts

1. **The level of interest rates (the cost of borrowing money) changes due to a variety of complex and interrelated factors (e.g., supply of and demand for financing, business cycle, GDP, inflation, central bank actions to stimulate the economy or control inflation**
   a) Short-term rates (which the Fed has more control of) have generally fallen within a range of 0% to 20% and have most often been within the lower part of that range. Long-term rates have generally been within 300 bps of short-term rates.
   b) Negative interest rates are possible (have been observed outside the U.S.) but unlikely due to structural and market differences between the U.S. and other economies.
   c) Interest rates can exhibit multi-year trends (e.g., up, down, low-for-long). Interest rates can stay at very low levels for several years. Short-term rates can stay low and rangebound ~~very near their lower bound~~ for several years while higher long-term rates continue to fluctuate.
2. **The volatility of interest rates varies over time, with periods of both high and low volatility.**
   a) Monthly changes in interest rates are generally limited in size (less than 80 bps) but changes tend to be greater when the level of interest rates is higher.
   b) Monthly changes in short-term rates tend to be larger than monthly changes in long-term rates when short-term rates are not near their lower bound, but the opposite relationship tends to hold when short-term rates are ~~near their lower bound~~ low or negative.
   ~~c) Volatility tends to increase in stressed markets.~~
   d) The standard deviation of monthly rate changes should generally be consistent with the historical data, given the level of interest rates.*
3. **The yield curve embodies the term structure of interest rates and takes a variety of shapes.**
   a) The normal yield curve shape is upward sloping (long-term rates greater than short-term rates) and concave downward. Normal yield curve shapes can persist for extended periods of time.
   b) Non-normal yield curve shapes include inversions (downward sloping), humps, and valleys. Inversions (and other non-normal yield curve shapes) are often associated with key points in the business cycle (e.g., recession indicator) but generally don't persist for extended periods of time.
   c) The slope of the yield curve tends to be lower (even negative/inverted) when short-term rates are at relatively high levels.
   d) Percentile metrics of the slope of the yield curve across scenarios should generally be consistent with history given the starting rate level.**

*added in place of AAA rate volatility criteria
**added in place of AAA rate slope criteria

Equity Model Stylized Facts

1. Equity indices (indeed, all asset classes) tend to exhibit **consistent risk/reward relationships** over long time horizons.
2. Cumulative equity returns tend to exceed the compounded risk-free rate (positive observed **equity risk premium**) over long time horizons, but over short time horizons the equity risk premium fluctuates due to several factors and can be negative.
3. Equities **fluctuate between bull and bear markets** (bubbles tend to burst) – markets can experience significant losses but eventually tend to **move back into positive territory** (cumulative equity returns over long time horizons tend to be positive).
4. Cumulative equity returns ***over long time horizons*** **are not materially impacted by initial market conditions**.
5. The **volatility of equity returns varies over time but has a strong tendency to revert to normative levels**. Changes in volatility over time increase the probability of both extreme gains and extreme losses from one period to the next (i.e., the distribution has fat tails, or ***positive kurtosis***). Furthermore, the **volatility of equity returns is higher in bear markets**. This increases the probability of extreme losses relative to extreme gains (i.e., the distribution has a longer left tail, or ***negative skewness***).
6. Equity markets contain **pathwise dynamics** over long time horizons that aren't present in the distribution of single-period returns. Future equity scenarios should have reasonable distributions of cumulative equity returns over long time horizons (e.g., 10, 20, 30 years), especially since these distributions are key to the performance of long-duration life and annuity products.
7. Future equity scenarios should include events that are plausibly **more extreme than history.**
8. Equity returns have both a **price and dividend component**, and they behave differently – Dividend returns tend to be more stable than price returns.
9. Returns between different equity indices are **generally positively correlated** over **long** time horizons. This correlation may increase sharply in bear markets, but it tends to revert to normative levels in a short period of time.

Corporate Model Stylized Facts

1. **General nature of credit markets and credit spreads**
   a) Credit markets tend to be cyclical with elevated defaults and migrations at the end of credit cycles. Credit-related losses tend to be "lumpy" or episodic.
   b) Credit spreads are positive and have a strong tendency to revert to long-term normative levels (generally within three to four years).
   c) Credit spreads exhibit volatility clustering (i.e., regimes of high and low volatility), and volatility has a strong tendency to revert to long-term normative levels.
2. **Corporate Credit Spreads: Relation across qualities and maturities**
   a) As a bond's credit quality decreases credit spreads, spread volatility, and the risk of loss increase.
   b) Longer maturity bonds generally have higher credit spreads than shorter maturity bonds. However, the credit spreads on shorter maturity bonds are more sensitive to current market conditions, so during market stresses credit spreads on shorter maturity bonds may increase more than credit spreads on longer maturity bonds.
   c) Credit spreads for different qualities and maturities tend to be strongly correlated (e.g., 80% or more).
3. **Corporate Credit Spreads: Relation to other market variables**
   a) Credit spreads tend to be higher and more volatile in equity bear markets (i.e., strong positive correlation to equity volatility, strong negative correlation to equity returns).
   b) Credit spreads tend to be negatively correlated with Treasury rates (i.e., flight to quality during market stress).
4. **General nature of bond index funds**
   a) A corporate bond fund is generally actively managed (regularly rebalanced) to meet defined maturity and quality targets (e.g.,- 5 to 10-year investment grade bonds) by trading individual bonds into and out of the fund. Such trading tends to increase when the corporate bond market experiences high levels of credit migration.

Corporate Model Stylized Facts (continued)

5. Bond index fund return dynamics

a) Bond index fund total returns reflect the impact of risk-free rates (and changes in risk-free rates) as well as credit-related returns in "excess" of risk-free rates.

- Total return = Risk free return + Excess return
- Excess return = Spread-based return -Frictional costs
- Spread-based return reflects credit spread income and price returns (i.e., changes in market price due to spread movement).
- Frictional costs reflect costs due to defaults (net of recoveries), migrations (e.g., selling downgraded bonds at a loss when they no longer meet the fund's quality targets), and rebalancing.

b) Bond index fund returns vary with the credit cycle.

- Spread-based return tends to decline significantly when spreads explode but then recover as spreads mean revert and migrations/defaults occur (i.e., the portfolio is purged).
- Frictional costs (which are generally not recoverable) tend to cluster and accumulate rapidly as bonds migrate/default, with severity depending on the magnitude and duration of the credit cycle.

6. Bond Index Fund Returns: Relation to other asset classes

a) Bond funds have risk/reward relationships that are generally consistent with other asset classes over long horizons.

b) Credit spreads for bond funds held in the separate account should be consistent with economic assumptions for bonds held in the general account.

Timeline for Testing and Major Milestones

Timeline for Testing and Major Milestones

5-Oct	Expose Interest Rate, Equity, and Corporate Model Stylized Facts and Acceptance Criteria until 11/10.
10/12 or 10/19	Expose Corporate Model Quantitative and Transparency/Documentation Comparisons until 11/10.
Oct-Early Nov	Conning Recalibrate Models based on exposed Stylized Facts and Acceptance Criteria.
	NAIC Model Office Improvements.
29-Nov	Review Stylized Facts and Acceptance Criteria Comments, Conning Scenarios after re-calibration in Orlando. Potentially Adopt Final Stylized Facts and Acceptance Criteria. Review Corporate Model Comparisons. Potentially select Corporate Model.
Nov-Feb	NAIC Model Office Testing.
	Circulate any promising scenario sets. Individual Companies with capacity that wish to do so are encouraged to test using their own models and share results with regulators.
	GOES Subgroup calls to review scenario statistics against acceptance criteria, review model office results.
	Adopt Final Stylized Facts and Acceptance Criteria if regulators have substantial edits. Conning recalibrations, if so.
3/14/2024	Present Model Office Results, Expose Scenario Set(s).
March-June	Unaggregated GOES Field Test (VM-20, VM-21/C3P2, and C3P1), If Needed
June-July	Reg-Only Company Presentations of Unaggregated GOES Field Test (VM-20, VM-21/C3P2, and C3P1) Results, If Needed
July-Sept	VM-22 Field Test

Note: Timeline is subject to change

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November 20, 2023

Rachel Hemphill,
Chair, National Association of Insurance Commissioners (NAIC) Life Actuarial (A) Task Force (LATF)

Craig Chupp
Vice Chair, NAIC LATF

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

Re: Generator of Economic Scenarios (Generator) Acceptance Criteria and Stylized Facts

Dear Chair Hemphill, Vice-Chair Chupp, and Chair Barlow:

The American Council of Life Insurers (ACLI) appreciates the opportunity to comment on the exposed stylized facts and acceptance criteria to support the Generator. We appreciate the dedication and hard work of LATF and LRBC on the development of a Generator to replace the existing American Academy of Actuaries (Academy) Interest Rate Generator. We recognize the countless hours that regulators have spent on this effort. We are committed to this project and look forward to continuing to work with the regulators to achieve implementation of the replacement Generator by January 1, 2026.

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The Generator will affect the reserves and/or capital levels for virtually all life products, including variable and fixed annuity products. The finalized Generator will have a significant impact on both the level and volatility of reserves and capital, as well as internal company practices. Movements in reserves and capital should be intuitive based on current economic conditions and suitable for agreed upon long-term targets. Material changes in reserves and capital need to be well understood by practitioners and company senior management. Setting reasonable and appropriate parameters for the Generator is critical as it reduces the risk of unnecessary costs and complexities in company capital planning, risk management frameworks, hedging programs, and new business processes.

Paramount to the development of the Generator is the selection of reasonable and appropriate acceptance criteria and stylized facts. Stylized facts, the qualitative view of the desired behaviors of the Generator, are a critical foundation as they describe key characteristics of the scenarios produced by the Generator.

Acceptance criteria, which are measurable, quantifiable, and transparent, are necessary to ensure the Generator produces reasonable scenarios over a wide range of plausible economic conditions. A minimal yet comprehensive set of acceptance criteria provides a clear gauge of outcomes relative to the desired properties of the Generator. There will need to be a balance in the acceptance criteria: too constrictive and the Generator be more difficult to maintain and likely to fail to meet enough of the criteria on a consistent basis; too broad and the Generator could always pass, regardless of the validity of the scenario sets.

ACLI proposes modifying the acceptance criteria set exposed by regulators. We attempted to balance a minimal but comprehensive set of criteria over a wide range of economic conditions. Our recommendations were developed using the expertise of our member companies with the support of data analysis and perspective on the criteria provided by our actuarial consultant, Milliman, Inc. ACLI recommends inclusion of all our proposed changes to acceptance criteria in order to produce scenarios that are sound and practical. Absence of some of these criteria could lead to undesirable behaviors of the generator under certain economic conditions.

We have aggregated our suggested changes in the following categories below. The specific recommended changes (if any) for each of the exposed criteria can be found in Appendix A. The technical rationale behind our recommendations can be found in Appendix B.

Categories:

1. Severity and frequency of worse-than-history interest rate events (applicable to the exposed acceptance criteria T1, T2, T3, T4, T5)
2. Equity returns and relationship to interest rates (applicable to the exposed acceptance criterion E1)
3. Mean reversion and volatility (applicable to ACLI proposed acceptance criteria T6, T7, C2)

1. Severity and frequency of worse-than-history interest rate events.

ACLI proposes bounding the absolute limits and likelihood of extremely low and high interest rates and the duration of time rates could remain there (T1, T2).

ACLI agrees with regulators it is appropriate for worse-than-history events to be reflected by the Generator; however, scenarios produced need to be reasonably related to historical dynamics and economic expectations and any worse-than-history events should not be excessive. Extremely low

or high rates occurring for an extended period of time would not only have a significant impact on life insurers, but it would also have potentially catastrophic consequences for the economy.

ACLI proposes retaining the Academy yield curve inversion criterion (T3).

The generator should produce yield curves that are plausible even in worse-than-history conditions. The absence of reasonable curve shapes has several potential consequences: introduction of arbitrage opportunities, inappropriate incentives for hedge behavior, among other issues.

ACLI proposes removing the low-for-long and high-for-long varying starting conditions criterion (T4) and expanding the general low-for-long criterion (T5).

ACLI supports regulators have prioritized "low-for-long" and "high-for-long" criteria in the Generator, but caution on the criteria being overly extreme. ACLI is concerned that forcing excessive low-for-long could challenge the model meeting the other important acceptance criteria, impair the Generator's ability to produce reasonable scenarios, and lead to significant changes to the model (such as higher than reasonable volatility or excessive reliance on a floor creating unreasonable curve shapes).

Regulators have exposed two criteria to address these situations. "Low- and High-For-Long at Varying Starting Conditions" (T5) is an extremely robust criterion, and we directionally support it. In addition to addressing the extreme rates, the Generator should also produce an appropriate number of "moderate" scenarios; we proposed modifying T5 criteria to account for this consideration. We would suggest removal of "Low For Long: 12/31/20 Starting Conditions" (T4) as an acceptance criterion as it does not provide significant incremental value beyond that provided by the T5 criterion.

2. Equity returns and relationship to interest rates:

We believe the interest-equity linkage assumption should be set to zero.

ACLI is concerned about the equity returns currently being produced by the Generator. First and foremost, interest-equity linkages, namely the equity risk premium and the interest-equity correlation assumptions, should only be implemented when there is statistically significant historical evidence that supports such modeling assumptions. We believe the historical data suggests such linkages are not statistically significant. The inclusion of interest-equity linkage serves to increase the complexity of the model without any corresponding benefit. Further, we believe that robust low rate and low equity scenarios may be achieved without modeled linkage. Adjusting equity parameters to stabilize long-term equity return in a changing rate environment is not an appropriate solution.

Second, inappropriate relationships in the Generator could lead to counterintuitive results: the interest-equity linkage could potentially lead to an excess requirement for capital in an extreme conditions or down markets; the capital the insurer had built up to that point should be the necessary cushion rather than requiring the company to inject additional capital. Additionally, inappropriate relationships could lead to significant variance in reserves and capital, which impairs a company's ability to practice sound asset liability management and other risk management activities and for regulators to adequately assess the strength of the companies under their authority.

3. Mean reversion and volatility

ACLI proposes expanding the list of acceptance criteria by retaining the Academy criteria for rate mean reversion (new T6) and volatility (new T7), and credit spread mean reversion (new C2).

ACLI proposes reinstating several additional Academy criteria. Acceptance criteria which serve to evaluate mean reversion are necessary to define and support realistic interest rates and a realistic credit spread process. Not effectively modeling the mean reversion dynamics of credit spreads can generate multiple large negative returns within a short duration which would result in unrealistic outcomes. Similarly, having effective criteria to address an appropriate level of rate volatility is of critical importance as realized volatility is a key driver of the cost of hedging, which impacts liability valuation and risk capital for certain products.

ACLI would recommend establishing mean reversion targets for the interest rate model (new T6) and the corporate model (new C2). We would also propose reinstituting an interest rate volatility target (T7).

Future considerations:

As part of the governance process after adoption of the Generator, the stylized facts and acceptance criteria will need to be reviewed for appropriateness in evolving economic environments. Some of the criteria, such as the interest rate mean reversion point and corporate model excess return, would be appropriate to review and update on a frequent basis. Other parameters should be reviewed and updated as appropriate as part of a broader review of the model calibration. Part of the governance should be developing a process to determine what criteria to assess and evaluate.

Once again, ACLI very much appreciates the opportunity to submit comments on this exposure and looks forward to future discussions with regulators as we work towards creating and implementing a new, robust, and impactful Generator.

Sincerely,

B Barfield Alan Morris Colin Masterson

cc: Scott O'Neal, NAIC

Appendix A: ACLI recommended changes to acceptance criteria compared to NAIC exposed acceptance criteria

I. Treasury Rates

Item	Category	Criteria
T1.	Prevalence of High Rates, Upper Bound on Treasury Rates	*NAIC Exposed Criteria –* a) The scenario set should reasonably reflect history, with some allowance for more extreme high and low interest rate environments b) Upper Bound: i. [20%] is >= [99%]-tile on the 3M yield fan chart, and no more than [5%] of scenarios have 3M yields that go above [20%] in the first 30 years ii. [20%] is >= [99%]-tile on the 10Y yield fan chart, and no more than [5%] of scenarios have 10Y yields that go above [20%] in the first 30 years *ACLI Proposed Criteria -* a) The scenario set should reasonably reflect history, with some allowance for more extreme high and low interest rate environments b) Upper Bound: i. 1Y rates should not exceed 20.3% ii. 20Y rates should not exceed 17.3% c) Frequency of high rates: i. The 99th percentile in the steady state[1] is <= 17.0% for 1Y rate ii. The 99th percentile in the steady state is <= 15.8% for 20Y rate d) Maximum sojourn length for high interest rates (> 17%) <= 4 years

[1] Steady state as defined by the Academy is months 961 through 1200 (years 80 through 100) of the projected scenarios.

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T2.	Lower bound on negative interest rates, arbitrage free considerations	*NAIC Exposed Criteria* Apply the following guidance for negative rates: a) All maturities could experience negative interest rates b) Interest rates may remain negative for multi-year time periods c) Rates should generally not be lower than -1.5% *ACLI Recommendation* Apply the following guidance for negative interest rates: a) Maturities less than 20 years could experience negative interest rates b) Interest rates may remain negative for multi-year time periods c) 1Y rates should not be lower than -1.0% d) 20Y rates should not be lower than 0.0% e) Frequency of low rates: i. The 99th percentile on the steady state is >= 0.0% for 1Y rate ii. The 99th percentile in the steady state is >= 1.0% for 20Y rate f) Maximum sojourn length for low interest rates (< 0%) <= [4] years
T3.	Initial Yield Curve Fit, Yield Curve Shapes in Projection, and Steady State Yield Curve Shape	*NAIC Exposed Criteria* a) Review initial actual vs. fitted spot curve differences for a sampling of 5 dates representing different shapes and rate levels for the entire curve and review fitted curves qualitatively to confirm they stylistically mimic the different actual yield curve shapes b) The frequency of different yield curve shapes in early durations should be reasonable considering the shape of the starting yield curve (e.g., a flatter yield curve leads to more inversions). c) The steady state curve has normal shape (not inverted for short maturities, longer vs shorter maturities, or between long maturities)

<table>
<tr><td></td><td></td><td>ACLI Recommendation: the above criteria, plus

d) Retain yield curve inversion criteria from Academy proposal: (Lower Bound and Frequency columns under Slopes):

<table>
<tr><th></th><th>Bucket</th><th>Lower Bound</th><th>Upper Bound</th><th>Historical Min and Max (for reference)[1]</th><th>Worse-Than-History Frequencies[2]</th></tr>
<tr><td>Slopes:</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>20Y-1Y</td><td>20Y <= 3%</td><td>-0.5% to -1.5%</td><td>3% to 4%</td><td>0.02% & 2.85%</td><td>0.5% to 2%</td></tr>
<tr><td>20Y-1Y</td><td>3% < 20Y <= 8%</td><td>-2% to -3.5%</td><td>4.5% to 6%</td><td>-1.38% & 4.15%</td><td>0.5% to 2%</td></tr>
<tr><td>20Y-1Y</td><td>8% < 20Y</td><td>-4% to -5%</td><td>3.5% to 5.5%</td><td>-3.36% & 2.90%</td><td>0.5% to 2%</td></tr>
</table>
</td></tr>
<tr><td>T4.</td><td>Low For Long: 12/31/20 Starting Conditions</td><td>NAIC Exposed Criteria (relevant for 12/31/2020 yield)

a) At least 10% of scenarios need a 10-year geometric average of the 20-year UST below 1.45%
b) At least 5% of scenarios need a 30-year geometric average of the 20-year UST below 1.95%

ACLI Recommendation: Remove criteria (covered by more comprehensive T5)</td></tr>
<tr><td>T5.</td><td>Low- and High-For-Long at Varying Starting Conditions</td><td>NAIC Exposed Criteria

a) For each scenario, calculate the geometric average of the [20-year] UST yield over the first [10] and [30] years of the projection.

b) Calculate the [1st] and [99th] percentiles of the distribution of geometric average rates (for both the 10 and 30-year horizons).

c) Look up criteria based on the starting level of the 20-year UST yield (interpolate if necessary).

ACLI Recommendation: the above criteria, plus

d) Use the Academy approach to determine parameters for 15th and 85th percentiles to expand the criteria table to also include conditions on moderate rate scenarios (placeholders shown in blue).</td></tr>
</table>

		<table><tr><th>20yr Rate Initial Condition</th><th colspan="4">10-Year Geometry Average</th><th colspan="4">30-Year Geometry Average</th></tr><tr><th></th><th>1%ile <</th><th>15%ile ></th><th>85%ile <</th><th>99%ile ></th><th>1%ile <</th><th>15%ile ></th><th>85%ile <</th><th>99%ile ></th></tr><tr><td>1%</td><td>0.94%</td><td>#.##%</td><td>#.##%</td><td>3.43%</td><td>1.50%</td><td>#.##%</td><td>#.##%</td><td>6.25%</td></tr><tr><td>2%</td><td>1.23%</td><td>#.##%</td><td>#.##%</td><td>5.05%</td><td>1.68%</td><td>#.##%</td><td>#.##%</td><td>7.71%</td></tr><tr><td>3%</td><td>1.62%</td><td>#.##%</td><td>#.##%</td><td>6.55%</td><td>1.86%</td><td>#.##%</td><td>#.##%</td><td>8.72%</td></tr><tr><td>4%</td><td>2.15%</td><td>#.##%</td><td>#.##%</td><td>7.74%</td><td>2.06%</td><td>#.##%</td><td>#.##%</td><td>9.62%</td></tr><tr><td>5%</td><td>2.66%</td><td>#.##%</td><td>#.##%</td><td>8.87%</td><td>2.26%</td><td>#.##%</td><td>#.##%</td><td>10.46%</td></tr><tr><td>6%</td><td>3.15%</td><td>#.##%</td><td>#.##%</td><td>9.96%</td><td>2.50%</td><td>#.##%</td><td>#.##%</td><td>11.16%</td></tr><tr><td>7%</td><td>3.63%</td><td>#.##%</td><td>#.##%</td><td>11.03%</td><td>2.78%</td><td>#.##%</td><td>#.##%</td><td>11.61%</td></tr><tr><td>8%</td><td>4.10%</td><td>#.##%</td><td>#.##%</td><td>12.07%</td><td>3.06%</td><td>#.##%</td><td>#.##%</td><td>11.99%</td></tr><tr><td>9%</td><td>4.64%</td><td>#.##%</td><td>#.##%</td><td>13.08%</td><td>3.34%</td><td>#.##%</td><td>#.##%</td><td>12.33%</td></tr><tr><td>10%</td><td>5.21%</td><td>#.##%</td><td>#.##%</td><td>14.01%</td><td>3.65%</td><td>#.##%</td><td>#.##%</td><td>12.63%</td></tr><tr><td>Rate Control</td><td>Low Rate</td><td colspan="2">Moderate Rate</td><td>High Rate</td><td>Low Rate</td><td colspan="2">Moderate Rate</td><td>High Rate</td></tr></table>
T6.	Rate Mean Reversion (retain Academy criteria)	*ACLI Recommendation* a) Mean reversion target: i. 50th percentile 2.0% < 1Y rate < 3.5% ii. 50th percentile 4.0% < 20Y rate < 5.5% b) Retain Academy Rate median reversion criteria with half-life of 10-20 years
T7.	Rate volatility (retain Academy criteria; supplement SF T2.d)	*ACLI Recommendation* a) Retain Academy criteria (various by rate level): <table><tr><th>Rate</th><th>Bucket (BOM)</th><th>Historical Stat</th><th colspan="3">Desired Range</th></tr><tr><td rowspan="2">[Chg1Y]</td><td><= [3%]</td><td>0.59%</td><td>0.30%</td><td>to</td><td>0.89%</td></tr><tr><td>> [3%] to <= [8%]</td><td>1.16%</td><td>0.58%</td><td>to</td><td>1.73%</td></tr></table>

			> [8%]	3.35%	1.67%	to	5.02%
		[Chg20Y]	<= [3%]	0.61%	0.31%	to	0.92%
			> [3%] to <= [8%]	0.75%	0.37%	to	1.12%
			> [8%]	1.56%	0.78%	to	2.33%

II. Equity Rates

Item	Category	Criteria
E1.	Low and High Accumulated Equity Returns	*NAIC Exposed Criteria* a) Use the former C3 Phase II equity model Calibration Criteria as a rough placeholder benchmark when evaluating equity scenarios. **Large Cap (S&P 500) Gross Wealth Factors** *ACLI Recommendation: the above criteria, plus* b) Add criteria for 0.5th percentile > [0.54/0.58/0.62] for 1/5/10-year WF

Percentile	1 year	5 years	10 years	20 years
2.5%	0.78	0.72	0.79	
5.0%	0.84	0.81	0.94	1.51
10.0%	0.9	0.94	1.16	2.1
90.0%	1.28	2.17	3.63	9.02
95.0%	1.35	2.45	4.36	11.7
97.5%	1.42	2.72	5.12	

		The relationship between the 0.5th (no less than) and 2.5th (no greater than) percentile criteria needs to be rational. (Need to be revisited with the updated Academy proposal that is being developed)

III. Corporate Rates

Item	Category	Criteria
C1.	Target Steady State Excess Returns and Average Annualized Excess Returns in Years 20-30	*NAIC Exposed Criteria* a) Set steady state excess return targets for each bond fund according to the criteria below. **Criteria** Steady state targets *(bps)* / IG 1-5 / IG 5-10 / IG Long / HY Target OAS *(avg. VM-20 ult. spread at [12/31/21])* / 107 / 141 / 163 / 448 Target Excess Return *(Target OAS * Excess Return % of OAS)* / 80 / 79 / 66 / 240 Criteria for avg. annualized Excess Return in years [20-30] / 80 -[10] / 79 -[10] / 66 -[10] / 240 -[20] b) Average annualized excess returns for each bond fund in years 20 through 30 of the projection should be no greater than the steady state excess returns, but no less than the steady state excess returns minus a buffer *ACLI Recommendation:* No changes

<table>
<tr>
<td>C2.</td>
<td>Credit spread mean reversion speed (new criteria; supplements SF C1.b)</td>
<td>ACLI Recommendation
a) Retain Academy criteria (half-life of 22-26 months)
<table>
<tr><th rowspan="2">Bond Fund</th><th colspan="3">Median</th><th rowspan="2">Midpoint month Desired Range</th></tr>
<tr><th>Month [0]</th><th>Month [1200]</th><th>Midpoint</th></tr>
<tr><td>IG 1-5</td><td>$Median_{[0]}$</td><td>$Median_{[1200]}$</td><td>$Avg(Median_{[0]}, Median_{[1200]})$</td><td>[22] to [26]</td></tr>
<tr><td>IG 5-10</td><td>$Median_{[0]}$</td><td>$Median_{[1200]}$</td><td>$Avg(Median_{[0]}, Median_{[1200]})$</td><td>[22] to [26]</td></tr>
<tr><td>IG Long</td><td>$Median_{[0]}$</td><td>$Median_{[1200]}$</td><td>$Avg(Median_{[0]}, Median_{[1200]})$</td><td>[22] to [26]</td></tr>
<tr><td>HY</td><td>$Median_{[0]}$</td><td>$Median_{[1200]}$</td><td>$Avg(Median_{[0]}, Median_{[1200]})$</td><td>[22] to [26]</td></tr>
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Appendix B: Technical Rational by Model

1. Treasury Rates Acceptance Criteria

T1. Prevalence of High Rates, Upper Bound on Treasury Rates

ACLI Proposed Acceptance Criteria:

d) The scenario set should reasonably reflect history, with some allowance for more extreme high and low interest rate environments.

e) Upper Bound:

   i. 1Y rates should not exceed 20.3% .
   ii. 20Y rates should not exceed 17.3%.

f) Frequency of high rates:

   i. The 99th percentile in the steady state[2] is <= 17.0% for 1Y rate.
   ii. The 99th percentile in the steady state is <= 15.8% for 20Y rate.

g) Maximum sojourn length for high interest rates (> 17%) <= 4 years.

Rationale:

While the current criteria set a minimum threshold for extremely low or high rates, they do not control how frequently this could occur. Therefore, we could have a generator that has a high frequency of extreme low rates, extreme high rates, low-for-long rates, or high-for-long rates that could be unduly severe but still pass the criteria. We think it would be reasonable to set targets around the maximum frequency of these tail scenarios, as well as the minimum and maximum scenario rates to put plausible limits on the severity of low and high rates.

A sojourn length is also important to include as a criterion as the generator could easily have excessively low or high rates for extended periods of time, which is incongruent with observed history and monetary policy by the Federal Reserve.

Supporting Data:

T1.a) Guidance Based on relevant US historical rates with allowance for worse than history scenarios.

[2] Steady state as defined by the Academy is months 961 through 1200 (years 80 through 100) of the projected scenarios.

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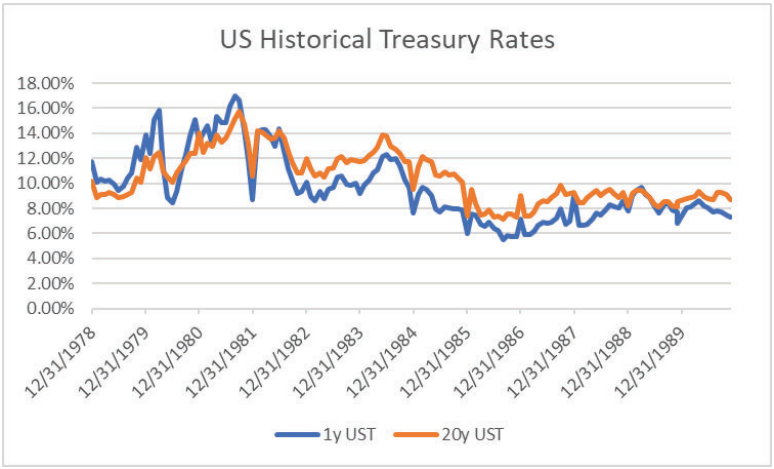
T1.b)



Guidance Based on relevant US Historical Rates plus one standard deviation for volatilities when rates are high (3.35% and 1.56% for the 1Y and 20Y UST, respectively). A specific boundary limits the severity of the deep tail compared to the 99th percentile. The 99th percentile would be unbounded above that level in the exposed criteria and could produce implausibly high rates.

T1.c) Guidance Based on maximum relevant US Historical Rates. This criterion is necessary to limit the frequency of severe rates.

T1.d) Reviewed relevant US and Non-US Historical Events. Based on this analysis, a maximum sojourn length of 8 years was determined. However, based on the assumption that high interest rate persistence could cause the US government to take action and Federal Reserve to adjust rates to alleviate negative economic impacts, a reasonable maximum sojourn length of 4 years was determined. Any longer sojourn length, compounded with a worse-than-history rate level criteria, will most likely lead to undue extreme stress scenarios.

T2. Lower bound on negative interest rates, arbitrage free considerations

ACLI Proposed Acceptance Criteria

Apply the following guidance for negative interest rates:

g) Maturities less than 20 years could experience negative interest rates.

h) Interest rates may remain negative for multi-year time periods.

i) 1Y rates should not be lower than -1.0%.

j) 20Y rates should not be lower than 0.0%.

k) Frequency of low rates:

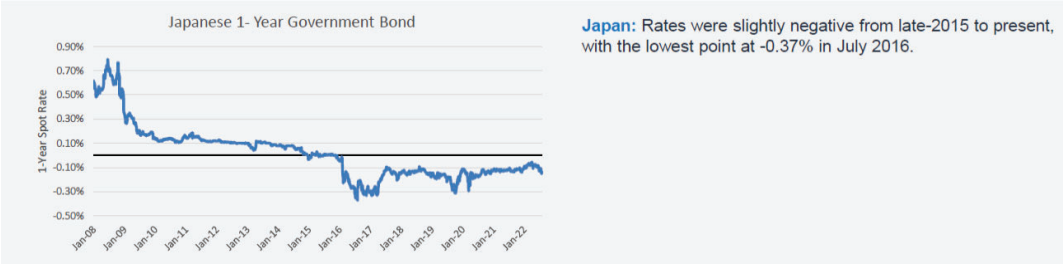
i. The 99th percentile on the steady state is >= 0.0% for 1Y rate.
ii. The 99th percentile in the steady state is >= 1.0% for 20Y rate.

l) Maximum sojourn length for low interest rates (< 0%) <= [4] years.

Rationale:
Same rationale as T1 above.

We think it is critical to set a different minimum for the shorter end and longer end of the yield curve as short rates are more likely to experience negative interest rates. Similar to high rates, it is critical to set a maximum frequency of extreme low rates and low-for-long rates which were not specified in the exposed criteria. Lastly, interest rates remaining negative for multi-year time periods criterion was expanded to have a quantitative measure of the duration for such circumstances under the maximum sojourn length criteria.

Supporting Data:
We considered international experience in our recommendations. Given significant differences in economies, we would caution looking at the world's worst case as being on par with US expectations; rather, it should be used to guide absolute limits for the criteria.



T2.a) Use information on rates from developed economies including Switzerland which has experienced prolonged periods of negative rates.

T2.b) Use information on rates from developed economies including Switzerland which has experienced prolonged periods of negative rates.

T2.c): Use information on rates from developed economies including Switzerland which has experienced prolonged periods of negative rates.

T2.d): Same as T2.c) above. Historical minimum differences between 1Y and 20Y rates are approximately 1.0%, so propose setting 20Y minimum 1.0% higher than the 1Y minimum.

T2.e): Use information on rates from developed economies including Switzerland which has experienced prolonged periods of negative rates.

T2.f): Reviewed relevant US and Non-US Historical Events. Based on this analysis, a maximum sojourn length of 8 years was determined. However, based on the

assumption that low interest rate persistence could cause the US government to take action and Federal Reserve to adjust rates to alleviate negative economic impacts, a reasonable maximum sojourn length of 4 years was determined. Any longer sojourn length, compounded with a worse-than-history rate level criteria, will most likely lead to undue extreme stress scenarios.

T3. Initial Yield Curve Fit, Yield Curve Shapes in Projection, and Steady State Yield Curve Shape

ACLI Proposed Acceptance Criteria:

a) Frequency of inversions overall years between 3.6% and 7.6%.

b) Max inversion sojourn length <= 24 months.

c) Retain maximum of yield curve inversion criteria from Academy proposal:

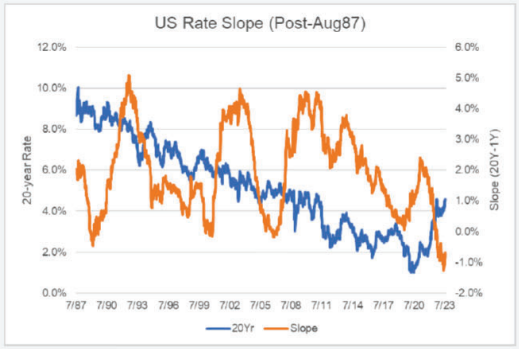
Max Inversion -0.5%/-2.0%/-4.0% where 20Y Rate <=3%/3-8%/>8%.

Rationale:
We believe the criteria exposed should include quantitative measures such as those suggested above.

Supporting Data:
T3.a) Guidance based on relevant US historical rates.

T3.b) Guidance based on relevant US historical rates.

T3.c) Guidance based on relevant US historical rates.



Frequency of Inversion	5.6%
Maximum Length of Inversion	56 weeks*
Average Length of Inversion	7.4 weeks
Average Slope when Inverted	-0.44%
Max Inverted Slope	-1.25%

Based on post-August 1987 data
*As of Nov 3, 2023

1. Standard deviation of frequency of inversion based on rolling 10-year periods is around 2%, supporting a range of 3.6-7.6% for frequency of inverted yield curves.
2. We are currently in the longest period of inverted yield curve (56 weeks as of 2023/11/3). As an element of conservatism, we propose a 2-year maximum Sojourn length for inverted yield curves.
3. To define worse-than-history slope inversion, we included data pre-1987 consistent with the Academy proposal, and added a -0.5% buffer to the historical max as the lower bound for rate slope.

T4. Low For Long: 12/31/20 Starting Conditions

ACLI Proposed Acceptance Criteria:

a) ACLI Recommendation: Remove criteria

Rationale:

T4.a) This Criterion is covered under T5 which is more comprehensive guidance based a review of criteria T4 and T5. Additionally, the T4 criterion is not defined for other starting conditions.

T5. Low- and High-For-Long at Varying Starting Conditions

ACLI Proposed Acceptance Criteria (a through c same as NAIC):

a) For each scenario, calculate the geometric average of the [20-year] UST yield over the first [10] and [30] years of the projection.
b) Calculate the [1st] and [99th] percentiles of the distribution of geometric average rates (for both the 10 and 30-year horizons).
c) Look up criteria based on the starting level of the 20-year UST yield (interpolate if necessary).
d) Use the Academy approach to determine parameters for 15th and 85th percentiles.

Rationale:

T5.a-c) Support NAIC and Academy justification for inclusion.

T5.d) Same approach should be used to evaluate additional percentiles that allows for Incorporation of Criteria on Boundary Conditions on Moderate Scenarios.

The 99th and 1st percentile criteria well define minimum and maximum thresholds for high-rate scenarios (i.e., extreme high or high-for-long) and low-rate scenarios (I.e., extreme low or low-for-long), respectively. The criteria do not constrain how much such tail scenarios can be included (i.e., criteria uses less than threshold for low rates and greater than for high rates).). To avoid excessive amounts of high or low-rate scenarios (at the cost of inadequate number of moderate scenarios), it is critical and necessary to include 15th and 85th percentiles to ensure an appropriate level of moderate scenarios to enable adequate reserve calculations (with proper mid-range rate scenarios) and capital valuations (without excessive tail scenarios).

T6. Rate Mean Reversion (additional criteria)

ACLI Proposed Acceptance Criteria

a) Mean reversion target:
   i. 50th percentile 2.0% < 1Y rate < 3.5%.
   ii. 50th percentile 4.0% < 20Y rate < 5.5%.

b) Retain Academy Rate median reversion criteria with half-life of 10-20 years.

Rationale:

Acceptance criteria which serve to evaluate mean reversion are necessary to define and support realistic interest rates.

Supporting Data:

T6.a) Specific acceptance criteria around rate mean reversion rate and speed are critical for appropriate behaviors of the interest rate generator. Recommendation is based on:

- Range of 50th percentile 2.0% < 1Y rate < 3.5% is based on inflation target of 2%, plus real interest rates between 0% and 1.5%;
- Range of 50th percentile 4.0% < 20Y rate < 5.5% is based on 1Y range above, adjusted for relevant historical average rate slope of 2%.

T6.b) Retain Academy criteria for reversion speed, i.e., a half-life of 10-20 years, which is within the range of mean reversion speeds implied in pricing of market swaptions. Market swaptions are generally priced with a mean reversion speed of approximately 5% (i.e., half-life of 13-14 years), largely consistent with the Academy proposal. As such, the Academy proposal seems reasonable and should be retained.

T7. Rate Volatility (additional criteria)

ACLI Proposed Acceptance Criteria

a) Retain Academy criteria (various by rate level):

Rate	Bucket (BOM)	Historical Stat	Desired Range
[Chg1Y]	<= [3%]	0.59%	0.30% to 0.89%
	> [3%] to <= [8%]	1.16%	0.58% to 1.73%
	> [8%]	3.35%	1.67% to 5.02%
[Chg20Y]	<= [3%]	0.61%	0.31% to 0.92%
	> [3%] to <= [8%]	0.75%	0.37% to 1.12%
	> [8%]	1.56%	0.78% to 2.33%

Rationale:

T7.a) ACLI supports retaining the Academy rate volatility criteria. Specific targets are important beyond the underlying stylized facts. Lack of specific volatility targets could lead to excess volatility in scenarios; insufficient volatility is unlikely given the other acceptance criteria. Excess volatility could create disconnects from typical and expected real-world economic behavior and can impact performance of hedges and sound risk management practices in the reserve and capital projections.

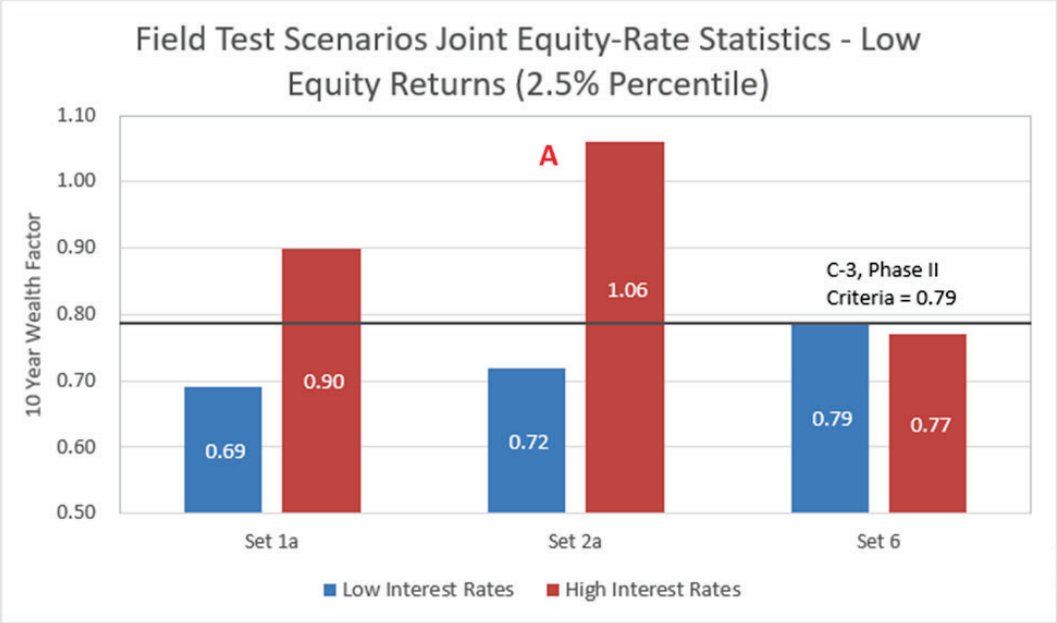
Supporting Data: Academy Proposal.

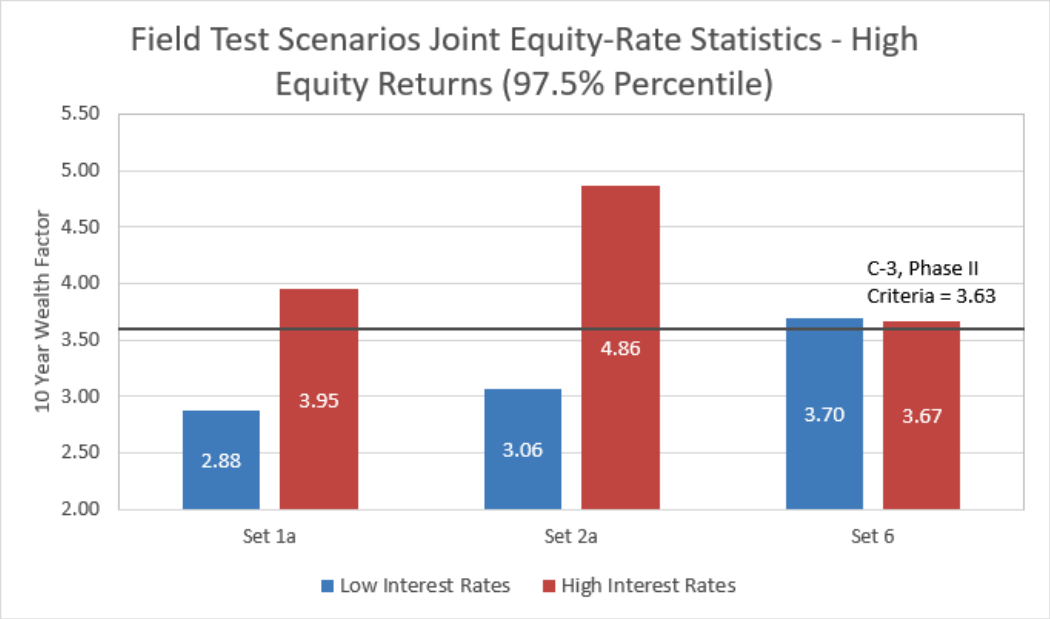
2. Equity Model Acceptance Criteria

General. The interest-equity linkage assumption should be set to zero

Rationale:

See charts below for comparisons of scenario sets 1A, 2A, and 6 from the Field Test. Sets 1A and 2A feature a linkage between equity returns and interest rates where the long term expected mean return varies as interest rates change (lower when rates are lower and vice versa as interest rates increase). Set 6 models equity and interest rates movements as independent and uncorrelated processes consistent with the historical approach used in the prescribed generator for US Statutory reserves and capital where relevant. Low/high interest rate scenarios referenced below were defined by dividing the scenario sets into quartiles based on the geometric average of the 20Y rate in the first 10 years (Low = 1st quartile and High = 4th quartile). Cumulative equity returns (wealth factors) were calculated over the same time horizon.



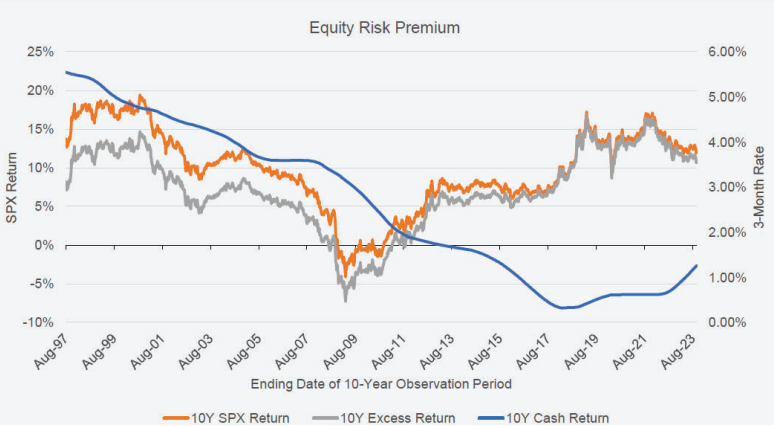


As long as a scenario set meets the wealth factor (WF) criteria in the low and high interest rate scenarios (e.g., the lowest and highest quartiles), we would view the set as having sufficient joint equity-rate severe scenarios. Looking at low equity returns (2.5th percentile), Scenario Set 6 (no equity-rate linkage) basically meets the C3P2 Equity WF criteria for all quartiles including those not shown in graph above, while sets 1a and 2a fail to meet the criteria in the highest quartiles and have returns notably below the criteria in lowest quartiles, e.g., there is an approximately 10 percentage point difference compared to the C3P2 criteria in the lowest quartile for scenario set 1a. This exhibit illustrates that the presence of an equity-rate linkage may 1) produce significantly lower equity scenarios relative to the WF criteria, particularly in low-rate scenarios, to compensate for the higher average equity returns in high interest rate scenarios, and 2) fail to generate sufficiently severe equity scenarios in a high interest rate environment. For example, in Set 2a, which was based on 12/31/2021 +200bps initial market conditions, the 2.5th percentile equity returns in the highest quartile reflect a 27% difference between the C3P2 criteria over the first 10 years (6% gain versus a 21% loss, respectively; shown as "A" in the 2.5th chart above).

When looking at high equity returns (97.5th percentile), most scenario sets with an equity-rate linkage in the Field Test struggled to meet the WF criteria. Set 2a is able to meet the C3P2 criteria on an aggregate basis at year 10 but does not meet them for specific quartiles due to the higher starting interest rates coupled with the equity-rate linkage. Set 6 has the least variation in WF across the quartiles and the returns align closely with the C3P2 WF criteria, while the other sets exhibit notable differences between the returns in the 1st and 4th quartiles.

In summary, sufficiently robust amounts low rate/low equity, or high rate/low equity scenarios can be achieved without modeling an equity/rate linkage. Modeling equity

and interest rate movements as independent and uncorrelated processes enables a more uniform level of prudence across interest rate levels, allows greater certainty of scenario sets satisfying the WF criteria over time and reduces implementation complexity (less risk of recalibration to meet criteria as market conditions change).). Furthermore, historical results indicate that an equity-rate linkage does not provide a statistically significant increase in the realism of the capital markets model (would see notably lower standard deviation in excess return vs. S&P 500 (SPX) return if equity-rate linkage did significantly increase realism of the model (see table below; difference between 5.1% vs 5.2%). Finally, the significant volatility resulting from introducing an equity-rate linkage makes it much more difficult for companies to appropriately manage future capital planning, hedging, and new business pricing.



Metric	Cash Return	SPX Return	Excess Return (above 3m rate)
Average Return	2.6%	9.8%	7.2%
Standard Deviation	1.7%	5.2%	5.1%

- Returns are measured based on rolling 10-year periods.
- Standard deviation is comparable between equity return and excess return (above 3-month rate), suggesting **the equity-rate linkage does not provide a significant increase in explanatory value.**

E1. Low and High Accumulated Equity Returns

ACLI Proposed Acceptance Criteria:

a) Use the former C3 Phase II equity model Calibration Criteria as a rough placeholder when evaluating equity scenarios (and updating when additional data is available).

Large Cap (S&P 500) Gross Wealth Factors

Percentile	1 year	5 years	10 years	20 years
2.5%	0.78	0.72	0.79	
5.0%	0.84	0.81	0.94	1.51
10.0%	0.9	0.94	1.16	2.1
90.0%	1.28	2.17	3.63	9.02
95.0%	1.35	2.45	4.36	11.7
97.5%	1.42	2.72	5.12	

b) Add criteria for 0.5th percentile > [0.54/0.58/0.62] for 1/5/10-year WF.

The relationship between the 0.5th (no less than) and 2.5th (no greater than) percentile criteria needs to be rational. (Need to be revisited with the updated Academy proposal that is being developed).

Rationale:

E1.a) It is appropriate to have a specific quantitative criterion for all components of the model, which includes equity returns. It would be beneficial to update the prior C3 Phase II equity model Calibration Criteria when additional information is available.

E1.b) Given the importance of tail behavior for the determination of capital, it would be appropriate to include criteria for the 0.5th percentile to control the frequency and severity of the tail. It is important that once such criteria are developed, the relationships in the tails should make sense; the relationship of the 0.5th percentile to the 2.5th percentile should be logical (there is not any severe or unexplainable jumps between these percentiles).

While criteria could also be developed for the 99.5th percentile, such scenarios would likely not be included in either the reserve or capital calculations (e.g., scenarios expected to sit outside of CTE (70)).

Supporting Data:

The following table is based on S&P 500 and Dow Jones Industrial Total Return (1950-2023). As a placeholder, we would propose developing criteria for the minimum values in years 1, 5, and 10 based on the historical minimums for years 1 and 10 and average of those years for year 5 for a smoother distribution (resulting in wealth factors of 0.54/0.58/0.62 for years 1/5/10). These targets would allow for a reasonable frequency and severity of "worse than history" scenarios in the extreme tail (aligns with stylized fact E.7). In the absence of such criteria, it can allow the scenario sets to have much lower returns than would be appropriate.

	Historical Equity Wealth Factors															
	S&P 500				Dow Jones				AIRG US Index				C3P2 Requirement			
Percentile	1-Year	5-Year	10-Year	20-Year	1-Year	5-Year	10-Year	20-Year	1-Year	5-Year	10-Year	20-Year	1-Year	5-Year	10-Year	20-Year
Min	0.54	0.67	0.62	2.51	0.57	0.73	0.83	2.20	0.40	0.37	0.36	0.40				
0.50%	0.64	0.83	0.79	2.98	0.66	0.90	0.97	2.46	0.67	0.56	0.58	0.75	>0.54	>0.67	>0.62	
1.00%	0.68	0.86	0.86	3.10	0.72	0.93	1.04	2.53	0.72	0.61	0.66	0.89				
2.50%	0.78	0.89	0.95	3.29	0.82	0.99	1.17	2.64	0.78	0.71	0.79	1.12	0.78	0.72	0.79	
5.00%	0.84	0.95	1.29	3.57	0.86	1.04	1.31	2.81	0.83	0.80	0.92	1.41	0.84	0.81	0.94	1.51
10.00%	0.91	1.04	1.46	3.93	0.92	1.12	1.46	3.16	0.88	0.93	1.12	1.80	0.90	0.94	1.16	2.10
25.00%	1.03	1.35	2.01	4.54	1.01	1.28	1.83	4.19	0.98	1.16	1.51	2.77				
50.00%	1.13	1.74	2.81	6.37	1.11	1.61	2.43	6.07	1.08	1.45	2.11	4.37				
75.00%	1.23	2.08	3.96	9.71	1.21	1.99	3.77	10.26	1.19	1.81	2.87	6.82				
90.00%	1.33	2.51	4.79	16.13	1.32	2.38	4.78	17.35	1.30	2.19	3.82	10.30	1.28	2.17	3.63	9.02
95.00%	1.39	2.84	5.17	21.85	1.38	2.71	5.30	22.86	1.36	2.48	4.48	12.99	1.35	2.45	4.36	11.70
97.50%	1.43	3.08	5.45	24.53	1.43	2.96	5.61	24.66	1.42	2.74	5.21	16.03	1.42	2.72	5.12	
99.00%	1.48	3.27	5.66	25.83	1.49	3.32	5.90	27.05	1.52	3.06	6.25	20.16				
99.50%	1.53	3.42	5.78	26.58	1.52	3.55	6.08	27.52	1.57	3.32	6.90	23.33				
Max	1.73	3.83	6.04	29.57	1.74	4.10	6.49	29.74	1.85	5.28	12.24	40.39				

We note that the 5Y in the table above would be inconsistent with the 10Y, so we suggest smoothing the value to be the average of the 1Y and 10Y (so 0.58).

3. Corporate Model Acceptance Criteria

C1. Target Steady State Excess Returns and Average Annualized Excess Returns in Years 20-30

NAIC Exposed Criteria (no proposed changes):

a) Set steady state excess return targets for each bond fund according to the criteria below.

Criteria

Steady state targets *(bps)*	IG 1-5	IG 5-10	IG Long	HY
Target OAS *(avg. VM-20 ult. spread at [12/31/21])*	107	141	163	448
Target Excess Return *(Target OAS * Excess Return % of OAS)*	80	79	66	240
Criteria for avg. annualized Excess Return in years [20-30]	80 -[10]	79 -[10]	66 -[10]	240 -[20]

b) Average annualized excess returns for each bond fund in years 20 through 30 of the projection should be no greater than the steady state excess returns, but no less than the steady state excess returns minus a buffer

Rationale: Criteria is sufficiently robust to capture excess returns associated with the corporate model.

C2. Low and High Accumulated Equity Returns (additional criteria)

ACLI Proposed Acceptance Criteria:

a) Retain Academy criteria (half-life of 22-26 months)

Bond Fund	Median			Midpoint month Desired Range
	Month [0]	Month [1200]	Midpoint	
IG 1-5	$Median_{[0]}$	$Median_{[1200]}$	$Avg(Median_{[0]}, Median_{[1200]})$	[22] to [26]
IG 5-10	$Median_{[0]}$	$Median_{[1200]}$	$Avg(Median_{[0]}, Median_{[1200]})$	[22] to [26]
IG Long	$Median_{[0]}$	$Median_{[1200]}$	$Avg(Median_{[0]}, Median_{[1200]})$	[22] to [26]
HY	$Median_{[0]}$	$Median_{[1200]}$	$Avg(Median_{[0]}, Median_{[1200]})$	[22] to [26]

Rationale:

C2.a) Consistent with VM-20: VM-20 prescribes a 4-year grading period for general account fixed income spreads. A midpoint around 24 months is reasonable. The Academy suggested a range of 22 to 26 months, which we think is a reasonable band around the midpoint.

Supporting Data:

Academy proposal

Historical events may suggest slightly faster mean reversion but decoupling the impact of volatility and mean reversion involves judgement.

November 10, 2023

Rachel Hemphill, PhD, FSA, FCAS, MAAA
Chair, NAIC Life Actuarial Task Force

Re: GOES Stylized Facts and Acceptance Criteria Comment Letter

Dear Rachel:

Nationwide appreciates the opportunity to comment on GOES Stylized Facts and Acceptance Criteria. We are in favor of the approach of defining Stylized Facts and Acceptance Criteria followed by robust testing in both model office and industry models. While a robust set of acceptance criteria are a vital ingredient in choosing candidate models, a model that meets all acceptance criteria may not be fit for use for all applications. Similarly, a model that does not meet all acceptance criteria is not necessarily unfit for use (though it does suggest potential limitations for awareness).

We offer the following specific comments on the exposure:

Stylized Facts: The stylized facts are well defined in establishing the qualitative behaviors that should be captured in the generator, and we applaud the NAIC and Academy in establishing these definitions. Expert judgment will be necessary in determining if a given model satisfies these stylized facts.

Lower Bound on Negative Interest Rates: *Rates should generally be above -1.5%*
While this is a reasonable criterion, if this is accomplished via a flooring mechanism rather than more complete calibration of the model it may introduce unrealistic behavior. For instance, an outsized portion of the distribution may be concentrated near the floor level where it is more realistic for there to be very little weight around this lower bound.

Low For Long Criteria (12/31/20 initial conditions):
a) At least 10% of scenarios need a 10-year geometric average of the 20-year UST below 1.45%
b) At least 5% of scenarios need a 30-year geometric average of the 20-year UST below 1.95%

Both the criteria for the 10-year and 30-year geometric averages are more extreme than any path observed in history, where the lowest are 2.00% and 2.68% respectively[1]. While it is desirable to include paths more extreme than history, it is too restrictive to target (at least) 10% of scenarios to be materially more extreme than history. While we recognize the modification to this criteria proposed by LATF, we believe that this criteria is still too restrictive. Additionally, we feel that this will result in the same issues uncovered in the first field test relating to interest rates being implausibly low in many scenarios.

Equity Criteria
We would like to reiterate that no material deficiencies have been identified with the current Academy equity model. As such, maintaining consistency with the current equity model would be beneficial in

[1] Based on historical long interest rates (10-year treasury as proxy) 1871-Present:
Shiller, R., U.S.Stock Price Data, Annual, with consumption,
both short and long rates, and present value calculations.
An Update of Data shown in Chapter 26 of Market Volatility,
R. Shiller, MIT Press, 1989, and Irrational Exuberance, Princeton 2015.
http://www.econ.yale.edu/~shiller/data.htm

understanding impacts to reserve and capital and avoiding unjustified movements. We are in favor of more complete equity acceptance criteria being defined with consistency to the current equity model along with satisfying the stylized facts defined.

We appreciate your consideration of our comments.

Sincerely,

Alex Hookway, FSA, MAAA
Sr. AVP, NF Quantitative Risk Management
Nationwide Financial

Philip Wunderlich, FSA, MAAA
Associate Vice President, Appointed Actuary
Nationwide Financial

cc Scott O'Neal, NAIC
Pete Weber, Ohio Department of Insurance

Mathematical Finance Company
QTSM CIR Green's Function Multifactor CIR and Affine Options SIRP ESG RS-ESG DMRP RS-DMRP

Nov 9, 2023

Honorable Rachel Hemphill
Chair, Life Actuarial (A) Task Force (LATF)
Re: Generator of Economic Scenarios (GOES) Acceptance Criteria

Dear Ms. Rachel Hemphill,

Please accept this comment on the Generator of Economic Scenarios (GOES) Acceptance Criteria. Insurance regulators have made a major step forward in management of interest rate and equity risk with this generator. The inclusion of negative interest rates is a particularly valuable step for American financial risk regulation. Many groups and individuals have contributed a great deal over the years to get to this point.

Sincerely yours,

Mark S. Tenney

618 Trailhead Road, Monument, CO 80132
(703) 474 0551 • marktenneymfc@gmail.com • mfcesg.com

1 Treasury Acceptance

1.1 Proposed T6 Arbitrage

Arbitrage among treasury bonds should not exist. If it is permitted in the model, then riskless arbitrage should be eliminated by introducing sufficient transaction costs in the portfolio system. The model must still be examined for allowing excessive return on risk. If that is still the case, then some sort of charge should be added to limit this. This can become quite complicated, but is important to the entire behavior of the system. This will have consequences for other parts of the system, equities and corporate spreads or returns.

The Generalized Fractional Floor is already a violation of arbitrage. But it also means a break in return on risk. The implications for corporate bonds and possibly equities need to be investigated and appropriate modifications or charges made in expected returns and returns on risk.

2 Equity Acceptance

2.1 Proposed E2 Correlation of equity classes

For equity classes with positive correlation, the requirement is as follows.

If the model allows for a changing correlation, then during a crisis, the correlation should be higher.

If there is a single fixed correlation between two assets that is normally positive, then it shall be at least its historical value, but it could be between its typical value and its value during a crisis.

3 Corporate Model Acceptance

3.1 Proposed C2

The same correlation criteria shall apply within corporate model bond classes and between them and equity asset classes.

4 Underlying economics

4.1 Inflation

Inflation is not explicitly taken into account. The Federal Reserve has a target inflation of 2 percent. This is a typical number for advanced countries. Are statistics from higher inflation eras in the past being used? Will that throw off the statistics if the 2 percent inflation target is kept? Or will statistics based on the 2 percent inflation era be off if inflation is higher in the future?

How strong is the commitment to the two percent target? Could the inflation target vary in the future leading to shifts in quantitative stylized facts or quantitative acceptance criteria? Or to quantitative calibration criteria?

Greg Mankiw thinks inflation may be closer to 3 percent for a while. Olivier Blanchard talked about the possible desirability of a higher inflation target at Brookings this year. However, he indicated that around 4 percent inflation instability sets in which makes a target that high undesirable.

4.2 Total Factor Productivity Growth

The total factor productivity growth rate is a key risk variable for the economy. This was 2 percent or higher before 1973. Since then it might be one percent. It is somewhat controversial as to what it really is. Greg Mankiw indicated to me earlier in the year that this has a wide margin of uncertainty. This might include a period of negative growth rate.

A shift in total factor productivity might change the growth rate of earnings. It could change the return on investment. That might change equity returns. It could shift the long run short term real interest rate.

4.3 Expected returns or risk premia may be lower

Risk premia may be lower. This could explain higher P/E ratios.

Expected returns could be lower because there are more elderly. They have a higher demand for investing and this results in a lower expected return on investments. This is often referred to as a demographic explanation of higher P/E.

5 Treasury Stylized Facts

5.1 1b Negative Rates

5.1.1 Taylor Rule and its variants

The Taylor Rule and other rules for central banks to set interest rates have been widely taught for many years. They are now taught even in introductory economics courses. They will become part of certification tests in banking, financial planning, to sell securities and possibly to sell insurance. These rules can produce negative interest rates as the desired interest rate.

The Taylor rule can be stated as follows.

https://www.federalreserve.gov/monetarypolicy/policy-rules-and-how-policymakers-use-them.htm

> The short-term rate is set as equal to the sum of a base rate, inflation, half of unwanted inflation plus half of the output gap.

The overall multiplier on inflation is 1.5. The Taylor Principle is the requirement that this multiplier be greater than one. The idea is that if the central bank rate goes up faster than inflation it is stabilizing.

The Fed's balanced rule can be stated as follows.

> The short-term rate is set as equal to the sum of a base rate, inflation, half of unwanted inflation plus the output gap.

A variant of this that is more intuitive to the man in the street is in terms of the unemployment gap.

> The short-term rate is set as equal to the sum of a base rate, inflation, half of unwanted inflation minus unwanted unemployment.

Another variant would be to use a multiplier of 1.5 on unemployment. Perhaps this has a stabilizing rationale on the downside similar to the Taylor Principle.

These rules can easily produce negative rates. For example, if the base rate is 1 percent, inflation is 2 percent, the inflation target is 2 percent, and unwanted unemployment is 5 percent, then unwanted inflation is zero, and the sum of 1, 2, 0, and -5 is -2 percent.

If the base rate is 1 percent, the inflation target is 2, actual inflation is zero, then the inflation gap is -2. Added to the base rate of 1 percent, this gives zero. For one version of the policy rule, unwanted unemployment is passed on one for one to reduce the central bank rate below zero. So unemployment 5 percentage points too high would result in a negative five percent central bank rate.

For 1932, the inflation rate was -10 percent and the unemployment rate 24 percent. Assume the inflation target and base rates were zero to make the math easier. Then the 1.5 multiplier on inflation gives -15 percent. Assuming the unemployment rate target was 4 percent, we then have an additional 20 percent of unemployment for a total of -35 percent as the central bank rate.

If every macroeconomics course teaches the Taylor Rule, and the Taylor Rule teaches negative interest rates, at some point, people will expect negative interest rates in a recession as standard and optimal. The unemployed and businesses will think they have a right to negative rates to get out of the recession. They will think they are cheated not to get them.

At some point, we may need the variables in the Taylor Rule in the economic scenario generator. So the generator may need inflation, output gap, unemployment, and possibly output and potential output. This will make it easier to interface with macroeconomic models and programs such as the Fed's FRBUS model of the US economy. It will also make it easier to talk to federal regulators in a crisis. If insurance companies want to borrow directly from the Fed when interest rates are negative, this might help in the discussions.

There is no viable competing rule to the Taylor Rule and its variants in economics classes. The Taylor Rule has become the orthodoxy that economics classes have been waiting for. It is easy to teach and to grade tests even in intro courses. Other simple rules have dropped by the wayside. A constant monetary growth rate was once bandied about but that did not stand up very well to reality. Real business cycle models don't do very well as practical guides and are seldom referenced for specific values of interest rates even in conservative venues.

There is much opposition to the Taylor Rule and to the New Keynesian Economic models that make explicit use of it. However, there is nothing to take its place for the lowest level of economics instruction. DSGE models sometimes use some variant of it or derive some rule to take its place.

Fed economists often use an inertial version of the policy rule where it takes time for a shift in one of the driver variables to manifest in a change in interest rates. In this case, the target of the policy rule is often the value from the Taylor Rule or the balanced rule or some variant.

The use of some type of Taylor Rule in DSGE models is discussed by Beaudry, Portier and Preston.

https://fportier.files.wordpress.com/2023/03/taylor-rule.v2.3-1.pdf

5.1.2 "structural and market differences"

The following is stated in the proposed stylized facts. It is proposed here that this be dropped. The Taylor Rule and the variants discussed above are used in the U.S., Europe, Asia and elsewhere. There is no structural difference in these rules, although different groups may choose different parameters.

> Negative interest rates are possible (have been observed outside the U.S.) but unlikely due to structural and market differences between the U.S. and other economies.

The same models and methods are used in economics for the U.S. and for Europe or Asia. Meetings of academic or central bank economists do not indicate any such structural or market differences between the U.S. and other developed countries. The IMF has a statistics seminar for national economics statistics agencies. This has not discussed any such structural or market difference at the times I have gone. Nor have meetings of the IMF and World Bank that I have attended or economics meetings.

I have attended or watched many think tank sessions in Washington D.C. Different economists or current or former government officials from different countries have talked there but not indicated a structural or market difference of the type indicated. Many of the leading economists in the US or DC were foreign born, such as Olivier Blanchard, who presents frequently and is a leading economist.

One exception to this is that some economists or government officials from the developing world prefer an inflation target of 5 percent so that there is enough room below the target to avoid negative interest rates. Such a target is not supported in the developed countries.

DSGE model papers also do not make any such structural distinction. The work on DSGE models by the Fed and US economists do not have any such different structural elements between the U.S. and other developed countries as a general rule, although specific papers might discuss such.

5.1.3 Exchange rate between paper money and bank accounts

In order to prevent arbitrage, the central bank can impose an exchange rate between paper money and bank accounts. This rate varies so that the return on paper money and bank accounts stops the arbitrage from working. An ideal version is that paper money and bank electronic reserves at the central bank earn the same rate.

Some version of the above could be added as a stylized fact.

> Arbitrage between paper money and bank accounts during periods of negative interest rates can be prevented by the central bank. This can be done by imposing a varying exchange rate between paper money and bank accounts so that the arbitrage is eliminated. In the ideal case, the rate earned on paper money and electronic reserves at the central bank are equal.

5.1.4 A global recession can lead to a migration crisis

If there is a global recession, the less developed countries may respond by sending people instead of goods. The IMF and World Bank might try to coordinate deep negative interest rates in the developed countries to head this off or stop it after it starts. The goal being that negative rates in developed countries would stimulate the developed economies and thus they would buy more goods from developing countries. This could lead to extended periods of deep negative rates such as -5 percent.

The World Bank and IMF were set up in 1944 during the Bretton Woods Conference. This was because it was believed that if the economic mistakes between World War One and World War 2 had been avoided, it would have avoided World War 2. This includes the hyper-inflations of the 1920s and the Great Depression. The Taylor Rule would have prevented both episodes.

Avoiding a deep depression and a resulting migration crisis would be of substantial magnitude and importance. That might be the 21st century equivalent of the Great Depression and World War 2. In this case, the Taylor rule and its variants would indicate the use of deep negative rates for several years in some scenarios.

6 Equity Stylized Facts

6.1 9. Correlation

> Returns between different equity indices are generally positively correlated over long time horizons. This correlation may increase sharply in bear markets, but it tends to revert to normative levels in a short period of time.

This correlation stylized fact is very important to a risk management system. This is particularly important for liquidity risk, i.e. withdrawals by customers during a crisis.

The 3 factor Cox, Ingersoll, and Ross model has 3 factors that are not correlated with each other because they follow a square root process that makes it difficult to manage correlation. Moreover, if correlation is added between these factors in some manner, then the closed form solutions for zero coupon yields and bond prices are lost. It would be possible to adjust for this as well as for the generalized fractional floor also causing the closed form solutions to no longer apply.

The documentation of the system needs to be sufficient to evaluate the correlation stylized facts as well as all the others. This is particularly true for the joint analysis of correlation, expected returns, risk premia, any stochastic volatility in the system, and any spikes or sustained increases in spreads or default rates. This applies to the joint analysis of bond and stock returns.

6.2 High P/E Controversy

The recent era of high price earnings ratios has created a debate on what it implies. One explanation of high P/E is that future returns will be lower. In one version of this, the equity risk premium is considered to be lower. If this is correct, then a regulator's generator of economic scenarios (GOES) should use lower equity risk premia and thus lower total returns.

The research of Campbell and Shiller on price earnings ratio is embodied to some extent in the CAPE or cyclically adjusted price to earnings ratio. Some observers think this is an indicator of over-valued markets. Over valued markets and future lower expected return are to some extent related.

6.2.1 High P/E High Return Paradox

P/E has been high for a number of years. But stock returns have also been high during this era. If high P/E and thus low E/P indicates lower future returns, then this should have started already. But stock market returns don't seem to have become lower. This might be considered a paradox.

Paradoxes are not good for ordinary investors or regulators. Although they may be an opportunity for speculative investors and finance professors.

6.2.2 Lower expected returns, more negative returns

If the high values of P/E indicate lower expected returns in the future, then we would likely get more negative returns in the future. We would also get longer subperiods of zero or negative growth. This can be critical for many products. It can also trigger higher lapses for some products. Correlation with bond returns and default rates also may need to be coordinated with this in the system.

DATE: November 10, 2023

FROM: Aaron Sarfatti, Chief Risk and Strategy Officer
Steve Tizzoni, Head of Actuarial Regulatory Affairs

SUBJECT: Generator of Economic Scenarios (GOES) Exposure

Executive Summary
Equitable appreciates the opportunity to comment on the GOES acceptance criteria and offers the following initial observations. More detail on each is below.

1. Treasury Model: Lower calibration percentiles in low starting interest rate conditions: A key tenet of an appropriately calibrated treasury model is its ability to produce a wide range of plausible interest rates. To that end, we suggest modifications to the criteria to achieve an appropriate distribution of low and high interest rate scenarios, but particularly to maintain the potential for sustained low interest rates when starting interest rates are low.
2. Equity Model: Introduce the equity and interest rate linkage: The robustness of current criteria is limited by the lack of a linkage between equity returns and interest rates, which is a critical property of an economic scenario generator in its promotion of hedging and sound risk management in all interest rate environments, and to align with historical data.
3. CTE Standard for Capital: Shift C3 Phase 2 capital to CTE 95 from CTE98: Equitable suggests CTE95 as the measure to set C3 Phase 2 capital requirement instead of CTE98, as GOES reform (including the elements outlined above) introduces the more robust set of scenario outcomes necessary to assure regulators to adopt the original Oliver Wyman suggestion of CTE 95.

Treasury Model: A key tenet of the economic scenario generator is its ability to produce a wide variety of plausible interest rates. To achieve this goal, Equitable suggests the following acceptance criteria modifications:

- *Modify Low-and High-for-Long Criteria (T.5):* Equitable supports the intent of the chart in criteria T.5 but believes the values should be calibrated to reflect more low-for-long scenarios. The criteria set the 1st and 99th percentiles of the 10-year and 30-year geometric average of the 20-year UST. While basing criteria on an initial treasury rate and geometric average, rather than a point in time, is appropriate, we believe the distribution is not varied enough, especially at the low end.

  It is crucial that the generator consider the possibility that interest rates remain low (such as in a Japan scenario), as that is currently lacking in the Academy Interest Rate

Generator ("AIRG"). This appears somewhat lost in the T.5 requirements, as the chart assumes that when rates are at 1%, the first percentile of the 10-year average is less than .94% and the 30-year average is less than 1.5%. Equitable believes these values should be lower to account for situations where interest rates are below the starting point on average over time.

- *Removal of Criteria as of 12/31/20 (T.4)*: Equitable believes that having separate acceptance criteria for 12/31/20 starting conditions is redundant and confusing. For example, it is unclear if these criteria will be developed for starting conditions other than 12/31/20 and what the relationship is (if any) between these criteria and the criteria in T.5. Additionally, if criteria T.5 is appropriately calibrated as noted above, separate criteria for 12/31/20 starting conditions should not be required.

Equity Model:

- *Equity / interest rate linkage*: Equitable supports a structural linkage between interest rates and equity returns via an equity risk premium.

  Conceptually, the constant equity risk premium (ERP) approach, as utilized in the GEMS model, reflects the fact that a rational investor would demand expected equity returns in excess of those offered by risk-free assets to compensate for bearing such risk. A phenomenon where variations in risk free interest rates create highly varied, and at times even negative, equity risk premia. This result is a "real world" model that inarguably fails "real world" common-sense investor principles.

  Historically, we analyzed the relationship between interest rate and equity returns based on the 20-year UST rate and the S&P 500 index return, and the analysis indicated a positive relationship between the two. Exhibit A below shows the historical 20-year US treasury rates and the annualized 20-year return of the S&P index *in the following 20-year period*. We note that, in performing analysis regarding the relationship of interest rates and equities, it is important to look at the relationship between interest rates and *future* equity returns, not short-term relationships, as the valuation of insurance liabilities requires long-term projections. The data clearly evidences a high correlation between current interest rates and future equity returns. This is strongly supportive of a positive relationship between interest rates and equities as in the proposed Conning scenarios, as evidenced in Exhibit B, which shows a positive correlation between the average UST 20-year rates and 20-year projected cumulative Large Cap returns based on field test Scenario 1A (orange line). This is not existent under current AIRG model (black line).

Exhibit A: Correlation between historical Treasury Rates and Future Equity Returns (20yr UST 20 rates unavailable for '87-'89)

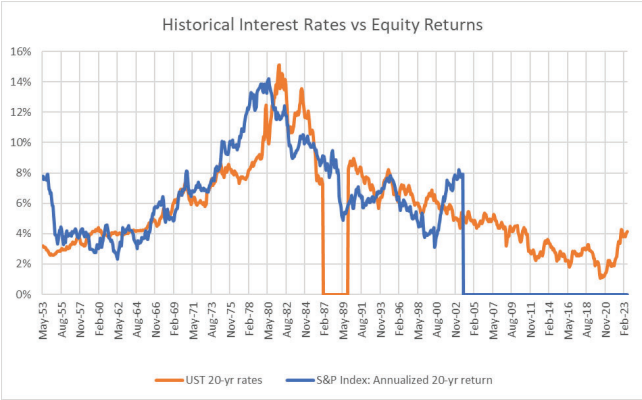
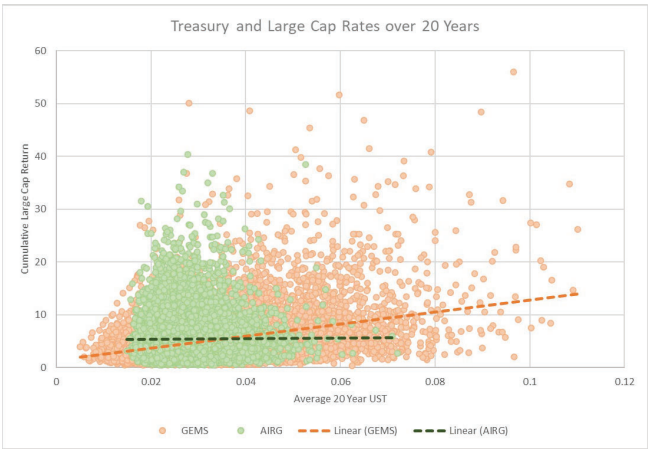


Exhibit B: GEMS vs current AIRG



Further, the rise in interest rates over the past several months has also demonstrated a clear effect of interest rates on equity valuations. The rise in interest rates depressed the value of many equity market sectors, as higher interest rates increased investor return requirements and expected future returns to justify investment in risky investments.

Lastly, and critically, a positive equity and interest rate linkage provides appropriate incentives for risk management. This linkage is consistent with industry fair value principles and promotes hedging by aligning the valuation of liabilities with that of instruments used to hedge liabilities.

- ***Additional Gross Wealth Factors (GWF):*** Equitable believes appropriately calibrated equity returns are critical to the generator. While we appreciate having GWF for the S&P 500, there was a lack of GWF for other indices, so Equitable would recommend acceptance criteria for other key equity indices, such as Russell 2000 (small cap), EAFE (international) and NASDAQ.

Corporate Bond Model: While Equitable did not perform a detailed review of the GEMS Corporate Bond Model, we believe the outcomes should be rendered consistent with General Account returns elsewhere in the Valuation Manual. The long-run high yield excess returns seemed beyond a rate we would consider prudent and may incentivize companies to increase separate account allocations to these risky sectors.

CTE 95 vs. CTE 98 for setting Risk Based Capital for Variable Annuities: Equitable proposes to shift to a CTE 95 measure for setting C3 Phase 2 capital for variable annuities instead of the CTE 98 together with the new GOES reform. During the development of the VM-21 framework, Oliver Wyman's original recommendation was to use CTE 95, the average of the worst 50 out of 1,000 scenarios. This recommendation was further noted that, to maintain sufficient prudence, the scenario generator must be enhanced to produce a broader range of financial outcomes.

This is addressed in the GOES reform as all scenario sets in the field test produced a much broader range of interest rates with equity scenarios being at least as prudent as AIRG. To illustrate that, we calculated the CTE 95 and CTE 98 for (1) the average 20-year UST rates over 20 years, (2) equity gross wealth factors over 20 years and (3) the value of a 20-year equity futures contract. Please see Exhibit C below for more details.

- *Interest rates*: the CTE 95 for the two primary scenario sets field tested (1a and 1b) are significantly lower than the CTE 98 from the AIRG, demonstrating the additional prudence in the GOES generator.
- *Equity Gross Wealth Factors*: the CTE 95 of the equity GWF under scenario sets 1a and 1b is lower than the CTE 95 of the AIRG GWF distribution, as expected, but remains higher than the CTE 98 under the AIRG.
- *Value of a 20-year Futures Contract:* Equitable calculated the CTE 95 and 98 of the value of a $1 at-the-money 20-year equity futures contract under both generators. As expected, given the more robust interest rate distribution and interest rate / equity linkage, the PV of the futures contract payoff is lower in the new GOES scenarios which reflects a higher cost of writing a long-term equity future contract or guarantee.

While the gross equity returns in the tested scenarios 1a and 1b *alone* are not significantly strengthened from the AIRG, given the much broader set of interest rate scenarios combined with the interest rate and equity linkage that ensures low-for-long rate scenarios are tested in tandem with poor equity returns, we believe that the CTE 95 of the GOES Scenarios would be more indicative of fair value and sufficiently prudent to serve as the C3 Phase 2 capital requirement as originally proposed by Oliver Wyman in lieu of the current CTE 98.

Exhibit C: CTE 98 vs. CTE 95 for tested scenarios

Avg. 20yr UST rate	GOES Scenario 1a	GOES Scenario 1b	AIRG
CTE 95	1.1%	1.2%	1.7%
CTE 98	0.9%	1.0%	1.6%

Equity GWF	GOES Scenario 1a	GOES Scenario 1b	AIRG
CTE 95	1.02	1.02	1.09
CTE 98	0.79	0.80	0.85

PV of Equity Futures Contract	GOES Scenario 1a	GOES Scenario 1b	AIRG
CTE 95	0.01	0.01	0.06
CTE 98	(0.18)	(0.18)	(0.11)

In addition, as Oliver Wyman noted and to which we agree, CTE 98 is challenged in that it is comprised of only 20 scenarios of the 1,000 scenarios typically analyzed. This small sample size makes it a less reliable measure of tail capital requirements and significantly more volatile compared to CTE 95. Equitable believes that, together with the new GOES, a CTE 95 measure for C3 Phase 2 capital requirements would result in a prudent framework that is meaningfully improved relative to the current standard.

* * * * * * * * *

Equitable appreciates the opportunity to comment on this exposed proposal, and we look forward to testing scenarios in a second field test. We are available to discuss our comments further as desired.

Sincerely,

Aaron Sarfatti

Aaron Sarfatti, ASA

Chief Risk Officer & Strategy Officer, Equitable

Stephen M. Tizzoni, FSA, MAAA

Head of Actuarial Methodology and Regulatory Affairs, Equitable

November 8, 2023

Ms. Rachel Hemphill, Chair, Life Actuarial (A) Task Force (LATF)
Mr. Philip Barlow, Chair, Life Risk-Based Capital (E) Working Group (Life RBC)
Mr. Mike Yanacheak, Chair, Generator of Economic Scenarios (E/A) Subgroup (GOES Subgroup)
National Association of Insurance Commissioners (NAIC)

Dear Ms. Hemphill, Mr. Barlow, and Mr. Yanacheak,

I wish to offer these comments on GOES Stylized Facts and Acceptance Criteria exposed on 10/5/23 (the "exposure").

General comment

The role of stylized facts in forming acceptance criteria appears to be completely misunderstood. The acceptance criteria that are proposed are calibration criteria only, and do not include reference to many of the stylized facts, making it unclear why the stylized facts are included at all.

Stylized facts are important and play a central role in evaluating whether a generator is appropriate for the purpose at hand. The first and most important acceptance criteria should be that the generator's stochastic process is capable of reproducing behavior consistent with the stylized facts. Only after that first and most important acceptance criteria has been met do calibration criteria come into play. The exposure completely fails to mention the first and most important acceptance criteria.

Stylized facts describe historical behavior, and the purpose of a real-world generator is to produce scenarios that simulate real-world behavior. A generator whose stochastic process is incapable of simulating important aspects of historical behavior is unacceptable no matter how it is calibrated. Evaluating a stochastic process against stylized facts is a very technical endeavor and is easily skipped over by those without the needed technical background in stochastic processes. I say this because last year I documented several reasons why Conning's real-world interest rate generator fails to be consistent with historical behavior and should be rejected on that basis alone. Those comments have had no effect on this discussion, perhaps due to their technical nature. You can download those comments here.

Stylized facts can be used to guide the design of a generator's stochastic process. I have written a short book illustrating how that can be done for an interest rate model. Chapter 3 of this book explains step-by-step how stylized facts can guide the design of the stochastic process for an interest rate model.

Specific comments on each sub-model

Interest rate model

The Treasury model acceptance criteria for low interest rates are far more extreme than anything that has ever been historically experienced and, if enacted, will undoubtedly change the insurance market to make products with interest rate guarantees less available and less affordable than they are today.

- "All maturities could experience negative interest rates". The lowest long-term rates ever experienced were in July 2020 when the 20-year rate was 0.98% and the 30-year rate was 1.20%. Since market prices for long term fixed-income maturities are based on expectations of future interest rates, a price consistent with a zero 30-year spot rate implies an expectation that interest rates will not exceed zero at any point in the next 30 years. I believe that is an unreasonable expectation and an unreasonable scenario. Zero or negative interest rates for long term fixed income securities are unreasonable and should not be required as an acceptance criteria.
- The low-for-long criteria based on the 12/31/20 starting yield curve requires a model calibration that deviates very far from historical behavior. I am not aware of any analysis supporting a 10-year geometric average rate in the future that is below the lowest single year-end rate ever recorded 10% of the time. It appears that such a requirement was simply pulled out of the blue based on some sort of intuition.

Conservatism in the principle-based approach comes from the choice of CTE level at which reserves and capital are set. The CTE level only has meaning if the underlying generator is calibrated in a realistic fashion, based on history, without adding intentional conservatism. It appears to me that these acceptance criteria are a clear attempt to add intentional conservatism to the calibration, thereby weakening the theoretical foundation of the whole principle-based regime.

Equity return model

I applaud continued use of the existing calibration criteria.

I would note that the criteria do not depend on starting conditions such as the starting level of interest rates. This is an important decision, because the model Conning put forward does produce scenario sets that depend very strongly on the starting level of interest rates.

Corporate model

Stylized fact 1a says "Credit markets tend to be cyclical with elevated defaults and migrations at the end of credit cycles. Credit-related losses tend to be "lumpy" or episodic."

I consider this stylized fact to be important because the lumpy nature of credit losses presents an elevated risk to insurers when such lumps of losses occur in a short period. Yet there is no reference to this stylized fact in the acceptance criteria.

Thank you for the opportunity to provide these comments.

Regards,

Stephen J. Strommen FSA, CERA, MAAA

Agenda Item 7

Discuss Actuarial Guideline LIII (AG 53)

Updates on Actuarial Guideline 53

Fred Andersen, FSA, MAAA

11/29/2023

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AG 53 provides uniform guidance for the asset adequacy testing applied to life insurers and is effective for reserves reported with respect to the Dec. 31, 2022, and subsequent annual statutory financial statements. A statement of actuarial opinion on the adequacy of the reserves and assets supporting reserves after the operative date of the Valuation Manual is required under Section 3B of the NAIC Standard Valuation Law (#820) and VM-30 of the Valuation Manual. Section 14A of Model #820 provides that actuarial opinions and related documents, including an asset adequacy analysis, are confidential information, while Section 14B provides that such confidential information may be shared with other state regulatory agencies and the NAIC. The asset adequacy analyses required under AG 53 reviewed in the preparation of this report were shared with the Valuation Analysis (E) Working Group and the NAIC in accordance with these requirements and continue to remain confidential in nature.

Notice Regarding Confidentiality

AG 53 provides uniform guidance for the asset adequacy testing, and is effective for reserves reported with respect to the Dec. 31, 2022, and subsequent annual statutory financial statements. A statement of actuarial opinion on the adequacy of the reserves and assets supporting reserves after the operative date of the Valuation Manual is required under Section 3B of the NAIC Standard Valuation Law (#820) and VM-30 of the Valuation Manual. Section 14A of Model #820 provides that actuarial opinions and related documents, including an asset adequacy analysis, are confidential information, while Section 14B provides that such confidential information may be shared with other state regulatory agencies and the NAIC. The asset adequacy analyses required under AG 53 reviewed in the preparation of this report were shared with the Valuation Analysis (E) Working Group and the NAIC in accordance with these requirements, and continue to remain confidential in nature.

Data Limitations

- Asset information shown in the slides that follow rely on data submitted by companies in their AG 53 templates. The NAIC took steps to review the data for reasonableness. However, the accuracy and reliability of the results are ultimately dependent on the quality of participant submissions.
- Some of the submitted data was adjusted to make it useable and help ensure greater consistency of reporting across companies. For example: 1) units were changed from dollars to millions where necessary; 2) asset types were mapped to those listed in the standard AG 53 template for companies that substituted different asset descriptions; 3) aggregated initial asset summary templates were created for companies that provided templates by segment but not in total; 4) templates submitted as PDFs were converted to Excel.
- Some companies did not submit AG 53 templates or did not complete all of the AG 53 template tabs.

AG 53 provides uniform guidance for the asset adequacy testing applied to life insurers and is effective for reserves reported with respect to the Dec. 31, 2022, and subsequent annual statutory financial statements. A statement of actuarial opinion on the adequacy of the reserves and assets supporting reserves after the operative date of the Valuation Manual is required under Section 3B of the NAIC Standard Valuation Law (#820) and VM-30 of the Valuation Manual. Section 14A of Model #820 provides that actuarial opinions and related documents, including an asset adequacy analysis, are confidential information, while Section 14B provides that such confidential information may be shared with other state regulatory agencies and the NAIC. The asset adequacy analyses required under AG 53 reviewed in the preparation of this report were shared with the Valuation Analysis (E) Working Group and the NAIC in accordance with these requirements and continue to remain confidential in nature.

Today's presentation

- Describe process for various interactions between NAIC VAWG, companies, and their domestic regulators
- Summarize aggregate findings from those interactions
- Explain recent and upcoming review aspects

AG 53 provides uniform guidance for the asset adequacy testing applied to life insurers and is effective for reserves reported with respect to the Dec. 31, 2022, and subsequent annual statutory financial statements. A statement of actuarial opinion on the adequacy of the reserves and assets supporting reserves after the operative date of the Valuation Manual is required under Section 3B of the NAIC Standard Valuation Law (#820) and VM-30 of the Valuation Manual. Section 14A of Model #820 provides that actuarial opinions and related documents, including an asset adequacy analysis, are confidential information, while Section 14B provides that such confidential information may be shared with other state regulatory agencies and the NAIC. The asset adequacy analyses required under AG 53 reviewed in the preparation of this report were shared with the Valuation Analysis (E) Working Group and the NAIC in accordance with these requirements and continue to remain confidential in nature.

Process for interactions re: companies' AG 53 filings

- If significant amount of assets with outlying high net yield assumptions
  - Interaction between VAWG and the domestic regulator
  - Domestic regulator either handles with the company or invites VAWG to correspond directly with the company

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Net Yield Assumptions Reviews

- Aiming to reduce cases of understated asset risk
- If asset adequacy analysis projections are too optimistic and assets underperform:
  - Reserves will turn out to be inadequate to support future claims payments
  - Previously released money (including dividends) may have been needed to support future claims payments
- VAWG interaction with domestic regulators regarding their life insurers with outlier assumptions is concluding
  - Additional conservatism in their asset adequacy analysis is expected for year-end 2023

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Results of interactions re: companies' outlying net yield assumptions

- Categories of companies with YE 2022 outlying high net yield assumptions, after interaction with VAWG / domestic regulator
  1. Commitment to add recommended conservatism for YE 2023
     - Company removed from outlier list
  2. Commitment to add significant conservatism for YE 2023 but not amount recommended
     - ok for YE 2023 but company will remain on outlier list, be subject to further prioritized review
  3. Resisting adding significant conservatism
     - Communication of concerns with regulatory financial groups, continued discussions and highly prioritized analysis

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AG 53 Reviews – other aspects

- Reinsurance collectability - reviewing responses from targeted companies that received inquiries
- Investment expenses - analyzing assumptions
- Attribution analysis – analysis related to assumed excess net yield assumptions
- Guidance Document – additional details and clarifications for year-end 2023

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Reinsurance Collectability Reviews

- In cases of non-traditional reinsurance (including cross border), help ensure:
  - There are enough quality assets at the reinsurer to pay reinsurance claims in moderately adverse conditions
  - Significant risks associated with reinsurance ceded are appropriately addressed in asset adequacy analysis projections, which will help ensure the ceding insurer's balance sheet is accurate.
  - A ceding company does not act like they've wiped their hands and balance sheet of the risk if the assuming company will be some combination of:
    - Weakly capitalized,
    - Under-reserved, or
    - With risky assets supporting reserves

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Reinsurance Collectability Reviews

- Targeted cases include:
  - Cross-border, not following US reserve and capital standards
  - Affiliated investments involved
- In targeted cases, inquiring on:
  - How ceding companies are analyzing this risk
    - Modeling the risk directly?
  - What metrics are being relied on to provide the ceding company comfort?
- Additional questions:
  - What are differences between US and non-US reserve and capital standards?
  - What are differences in assumptions underlying modeling of US and non-US standards?
    - e.g., mortality, index rider utilization, alternative asset returns

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Investment Expenses

- Investment expenses – analyzing two aspects:
  - Accuracy of Assumption: are investment expenses sufficiently modeled in asset adequacy analysis?
    - If trending towards more complex assets with more attention and expertise needed, future investment expenses will likely be higher and should be modeled that way
  - Reasonableness of Expense Amount: is the amount of investment expenses leaving the insurer reasonable?
    - Is there appropriate value being returned?
    - Arms-length?
    - Coordinating with other NAIC groups on this aspect of the review

- Assumptions were analyzed from AG 53 filings

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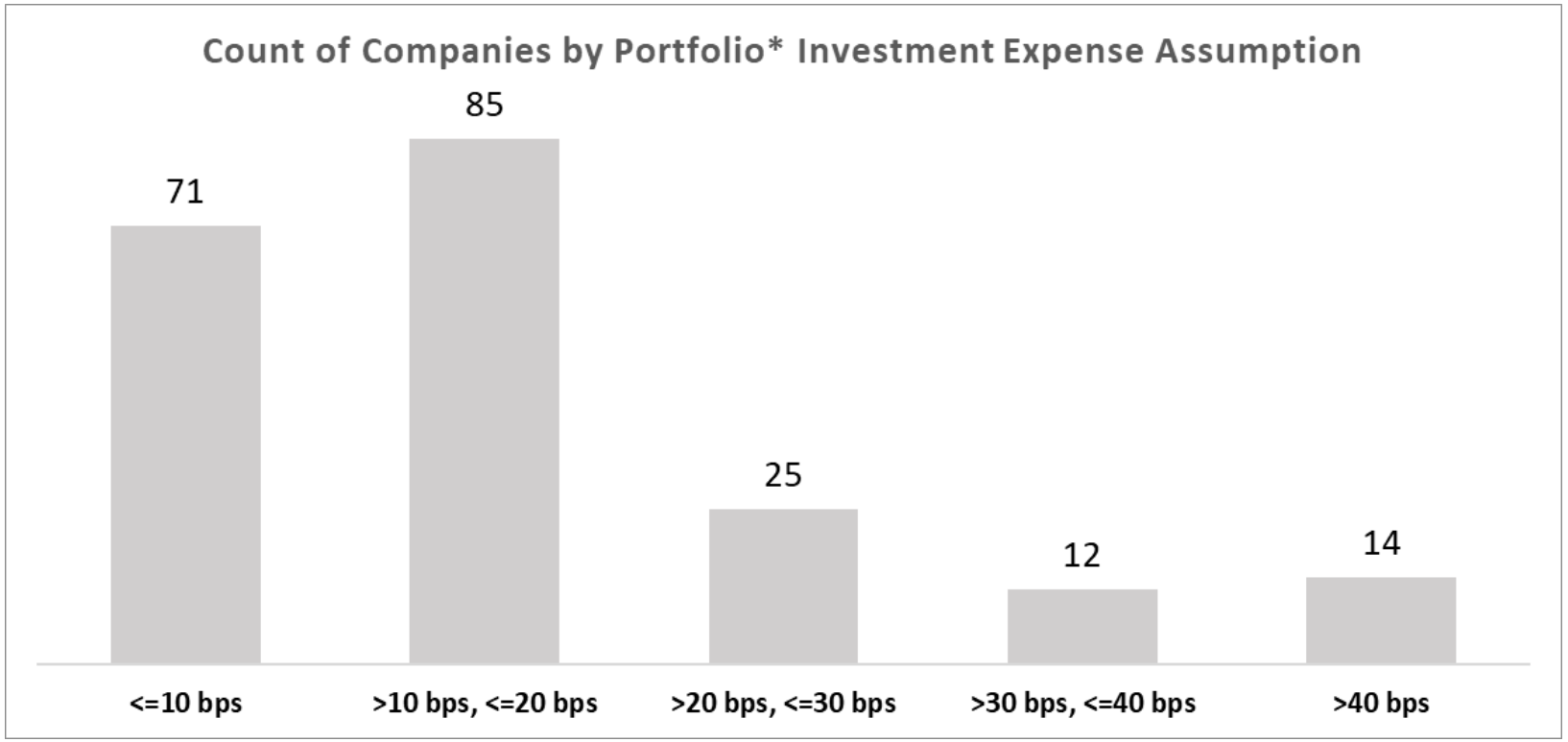
Investment Expenses – for Initial Assets, Non-Affiliated

Overall Average Portfolio* Investment Expense Assumption = 17 bps



- For assumptions in the lower range, are the assumptions accurate?
- For assumptions in the higher range, are the expense amounts reasonable?

*Portfolio assumptions calculated as a weighted average across asset types, by amount of initial assets.

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Overall Average Investment Expense Assumptions by Asset Type Groupings

Asset Types as shown in the AG 53 Templates:

Box	Asset Type	Overall Average* of Investment Expense Assumption
1	Public Non-Callable, Non-Convertible Corporate Bonds	0.14%
	Callable Bonds	
	Convertible Securities	
	Floating Rate Corporate Notes	
	Municipal Bonds	
	Other Private Bonds	
	Non-Convertible Preferred Stock	
2	Agency Mortgage Backed Securities	0.18%
	Non-Agency Commercial Mortgage Backed Securities	
	Non-Agency Residential Mortgage Backed Securities	
	Collateralized Loan Obligations	
	Other Asset Backed Securities	
3	Equities or Equity-Like Instruments	0.23%
	Real Estate	
	Mortgage Loans	
	Schedule BA Assets – Equity-Like Instruments	
	Schedule BA Assets – Non-Equity-Like Instruments	
	Derivative Instruments	
	Other – Not Covered Above	

*Overall average across all companies with investment expense assumptions for non-affiliated initial assets, calculated as a weighted average by amount of initial assets for the box of asset types.

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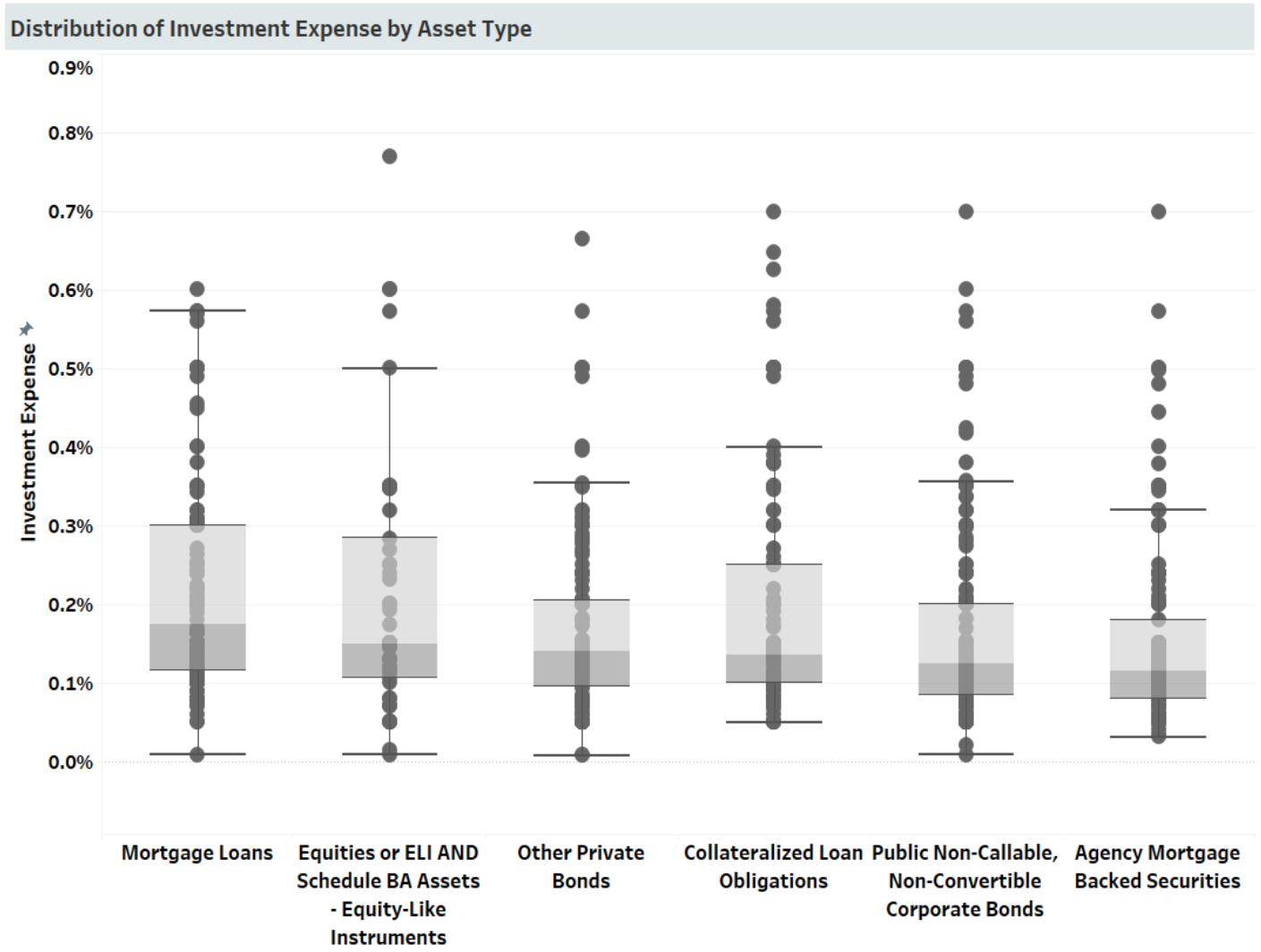
Distribution of assumptions by sample asset types



All the asset types tend to have a wide range of investment expense assumptions by company

Generally, the assumptions tend to align with the complexity of the assets

Notes:
Shows distribution of company assumptions for each asset type.
Excludes 0 and Null Investment Expenses.
Some extreme outliers removed.

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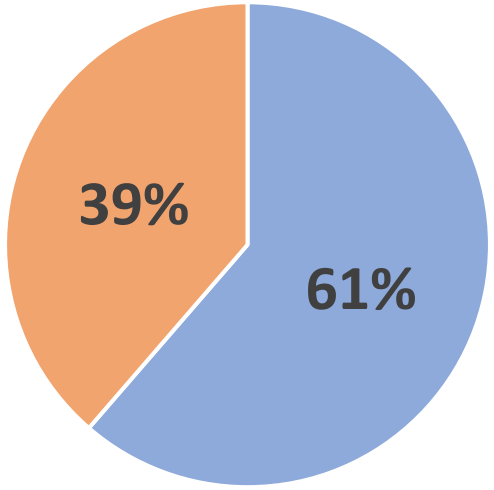
Companies took two general approaches for setting their investment expense assumptions

Approaches by Company Count



Different
Investment expense assumptions were <u>not the same</u> across all asset types

Same
Investment expense assumptions were the <u>same</u> across all asset types

- What are reasons for selecting the approach used?
- Are the assumptions appropriately updated when the company uses the same assumption across all asset types as the asset allocation changes?

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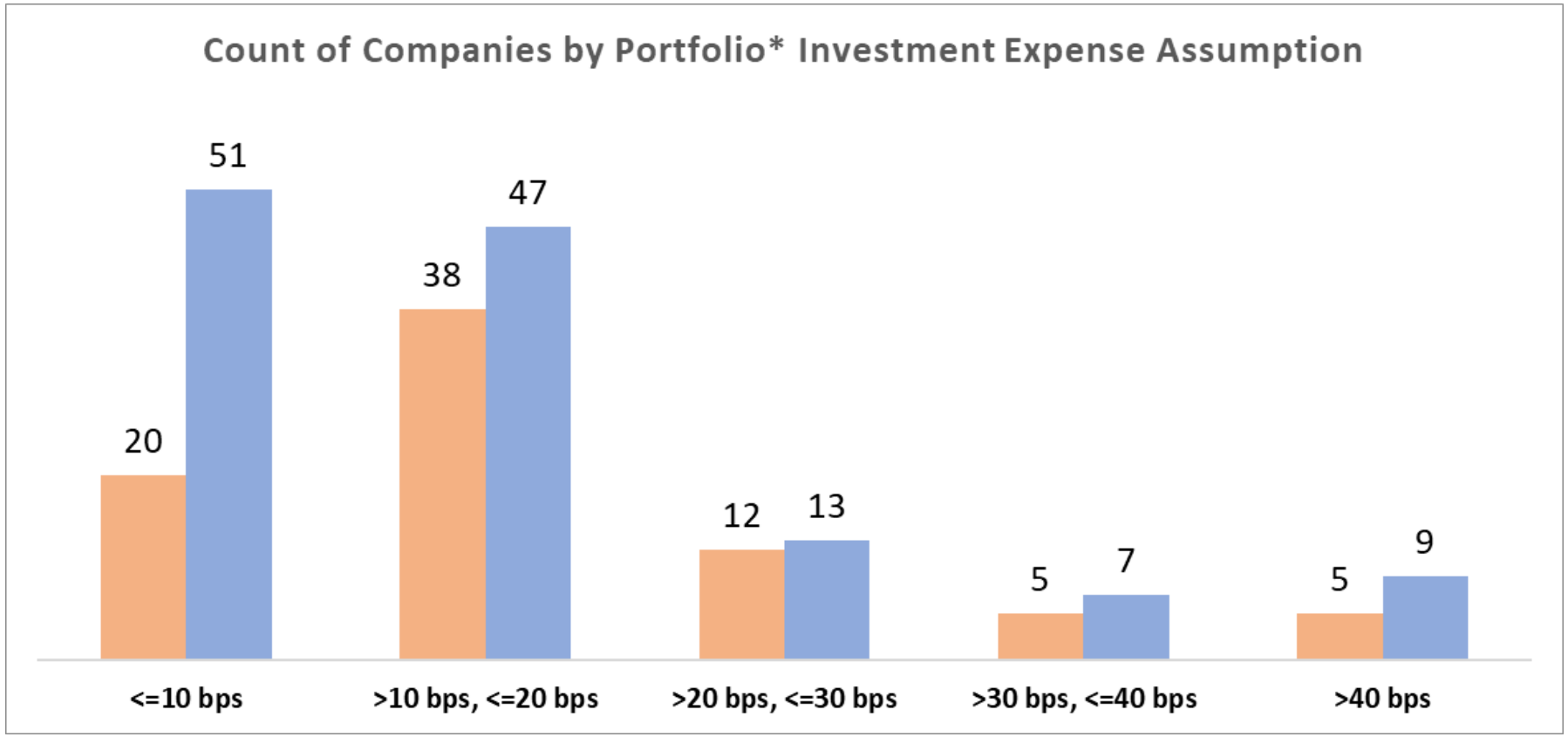
Company portfolio average can generate questions



Are some companies using the "same" approach understating their investment expense assumptions?

Different: Investment expense assumptions were not the same across all asset types

Same: Investment expense assumptions were the same across all asset types

*Portfolio investment expense assumptions for non-affiliated initial assets calculated as a weighted average across asset types, by amount of initial assets.

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What are regulators looking for in the AG 53 filings regarding Investment Expense Assumptions?

- Commentary on how investment expense assumptions are commensurate with the expected expenses in light of the complexity of the assets

- Where relevant, explanation of why complex assets are not leading to higher investment expenses than less complex assets

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Attribution Analysis

- Examination of excess net yield being assigned to credit risk or illiquidity risk with no modeled potential losses
- Reasons?
  - Some companies say they have advantages in expertise or connections that can be expected to last through the projections (30+ years)
  - Some companies use corporate bond default experience for their high-yielding complex assets
    - Relevance and recognition of additional risk?
  - Perhaps "beyond moderately adverse" is an explanation
    - However, if there is tail risk that occurs beyond a certain percentile:
      - The full distribution of risk should still be considered
        - Modeling advancements may be needed or additional conservatism
      - Similar to CTE with variable annuity guarantees, tail risk should not be ignored
- Opportunity for the company actuary to demonstrate they understand the asset and the risk

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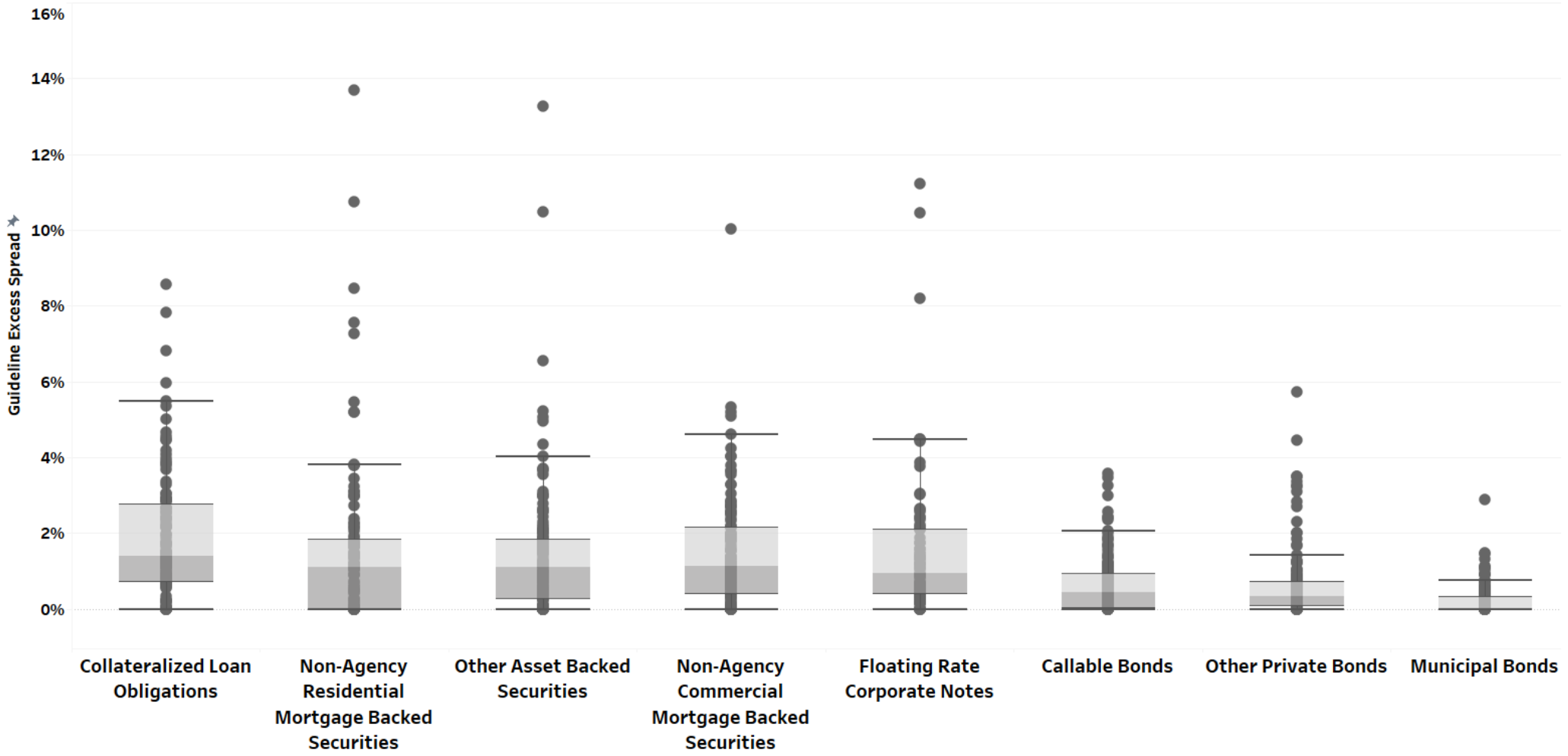
Attribution Analysis
for Initial Assets

The attribution analysis starts with the Guideline Excess Spread for each invested asset type

Guideline Excess Spread = Net Market Spread - Investment Grade Net Spread Benchmark



Notes: Shows distribution of company results for a sample of asset types. Some extreme outliers removed.

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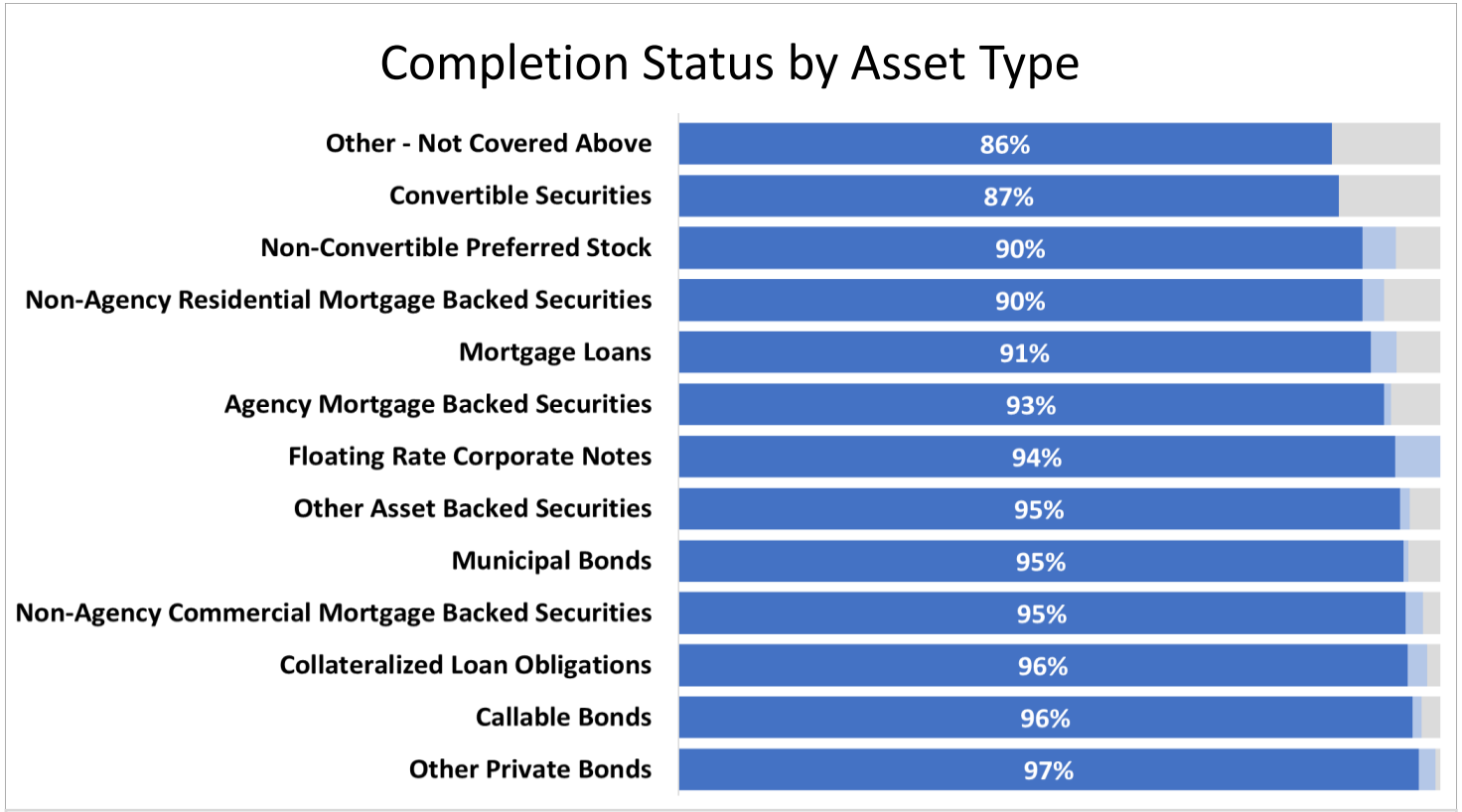
Attribution Analysis
for Initial Assets

Another component of the attribution analysis was to attribute the Guideline Excess Spread to components for Credit Risk, Illiquidity Risk, and Other Risk.



Using the Attribution Template for Initial Assets:

Complete: All applicable columns were filled in and reconciled

Partial: Some applicable columns were not filled in or did not reconcile

Incomplete: No applicable columns were filled in as expected

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- For year-end 2022, companies were asked to provide a "best efforts" submission for this
- For year-end 2023, where applicable, improved methods explaining high net spread assumptions may be expected

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What are regulators looking for in the AG 53 filings regarding Attribution Analysis?

- An explanation of the source that the company actuary believes drives any excess spreads beyond the benchmark

- Reflection of considerable thought in the attribution regarding the range of risks, especially to the extent assumed excess spreads are higher
    - Otherwise it may appear the company actuary does not understand the complex asset and related risk

- Model rigor that captures the specific risks of complex assets, or additional conservatism in assumptions

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AG 53 Guidance Document

- Finalized in September with a goal is to reduce follow-up inquiries
- Highlights:
  - Sensitivity test for initial equities
    - Addresses reinvestment focus of sensitivity tests not picking up assets without maturities
  - Allocation of higher-yielding assets over the projection
    - Addresses small allocations of higher yielding asset types becoming substantial over time
  - Structured asset information by tranche
    - Addresses different risk of senior and junior tranches
  - Payment in kind asset information
    - Addresses potential cash flow issues
  - Reinsurance collectability
    - Clarification that relevant ASOP 11 should be included in the AG 53 filing

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AG 53 Reviews – upcoming activities

- Continue current interactions with companies and their regulators
  - Add conservatism to outlier net yield assumptions
  - Better understand reinsurance collectability areas of comfort and vulnerability
- Coordinated review of investment expense assumptions and reasonability
- Issue handed to Life Actuarial Task Force
  - Difference in common practice between modeling fixed income security risk and equity risk

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Agenda Item 8

Review Results of New Calibration of the GOES
(Materials Pending)

Agenda Item 9

Consider Adoption of the GOES (E/A) Subgroup Report and Hear a Timeline Update

Timeline for Testing and Major Milestones

Timing	Milestone	On Track?
5-Oct	Expose Interest Rate, Equity, and Corporate Model Stylized Facts and Acceptance Criteria until 11/10.	
10/12 or 10/19	Expose Corporate Model Quantitative and Transparency/Documentation Comparisons until 11/10.	
Oct-Early Nov	Conning Recalibrate Models based on exposed Stylized Facts and Acceptance Criteria.	
	NAIC Model Office Improvements.	
29-Nov	Review Stylized Facts and Acceptance Criteria Comments, Conning Scenarios after re-calibration in Orlando. Potentially Adopt Final Stylized Facts and Acceptance Criteria. Review Corporate Model Comparisons. Potentially select Corporate Model.	
Nov-Feb	NAIC Model Office Testing.	
	Circulate any promising scenario sets. Individual Companies with capacity that wish to do so are encouraged to test using their own models and share results with regulators.	
	GOES Subgroup calls to review scenario statistics against acceptance criteria, review model office results.	
	Adopt Final Stylized Facts and Acceptance Criteria if regulators have substantial edits. Conning recalibrations, if so.	
3/14/2024	Present Model Office Results, Expose Scenario Set(s).	
March-June	Unaggregated GOES Field Test (VM-20, VM-21/C3P2, and C3P1), If Needed	
June-July	Reg-Only Company Presentations of Unaggregated GOES Field Test (VM-20, VM-21/C3P2, and C3P1) Results, If Needed	
July-Sept	VM-22 Field Test	

Note: Timeline is subject to change

Agenda Item 10

Hear an Update from the American Academy of Actuaries (Academy) Economic Scenario Generator Subcommittee on Equity Acceptance Criteria (Materials Pending)

Agenda Item 11

Discuss Comments Received on Amendment Proposal Form (APF) 2023-10

Life Actuarial (A) Task Force/ Health Actuarial (B) Task Force
Amendment Proposal Form*

1. Identify yourself, your affiliation and a very brief description (title) of the issue.

   Identification:
   American Academy of Actuaries, Life Reserves Subcommittee (formerly LRWG)

   Title of the Issue:
   Discount Rate for VM-20 Stochastic Reserve

2. Identify the document, including the date if the document is "released for comment," and the location in the document where the amendment is proposed:

   January 1, 2023, NAIC Valuation Manual

   VM-20 sections 5.B and 7.H.4; VM-31 sections 3.D.2 and 3.D.6

3. Show what changes are needed by providing a red-line version of the original verbiage with deletions and identify the verbiage to be deleted, inserted or changed by providing a red-line (turn on "track changes" in Word®) version of the verbiage. (You may do this through an attachment.)

   See attached. The proposed changes are extracted from existing language in VM-21 (see VM-21 Section 4.B.3) or from existing language in VM-31 related to the deterministic reserves but modified for the stochastic reserve

4. State the reason for the proposed amendment? (You may do this through an attachment.)

   We propose modifying the discount rate used to calculate the scenario reserves within the VM-20 Stochastic Reserve (SR) to be the Net Asset Earned Rate (NAER) on additional assets while also allowing for the Direct Iteration Method (DIM) as an alternative approach to calculating these scenario reserves. The principal reason for making this change is to address concerns related to APF 2023-03 Part 3, which deals with borrowing costs. In particular, it has been noted that a disconnect would now exist between the borrowing rate and the scenario discount rate used in calculating the scenario reserves for the VM-20 SR. Secondly, the upcoming changes to the Economic Scenario Generator will likely lead to instances of negative interest rates, which calls into question the appropriateness of discounting at 105% of a Treasury rate. Changing to the NAER will allow for more appropriate discounting in these types of scenarios. Thirdly, the existing methodology of using SR discount rates equal to 105% of the path of 1-year Treasury rates does not have a clear, strong rationale for use. The methodology originated from C3P2 Standard Scenario for variable annuities, and the discount rate in C3P2 was later revised and eventually the Standard Scenario was eliminated altogether. This methodology for discounting is not used in most current applications where GPVAD are calculated.

* This form is not intended for minor corrections, such as formatting, grammar, cross–references or spelling. Those types of changes do not require action by the entire group and may be submitted via letter or email to the NAIC staff support person for the NAIC group where the document originated.

NAIC Staff Comments:

 1

Dates: Received	Reviewed by Staff	Distributed	Considered
8/17/23	K.K		
Notes: APF 2023-10			

 2

VM-20

Section 5: Stochastic Reserve

For a group of one or more policies for which a SR is to be calculated, the company shall calculate the SR as follows:

A. Project cash flows in compliance with the applicable requirements in Section 7, Section 8 and Section 9 using the stochastically generated scenarios described in Section 7.G.2., and further described in Appendix 1. In determining the SR, the company shall determine the number and composition of subgroups for aggregation purposes in a manner that is consistent with how the company manages risks across products with significantly different risk profiles, and that reflects the likelihood of any change in risk offsets that could arise from distributional shifts between product types due to, for example, differing policyholder behavior. If a company is managing the risks of two or more products with significantly different risk profiles as part of an integrated risk management process, then the products may be combined into the same subgroup for aggregation purposes. If policies from more than one VM-20 Reserving Category are included in such a subgroup, the reserve for each VM-20 Reserving Category shall also be determined, as described in Section 5.G.

Guidance Note: Aggregation refers to the number and composition of subgroups of policies that are used to combine cash flows. Aggregating policies into a common subgroup allows the cash flows arising from the policies for a given stochastic scenario to be netted against each other (i.e., allows risk offsets between policies to be recognized). Note Section 5.G regarding the calculation of the ~~SRon~~SR on a stand-alone basis for each VM-20 Reserving Category.

B. Calculate the scenario reserve for each stochastically generated scenario ~~as follows~~using the method described in either Section 5.B.1 or Section 5.B.2:

1. Present Value Method

   a. For each model segment at the model start date and end of each projection year, calculate the discounted value of the negative of the projected statement value of general account and separate account assets using the path of discount rates for the model segment determined in compliance with Section 7.H.4 from the projection start date to the end of the respective projection year. The balance of policy loans on the valuation date (if explicitly modeled under Section 7.F.3.b) and the balance of separate account assets on the valuation date are modeled each period in compliance with the applicable changes in these asset balances as defined in Section 7.

Guidance Note: The projected statement value of general account and separate account assets for a model segment may be negative or positive.

   b. Sum the amounts calculated in Subparagraph 1 above across all model segments at the model start date and end of each projection year.

Guidance Note: The amount in Subparagraph 2 above may be negative or positive.

   c. Set the scenario reserve equal to the sum of the statement value of the starting assets across all model segments and the maximum of the amounts calculated in Subparagraph ~~2~~b above.

2. Direct Iteration Method

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Solve for the amount of starting assets which, when projected along with all contract cash flows, result in the defeasement of all projected future benefits and expenses at the end of the projection horizon with no accumulated deficiencies at the end of any projection year during the projection period.

C. Rank the scenario reserves from lowest to highest.

D. Calculate CTE 70.

E. Determine any additional amount needed to capture any material risk included in the scope of these requirements but not already reflected in the cash-flow models using an appropriate and supportable method and supporting rationale.

F. Add the CTE amount (D) plus any additional amount (E) less the positive or negative PIMR balance allocated to the group of one or more policies being modeled under Section 7.D.7.

G. The SR equals the amount determined in Section 5.F. If the company includes policies from two or more VM-20 Reserving Category in a subgroup for aggregation purposes as described in Section 5.A, the company shall calculate the SR for policies from each VM-20 Reserving Category on a stand-alone basis by following the process of A through F above.

Section 7.H

4. ,The company shall use the path of NAER on an additional invested asset portfolio of general account assets for each model segment within each scenario as the discount rates in the SR calculations in Section 5.

a. The additional invested asset portfolio for a scenario is a portfolio of general account assets as of the valuation date, outside of the starting asset portfolio, that is required in that projection scenario so that the projection would not have a positive accumulated deficiency at the end of any projection year. This portfolio may include only (i) general account assets available to the company on the valuation date that do not constitute part of the starting asset portfolio; and (ii) cash assets.

Guidance Note: Additional invested assets should be selected in a manner such that if the starting asset portfolio were revised to include the additional invested assets, the projection would not be expected to experience any positive accumulated deficiencies at the end of any projection year. It is assumed that the accumulated deficiencies for this scenario projection are known.

b. To determine the NAER on additional invested assets for a given scenario:

i. Project the additional invested asset portfolio as of the valuation date to the end of the projection period,

a) Investing any cash in the portfolio and reinvesting all investment proceeds using the company's investment policy.

b) Excluding any liability cash flows.

c) Incorporating the appropriate returns, defaults, and investment expenses for the given scenario.

ii. If the value of the projected additional invested asset portfolio does not equal or exceed the accumulated deficiencies at the end of each projection year for the scenario, increase the size of the initial additional invested asset portfolio as of the valuation date, and repeat the preceding step.

iii. Determine a vector of annual earned rates that replicates the growth in the additional invested asset portfolio from the valuation date to the end of the projection period for the scenario. This vector will be the NAER for the given scenario.

Guidance Note: There are multiple ways to select the additional invested asset portfolio at the valuation date. Similarly, there are multiple ways to determine the earned rate vector. The company shall be consistent in its choice of methods, from one valuation to the next.

~~a.~~

Guidance Note: The use of different discount rate paths for the deterministic and scenario reserves is driven by differences in methodology. The DR is based on a present value of all liability cash flows, with the discount rates reflecting the investment returns of the assets backing the liabilities. The scenario reserve is based on a starting estimate of the reserve and assets that support that estimate, plus the greatest present value of accumulated deficiencies. Here, the discount rates are ~~a standard estimate of~~ the investment returns of only the marginal assets needed to eliminate either a positive or negative deficiency.

VM-31

Section 3.D.2

i. Stochastic Reserve Method – Identification of the method used to determine the scenario reserve, either (1) the present value method described in VM-20 Section 5.B.1; or (2) the direct iteration method described in VM-20 Section 5.B.2.

Section 3.D.6

i. Net Asset Earned Rate – For each model segment's DR: If the gross premium valuation method outlined in VM-20 Section 4.A was used, a listing or graph of the path of calculated NAER for all years of the projection and an explanation of any abnormally high or low NAER values or unusual patterns over time. For each model segment's SR: If the present value method outlined in VM-20 Section 5.B.1 was used, a description of the vectors of NAER, including graphs or tables of summary statistics helpful to the understanding of the NAER vectors produced for each scenario, with a statement that a complete listing of NAER will be made available in electronic spreadsheet format upon request.

v. Additional Assets – For each model segment's SR: If the present value method outline in VM-20 Section 5.B.1 was used, a summary of the amounts of additional assets needed to fund the present value of the accumulated deficiency, including a description of the calculation process and the types of assets included.

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Brian Bayerle
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Policy Analyst
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November 13, 2023

Rachel Hemphill
Chair, NAIC Life Actuarial (A) Task Force (LATF)

Re: APF 2023-10 (Discount Rate for VM-20 Stochastic Reserves)

Dear Chair Hemphill:

The American Council of Life Insurers (ACLI) appreciates the opportunity to submit comments on APF 2023-10 which was exposed by LATF during their meeting on September 28, 2023. ACLI has no objections to the APF's proposed modifications to the discount rate used to calculate VM-20 Stochastic Reserve scenario reserves which include the primary use of Net Asset Earned Rate (NAER) on additional assets and the allowance of Direct Iteration Method (DIM) as an alternative calculation strategy.

While ACLI generally supports adoption of this APF, we do have a number of questions and concerns for regulators to consider so there aren't any unintended consequences for industry caused by the proposed changes post-implementation. These considerations are listed below:

- One question we have is regarding the asset collar requirement on VM-20 (which does not exist on VM-21). If the SR is winning, the assets from that model should be included in the asset collar analysis. Since there are now two methods for doing the SR, both should be considered:
    - Present Value Method - Do we use the starting assets only, or do we use the starting assets plus the CTE (70) of the additional invested assets (i.e., the SR reserve)?
    - Direct Iteration Method - Each scenario has different starting assets. Do we use the CTE (70) of the starting assets (i.e., the SR reserve) as the starting assets?
        i. In either case, a reasonable result might be to treat the SR result as the starting asset position for any model blocks where the SR is the dominant reserve.

Once again, ACLI is appreciative of the opportunity to provide feedback on this APF, and we look forward to additional conversation with regulators on this and other topics others as we move towards the end of the calendar year.

Sincerely,

Colin Masterson

cc: Scott O'Neal, NAIC

Agenda Item 12

Discuss Comments Received on APF 2023-12

Life Actuarial (A) Task Force/ Health Actuarial (B) Task Force
Amendment Proposal Form*

1. Identify yourself, your affiliation, and a very brief description (title) of the issue.

Identification:
Fred Andersen, FSA, MAAA and Ben Slutsker, FSA, MAAA

Title of the Issue:
Clarify expectations on reflection of equity return volatility in VM-30 cash-flow testing.

2. Identify the document, including the date if the document is "released for comment," and the location in the document where the amendment is proposed:

VM-01

VM-30 Section 3.B (new item 7 with items below renumbered)

January 1, 2023 NAIC Valuation Manual

3. Show what changes are needed by providing a red-line version of the original verbiage with deletions and identify the verbiage to be deleted, inserted, or changed by providing a red-line (turn on "track changes" in Word®) version of the verbiage. (You may do this through an attachment.)

Add the following definition to VM-01

- The term "equity-like instruments" means assets that include the following:
  - Any assets that, for purposes of risk-based capital C-1 reporting, are in the category of common stock, i.e., have a 30% or higher risk-based capital charge.
  - Any assets that are captured on Schedule A or Schedule BA of the annual statement.
  - Bond funds.

Add the following subsection 3.B.7. and renumber the items below:

7. When the form of asset adequacy analysis is cash-flow testing, investment return assumptions for equity-like instruments shall not solely project the anticipated long-term average return (e.g., a single level assumption set to the long-term average) but account for the volatility of such returns which may be expected in moderately adverse conditions.

   a. To accomplish the accounting for volatility, one or more of the following approaches may be employed, as appropriate:

      i. Stochastic modeling for equity returns, with accompanying analysis of risk metrics.

      ii. As relevant to capture the risk, including up, down, and/or volatile equity return scenarios for each given set of interest rate paths.

      iii. Projecting one or more market drops, taking into consideration future points at which cash-flow testing results could be vulnerable to market downturns.

iv. Reflecting a level return assumption set equal to a tail risk metric, for example, setting investment returns to the average of the worst 30% of future scenarios, i.e., CTE70.

b. A qualitative description of why the equity return scenario used in asset adequacy analysis is moderately adverse in light of the company's portfolio should be provided.

4. State the reason for the proposed amendment? (You may do this through an attachment.)

As presented at the August 2023 NAIC meeting, Actuarial Guideline 53 reviews revealed usage of flat, high, unchanging equity return assumptions for the length of 30+ year projections by many industry members.

We believe that, just as fixed securities should have their risks appropriately reflected in cash-flow testing, so should equity-like instruments.

This proposal stops short of establishing a guardrail on equity return assumptions (as exists in other Valuation Manual sections), but such a guardrail may also be a consideration if regulators do not see an appropriate reflection of equity market volatility.

Dates: Received	Reviewed by Staff	Distributed	Considered
10/25/23	SO		
Notes: 2023-12			

DATE: November 17, 2023

FROM: Di Yang, Actuarial Methodology & Regulatory Affairs

SUBJECT: APF 2023-12 Exposure

Equitable appreciates the opportunity to comment on APF 2023-12. This proposal requires Asset Adequacy Testing (AAT) investment return assumptions for equity-like instruments reflect volatility instead of solely projecting a flat long-term average return. The proposal requires that this language be included in VM-30.

We support this APF, as we believe guardrails on AAT assumptions, including on investments, ensure robust reserves. Additionally, including guardrails on equity-like instruments is appropriate and consistent with intention of AG53 for the fixed income and equity-like instruments disclosure, as noted in the APF submission.

We favor a General Account equity return guardrail that is consistent with CTE 70 under the new economic scenario generator but that has a defined maximum difference vs. the fixed income guardrail. The rationale for this is two-fold: (1) CTE 70 under GOES will be consistent with liability side regulations and (2) using a maximum spread to fixed income will ensure companies are not incentivized to shift assets to equities to reduce AAT reserves.

In addition, regarding concerns on asset volatility, we believe the best way to test balance sheet resiliency to asset drawdowns is to stress asset values down (moderately adverse) for a defined period within AAT, allowing for reflection of demonstrable hedging, and then followed by use of the long-run assumptions discussed above.

Finally, we also support this language to be included in VM-30 as more robust guardrail and ensure consistent applications across the industry.

Equitable appreciates the opportunity to comment on the proposal. We are available to discuss our comments further at your convenience.

Sincerely,

Di Yang, Actuarial Methodology & Regulatory Affairs

cc. Aaron Sarfatti, ASA, Chief Risk Officer & Strategy Officer, Equitable

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Colin Masterson
Policy Analyst
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November 17, 2023

Rachel Hemphill,
Chair, NAIC Life Actuarial (A) Task Force

Re: APF 2023-12 (VM-30 Equity Return Volatility).

Dear Chair Hemphill:

The American Council of Life Insurers (ACLI) appreciates the opportunity to submit comments on APF 2023-12, which aims to clarify expectations on reflection of equity return volatility in VM-30 cash-flow testing.

We agree that the provisions of the APF should be considered by Appointed Actuaries. However, industry is concerned that including such prescriptive requirements in the Valuation Manual diminishes the value of the Actuarial Opinion and the dialogue necessary between the Appointed Actuary and their domestic regulator.

We would propose regulators consider requesting the American Academy of Actuaries to include approaches to account for equity volatility (APF subsection 3.B.7.a) in a Practice Note.

Given the considerations above, we propose the following edits to subsection 3.B.7:

7. When the form of asset adequacy analysis is cash-flow testing, investment return assumptions for equity-like instruments shall not solely project the anticipated long-term average return (e.g., a single level assumption set to the long-term average) but ~~account for the~~ should analyze how volatility of such returns ~~which may be expected in moderately adverse conditions~~ may affect the asset adequacy analysis results.

~~a. To accomplish the accounting for volatility, one or more of the following~~

~~approaches may be employed, as appropriate:~~

~~i. Stochastic modeling for equity returns, with accompanying analysis of risk metrics.~~

~~ii. As relevant to capture the risk, including up, down, and/or volatile equity return scenarios for each given set of interest rate paths.~~

~~iii. Projecting one or more market drops, taking into consideration future points at which cash flow testing results could be vulnerable to market downturns.~~

~~iv. Reflecting a level return assumption set equal to a tail risk metric, for example, setting investment returns to the average of the worst 30% of future scenarios, i.e., CTE70.~~

~~b.~~ A qualitative description of why the equity return scenario used in asset adequacy analysis is moderately adverse in light of the company's portfolio should be provided.

Further, the definition of "equity-like instrument" matches the AG 53 definition; however, the additional guidance for YE2023 states, "surplus notes, bond ETFs, and preferred stock ETFs, companies should treat these as non-equity-like instruments". It would make sense to align the definition with the latest guidance, so we would suggest the following edits to the definition:

The term "equity-like instruments" means assets, excluding surplus notes, bond ETFs, and preferred stock ETFs, that include the following:

- Any assets that, for purposes of risk-based capital C-1 reporting, are in the category of common stock, i.e., have a 30% or higher risk-based capital charge.
- Any assets that are captured on Schedule A or Schedule BA of the annual statement.
- Bond funds.

Thank you very much for considering our feedback and we look forward to discussion at the NAIC Fall National Meeting in Orlando.

Sincerely,

Colin Masterson

cc: Scott O'Neal, NAIC

Agenda Item 13

Consider Exposure of APF 2023-13

Life Actuarial (A) Task Force/ Health Actuarial (B) Task Force
Amendment Proposal Form*

1. Identify yourself, your affiliation and a very brief description (title) of the issue.

   Linda Lankowski, RGA, William Leung, MO DCI

   Annuity mortality tables and non-US lives mortality.

2. Identify the document, including the date if the document is "released for comment," and the location in the document where the amendment is proposed:

   - VM-M Sections 1 and 2
   - VM-31 Section 3.D.3

3. Show what changes are needed by providing a red-line version of the original verbiage with deletions and identify the verbiage to be deleted, inserted or changed by providing a red-line (turn on "track changes" in Word®) version of the verbiage. (You may do this through an attachment.)

VM-M: Section 1: Valuation and Nonforfeiture Mortality Tables

K. 2017 Commissioners Standard Guaranteed Issue Mortality Tables

1. "2017 Commissioners Standard Guaranteed Issue Mortality Table" (2017 CSGI) means that 2017 Guaranteed Issue basic ultimate mortality table with 75% loading, consisting of separate rates of mortality for male and female lives, as well as combined unisex rates, developed from the experience of 2005–2009 collected by the SOA. This table was adopted by the NAIC on Aug. 7, 2018 and is included in the NAIC Proceedings of the 2018 Summer National Meeting.

L. 1994 Group Annuity Reserving (1994 GAR) Table

1. "1994 GAR Table" means that mortality table developed by the Society of Actuaries Group Annuity Valuation Table Task Force and shown on pages 866-867 of Volume XLVII of the Transactions of the Society of Actuaries (1995).

M. 1983 Table a

1. "1983 Table 'a'" means that mortality table developed by the Society of Actuaries Committee to Recommend a New Mortality Basis for Individual Annuity Valuation and adopted as a recognized mortality table for annuities in June 1982 by the National Association of Insurance Commissioners. [See 1982 Proceedings of the NAIC II, page 454.]

Commented [LML1]: The GAR and Table a language came from Model 821. While the draft of VM-22 references a 2021 SOA Deferred Annuity Table, this has not yet been adopted by LATF.

N. Non-US Insured Mortality

1. For blocks of polices covering insureds who are not residents of the United States, the company may use a mortality table developed for the country(ies) of residence. While it is anticipated that this table would be developed by the regulatory authority or the actuarial society of the country, in the absence of such an industry table, the insurer may develop a table appropriate for reserve valuation. Such mortality tables must be approved by the insurance department of the state of domicile before being used for

reserve purposes. Margins consistent with the purpose of US statutory reserve methods are to be included in this table.

VM-M: Section 2: Industry Experience Valuation Basic Tables

A. 2008 Valuation Basic Table (2008 VBT)

B. 2015 Valuation Basic Table (2015 VBT) The 2015 Valuation Basic Table is a valuation table without loads jointly developed by the Academy and SOA for use in determining a company's prudent estimate mortality assumption for valuations of Dec. 31, 2015, and later. The table consists of the Primary table (Male, Female, Smoker, Nonsmoker and Composite), 10 Relative Risk tables for nonsmokers (Male and Female) and four Relative Risk tables for smokers (Male and Female). Rates for juvenile ages are included in the composite tables. The tables are on a select and ultimate and ultimate-only basis and are available on an age nearest and an age last birthday basis.

C. For blocks of polices covering insureds who are not residents of the United States, the company may use a mortality table developed for the life insurance industry in the country of residence. If a relevant industry table is not available, the company will create an industry table by applying a margin to its anticipated mortality which would be equivalent to the difference between the company's anticipated mortality for US business and the VBT table used for its US business. Such mortality tables must be approved by the insurance department of the state of domicile before being used for reserve purposes.

VM-31: Section 3.D.3: Life Report Mortality

n. Adjustments to NPR Mortality – Description and rationale of any adjustments made to the CSO mortality rates used in the NPR calculation to reflect the requirements of VM-20 Section 3.C.1.g.

o. Adjustments to Prescribed Margins - Description and rationale for any adjustments made to prescribed mortality margins pursuant to VM-20, Section 9.C.6.d or Section 9.C.6.e.

p. Non-US Mortality – Description and rationale for mortality tables used to value non-US blocks of business.

4. State the reason for the proposed amendment? (You may do this through an attachment.)

1994 GAR and 1983 Table a will be needed for valuations using (proposed) VM-22 methodology.

Life insurance that is sold internationally is reinsured into the United States. Mortality for international insureds may vary significantly from that of US insurance markets. The Valuation Manual should be updated to allow for international mortality tables.

* This form is not intended for minor corrections, such as formatting, grammar, cross–references or spelling. Those types of changes do not require action by the entire group and may be submitted via letter or email to the NAIC staff support person for the NAIC group where the document originated.

NAIC Staff Comments:

Dates: Received	Reviewed by Staff	Distributed	Considered
11/15/23, 11/17/23	S.O.		
Notes: 2023-13			

Agenda Item 14

Hear an Update on SOA Research and Education

SOCIETY OF ACTUARIES RESEARCH UPDATE TO LATF

November 29, 2023

Dale Hall, FSA, MAAA, CERA
Managing Director of Research

Kate Eubank, FSA, MAAA
Senior Experience Studies Actuary

Presentation Disclaimer

The material and information contained in this presentation is for general information only. It does not replace independent professional judgment and should not be used as the basis for making any business, legal or other decisions. The Society of Actuaries assumes no responsibility for the content, accuracy or completeness of the information presented.

SOA Research INSTITUTE

Rating Agency Perspectives on Capital Requirements

Rating Agency Perspectives on Insurance Company Capital

- Constructed to add to the curriculum of the SOA Corporate Finance & Enterprise Risk Management and Individual Life & Annuity FSA tracks
- Overview of rating agencies
- Background on credit ratings, rating types, rating process and rating scales using examples from four major rating agencies: A.M. Best, Fitch, Moody's, S&P
- Examples of quantitative tools used to evaluate and differentiate an insurer's available capital relative to modeled required capital

https://www.soa.org/resources/research-reports/2023/ratingagency-perspectives-insurancecompany-capital/

SOA Research INSTITUTE

SOA Research INSTITUTE

Accelerated Underwriting Survey and Impact of COVID in Underwriting

Mortality and Longevity

Accelerated Underwriting Survey and Impact of COVID in Underwriting

- Initiated by Reinsurance Section; Milliman as researcher
- Follow-up to 2019 Survey
- 2 surveys - Direct writer (24) and Reinsurer (7)
- Examines how Accelerate Underwriting (AU) practices are evolving and changing
- Responses collected 4Q 2022 – 1Q 2023
- Target Release by November 17

SOA Research INSTITUTE

Survey Scope

- Most of the analysis was done on companies' "most prevalent" AU program
- General information on AU Programs
- Algorithms
- Post-Issue Audits and Random Holdouts
- Mortality and Lapse
- General Questions
  - Challenges in designing and drivers for success
  - Best data for assessing mortality
  - Top Tools to mitigate fraud

SOA Research INSTITUTE

Results – General Information

The most prevalent AU program was	Number of Companies
A modification	7
New	17
Total Respondents	24

Was the most prevalent program changed/created because of COVID-19?	Number of Companies
Yes	8
No	16
Total Respondents	24

Comparison: 2022 Survey to 2019 Survey

- Average minimum issue age decreased from 20 to 16. (18 most common)
- Average maximum issue age increased from 55 to 59.
- Average minimum face amount increased from $53,000 to $79,000.
- Average maximum face amount increased from $800,000 to $2,100,000.

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Results – Mortality Slippage

Estimate of Mortality Slippage in 2022

Method	All Companies	Number of Respondents
Direct Company Ratio of AU to Fully Underwritten	9%	20
Direct Company Random Holdouts	17%	15
Direct Company Post-Issue Audits	9%	6
Reinsurer Lowest Mortality Clients	1%	5
Reinsurer Highest Mortality Clients	>20%	5

SOA Research INSTITUTE

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Analysis and Trends of U.S. Insurance Industry Climate Risk Financial Disclosures

Catastrophe and Climate

U.S. Insurance Industry
Climate Risk Financial Disclosures

- Partnership Project with NAIC's Center For Insurance Policy Research
- Analysis of climate risk disclosures for the 2021 reporting year
  - TCFD format: Narrative responses
  - Governance
  - Strategy
  - Risk management
  - Metrics and targets

SOA Research INSTITUTE

U.S. Insurance Industry
Climate Risk Financial Disclosures

- High-level observations
- Short: About 40% of the universe of 2021 disclosures contain less than 5000 characters of text – too brief to offer a meaningful discussion of climate risk.
- Length and comprehensiveness of disclosures is positively correlated with the size of insurers. Consequently, while about 40% of the disclosures are less than 5000 characters, this group collectively represents only 11% of total direct premiums.
- Broad range of approaches to disclosing climate risk especially by line-of-business

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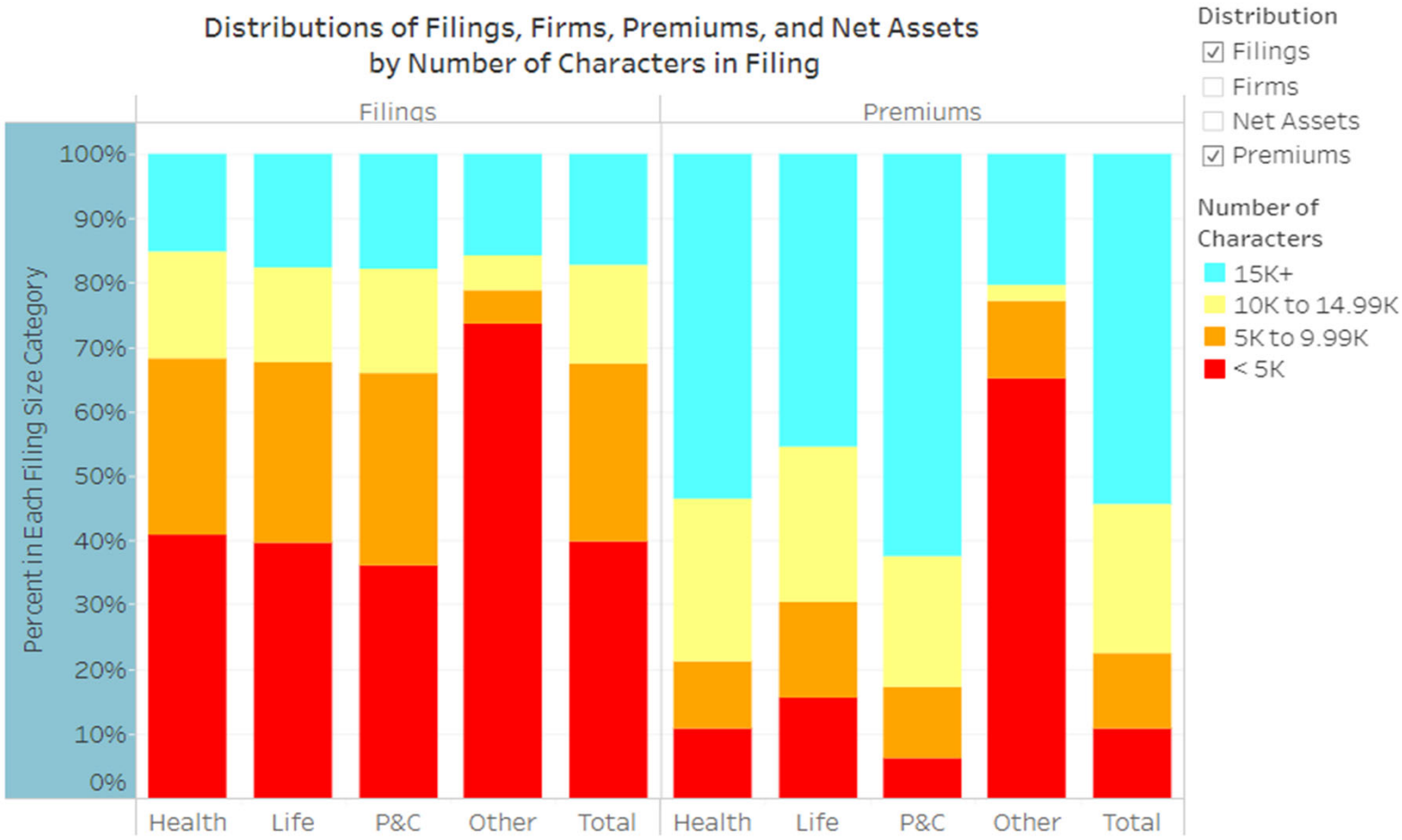

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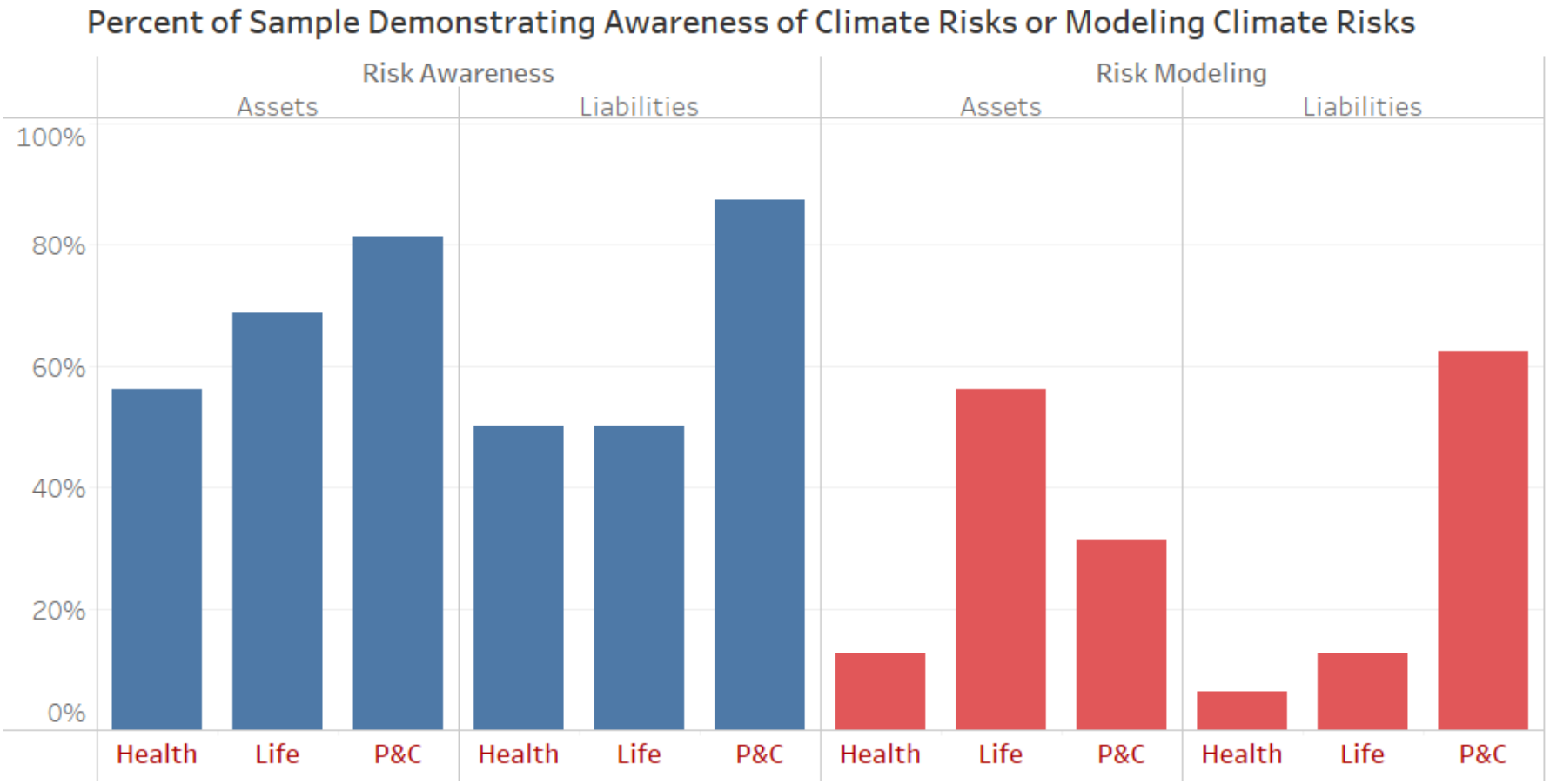

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U.S. Insurance Industry
Climate Risk Financial Disclosures

- Health:
  - 50% of health insurers in the sample discuss climate-related risks to underwriting and liabilities, but only 6% report attempts to qualitatively or quantitatively assess or model these risks.
- Life: Investment oriented
  - 70% of the sampled disclosures of life insurers specifically identify climate-related investment risks, and 56% report attempts to assess or model (either qualitatively or quantitatively) the potential impact of climate-related risks on their investment portfolios.

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U.S. Insurance Industry
Climate Risk Financial Disclosures

- P&C:
  - Relative to other types of insurers, P&C insurers were more likely to have established a governance framework to address climate-related risks, as well as a strategy and risk management process to assess and manage the risk.
  - More likely to have identified metrics and targets related to climate risks and opportunities

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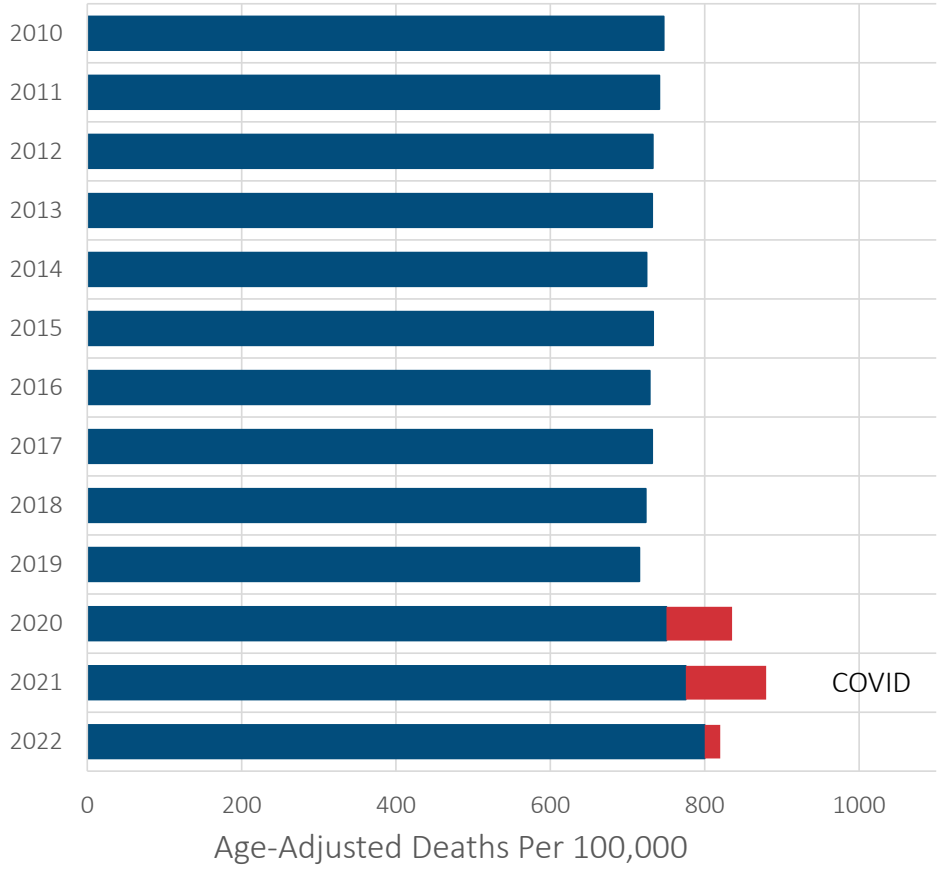
Population and Insured Mortality Update

Mortality and
Longevity

The Overarching Story

Population Trends

- 2019: 715 Deaths per 100,000
- 2020: 835 Deaths per 100,000
  - 16.8% increase over 2019
- 2021: 880 Deaths per 100,000
  - 5.3% increase over 2020
- 2022: 811 Deaths per 100,000
  - 7.8% decrease over 2021



SOA Research Institute

https://www.cdc.gov/nchs/nvss/vsrr/mortality-dashboard.htm#

Awareness of Chronic Condition causes of death

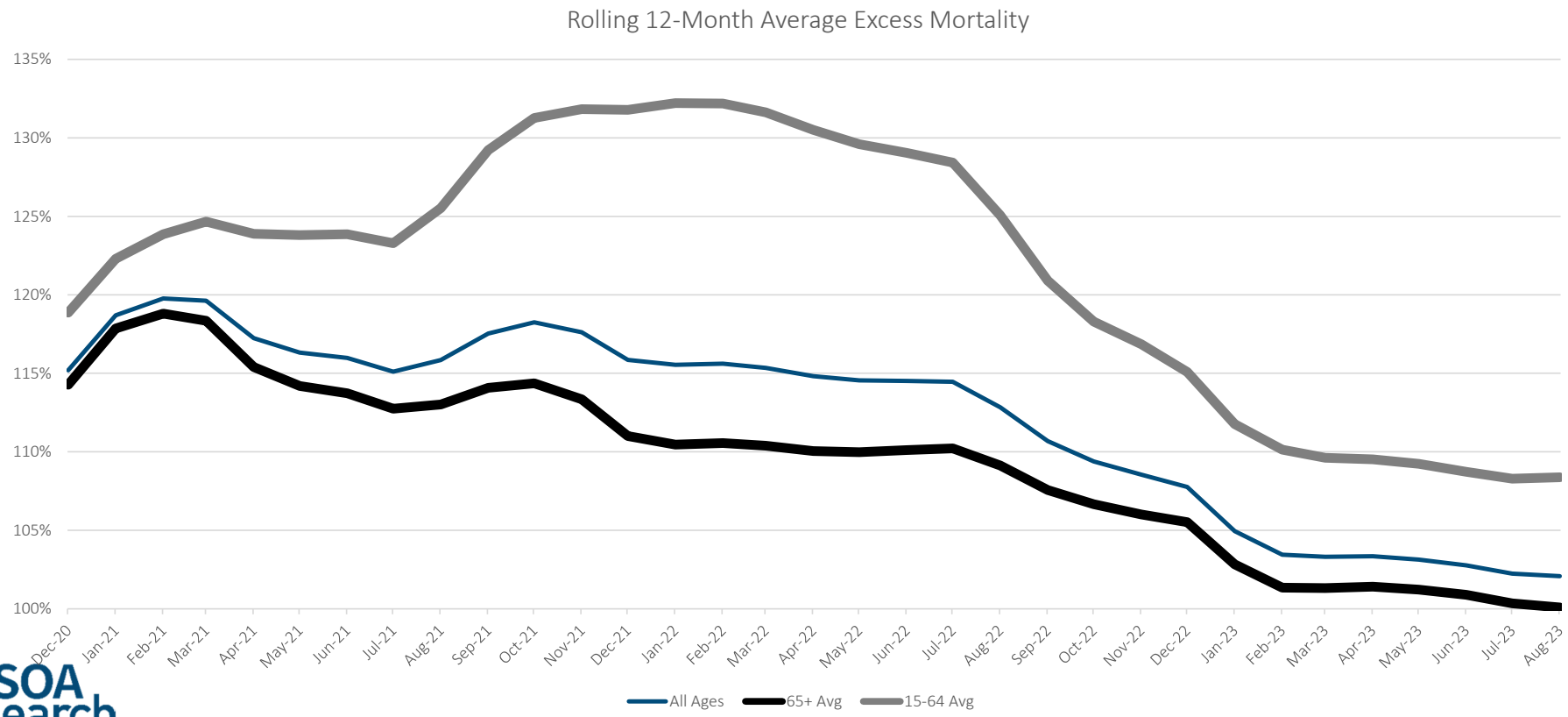
- Rates per 100,000 population; Age-Adjusted across population
- Chronic condition mortality deaths continue to be monitored

Cause of Death	2017	2018	2019	2020	2021	2022	Increase 2022 over 2019
Cancer	152.5	149.1	146.2	144.1	146.6	143.4	(1.9%)
Diabetes	21.5	21.4	21.6	24.8	25.4	24.2	12.0%
Liver	10.9	11.1	11.3	13.3	14.5	13.8	22.1%
Hypertension	9.0	8.9	8.9	10.1	10.7	10.5	17.9%

SOA Research Institute

https://www.cdc.gov/nchs/nvss/vsrr.htm

Population Mortality Trends Reducing Different Level Trends by Age Group



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2019-2021 Variable Annuity Study Update

Aging and
Retirement

2019-2021 Variable Annuity Contract Owner Behavior Experience Study

- Published in November as latest release in ES Pro partnership between SOA Research Institute and LIMRA
- Data reflected in the study:
  - 15 companies
  - 64% market share based on industry new sales
  - Over 500,000 surrenders and $41 billion in contract value withdrawn
- Contract owner behavior studied:
  - Withdrawal activity, including under various GLBs
  - Surrender rates
  - Additional premium deposits

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Universal Life Lapse and Surrender Study Update

Mortality and Longevity

2015-2021 Universal Life Lapse and Surrender Experience Study

- Soon-to-be published as the next release in ES Pro partnership between SOA Research Institute and LIMRA
- Data reflected in the study:
  - 24 companies
  - 83% market share
  - Over 1.3 million lapses/surrenders
- This study is a precursor to a UL Premium Persistency experience study that is expected to be published in first half of 2024

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Discussion

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Additional Life Research

Experience Studies

Project Name	Objective	Link/Expected Completion Date
2019 Quintile Analysis	Publish a report that ranks individual company experience into quintiles	https://www.soa.org/resources/research-reports/2023/us-ind-life-quintile/
2019-20 Fixed Indexed Annuity Study - Report	Examine lapse and the utilization of guaranteed living withdrawal benefit options on fixed index annuity policies under a Joint SOA/LIMRA project and release Tableau visualizations with the observations from the study.	https://www.soa.org/resources/experience-studies/2023/19-20-fia/
COVID-19 Cause of Death Study - 2022 Q2 Update	Publish a semi-annual cause of death study for individual life insurance	https://www.soa.org/resources/research-reports/2023/ind-life-covid-cod/
2023 Life Mortality Improvement	Develop AG38 mortality improvement assumptions for YE 2023	https://www.soa.org/resources/research-reports/2023/ind-life-mort-imp-scale/
COVID-19 Individual Life Mortality Study - Experience Study Report - 2022 Q3	Complete a mortality study assessing the impact of COVID-19 on Individual Life Insurance.	https://www.soa.org/resources/research-reports/2023/ind-life-covid-mort-landing/
COVID-19 Reported Claims Study - 1Q 2023 Update	Draft a research study reviewing Covid-19 reported deaths by quarter	https://www.soa.org/resources/research-reports/2023/us-ind-life-covid-rca-landing/
GRET for 2024	Develop the Generally Recognized Expense Table (GRET) for 2024	https://www.soa.org/resources/research-reports/2023/2024-gret-recommendation/
COVID-19 Individual Life Mortality Study - Experience Study Report - 2022 Q4	Complete a mortality study assessing the impact of COVID-19 on Individual Life Insurance.	https://www.soa.org/resources/research-reports/2023/ind-life-covid-mort-landing/
2000-2021 U.S. Historical Population Mortality Rates	Publish unsmoothed SSA-Style historical mortality rates for 2000-2021	https://www.soa.org/resources/research-reports/2023/us-historical-mortality/
2019-21 Variable Annuity Guaranteed Living Benefit Utilization Study - Report	Examine the utilization of guaranteed living benefit options on variable annuity policies under a Joint SOA/LIMRA project.	11/15/2023
Group Life COVID-19 Mortality Survey Update - through June 2023	Complete an update on a mortality study assessing the impact of COVID-19 on Group Life Insurance.	11/15/2023
COVID-19 Reported Claims Study - 2Q 2023 Update	Draft a research study reviewing Covid-19 reported deaths by quarter	11/21/2023
2015-21 Universal Life Premium Persistency Study - Report	Analyze the premium persistency for universal life products - Data collection and validation phase	11/27/2023
COVID-19 Cause of Death Study - 2022 Q4 Update	Publish a semi-annual cause of death study for individual life insurance	11/28/2023
ILEC Mortality Experience Report Update for 2018 - 2019	Draft a report updating the ILEC mortality experience reporting for 2019	12/14/2023
2009-2015 Individual Life Experience Committee Lapse and Mortality Study	Study mortality and lapse experience in the database of 2009-2015 individual life experience data and release a report with the findings.	12/15/2023
Life Predictive Mortality Model	The theme is around the sharing and warehousing of PA tools and information, similar to a data science environment.	12/29/2023
US Population Mortality Observations: Updated with 2022 Experience	Explore observations from the release of the 2022 U.S. population mortality data.	2/14/2024

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Practice Research

Project Name	Objective	Link/Expected Completion Date
International Comparison of Regulatory Requirements Study Note; 2021.08	Capital Adequacy Regulatory Requirements in Life Insurance across 4 key models in the US, Canada, EU and Bermuda.	https://www.soa.org/resources/research-reports/2023/regulatory-capital-adequacy-four-jurisdictions/
Expert Opinion on Impact of COVID-19 on Future Mortality - Survey 2	Survey panel of experts on short and mid term thoughts on future population and insured mortality.	https://www.soa.org/resources/research-reports/2023/covid-impact-future-mortality-us/
Unhealthy Longevity	Examine differences in mortality/longevity between impaired vs healthy lives.	https://www.soa.org/resources/research-reports/2023/unhealthy-longevity-us/
2023 MIM Update	Enhance MIM-2021 with additional data and guidance	https://www.soa.org/4aa1fe/globalassets/assets/files/resources/research-report/2023/mortality-improvement-model.pdf
Challenges and Opportunities with Rethinking Fairness Metrics for Life Insurance Processes: An Actuarial Perspective	Summarize the challenges and complexities with defining and measuring fairness for life insurance products and processes.	11/13/2023
2023 Living to 100	Produce body of research to help with old age mortality modeling and projection and research to support the needs of an increasing aging population.	11/17/2023
Accelerated Underwriting Survey and Impact of COVID in Underwriting	Update prior survey and explore the way insurers have adapted their underwriting practices	11/17/2023
Ethics and AI 2023 Update	This report will highlight the ethical risks arising from the application of Artificial Intelligence (AI) in actuarial practice and to have tools to use to identify and manage it, **with a new additional focus on the fast-growing use of generative AI tools**. This paper provides a technical overview of the tools and disciplines currently in AI as well as the forces at work that financial institutions such as insurance companies are using to modernize their analytical processes.	12/5/2023
Mortality and Race	Summarize available literature on mortality and race and discuss actuarial aspects.	12/6/2023
Maternal Mortality	Study maternal mortality in US and compare to other countries	12/6/2023
National-Level Mortality Data SSA Versus NCHS Mortality Trend Discrepancies	Create credible resource for actuaries to determine appropriate U.S. population data source to use for a specific actuarial application.	12/29/2023
2022 Mortality by socioeconomic category update	Update mortality by socioeconomic lifetables with 2020 data and examine the impact of COVID 19 on socioeconomic mortality trends	12/31/2023
Comparison of 2015 VBT to Socioeconomic decile mortality	Examine life insurance VBT vs NCHS mortality by socioeconomic category.	12/31/2023
Cardiovascular Disease	Examine cardiovascular disease mortality trends	12/31/2023
Statistical Approaches for Imputing Race and Ethnicity	Outline the various approaches for statistically imputing race and ethnicity in the U.S. along with their strengths and weaknesses to help familiarize actuaries with these techniques.	2/29/2024

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Agenda Item 15

Hear an Update from the Academy Council on Professionalism and Education
(No Materials)

Agenda Item 16

Hear an Update from the Academy Life Practice Council

Life Practice Council Update

Amanda Barry-Moilanen
Policy Analyst, Life

Life Actuarial Task Force (LATF) Meeting

November 30, 2023

American Academy of Actuaries

Academy Webinars and Events

- **Recent**
  - PBR Bootcamp: Combination Products
  - PBR Bootcamp: Hedge Modeling
  - PBR Bootcamp: Reinsurance
  - Academy Annual Meeting: Envision Tomorrow
- **Upcoming**
  - PBR Bootcamp: VM-31 as Seen by Regulators
  - In-person PBR Bootcamp (stay tuned!)

Recent Activity

- Delivered comments to the Valuation Manual (VM)-22 (A) Subgroup on the July 2023 Exposure Draft of the VM-22 Standard Projection Amount (SPA).
- In collaboration with the Academy's Casualty Practice Council, delivered comments to the Colorado DOI on proposed regulations on unfairly discriminatory testing practices.
- C1 Subcommittee Chair, Steve Smith, and Senior Life Fellow, Nancy Bennett, presented to the Valuation of Securities (E) Task Force on principles for structured securities modeling.

American Academy of Actuaries

Ongoing Activity

- Educational material on economic scenario generators and acceptance criteria for LATF
- Annual Life and Health Law Valuation Manual will be released in January, 2024
- Revisiting the covariance methodology in life RBC
- Updating the Asset Adequacy Analysis Practice Note
- Developing a Non-Guaranteed Elements Practice Note

Thank you

Questions?

For more information, please contact the Academy's life policy analyst, Amanda Barry-Moilanen (barrymoilanen@actuary.org)

American Academy of Actuaries

Agenda Item 17

Discuss Revision to the VM-20, Requirements for Principle-Based Reserves for Life Products, Future Mortality Improvement Rates and Application
(No Materials)

Agenda Item 18

Consider Adoption of Request for Life Knowledge Statements for US Appointment Actuaries, Illustration Actuaries, and Qualified Actuaries

TO: Bill Michalisin, Executive Director, AAA
Ken Kent, Past President, AAA
Lisa Slotznick, President, AAA
Darrell Knapp, President-Elect, AAA

FROM: Rachel Hemphill, Chair, Life Actuarial (A) Task Force
Craig Chupp, Vice-Chair, Life Actuarial (A) Task Force

RE: Request for Life Knowledge Statements for US Appointed Actuaries, Illustration Actuaries and Qualified Actuaries

DATE: November 30, 2023

In light of planned changes to the required educational material for the Society of Actuaries (SOA) fellowship tracks, the Life Actuarial (A) Task Force (LATF) finds that it is necessary to formally outline the knowledge statements necessary for life actuaries signing certain statements of actuarial opinion, including for actuaries serving as appointed actuaries, as illustration actuaries, and as qualified actuaries for principle-based reserves. To this end, LATF requests that the AAA recommend knowledge statements that must be met by life actuaries signing such statements of actuarial opinion. In particular, this would address the US regulatory content that is necessary to be able to adequately fulfill each of these roles. However, the list would not be limited to regulatory content, as a clear, comprehensive list of knowledge statements for US life actuaries fulfilling these critical roles would broadly support the robustness and reliability of these actuarial opinions. We anticipate that the knowledge statements may vary by practice area, notably for long-term care actuarial opinions, and request your input on where such variances are necessary or appropriate. In addition, as the actuaries opining in these areas often rely on a number of other actuaries to complete supporting work, we request that the AAA similarly formally outline knowledge statements for US life actuaries working in asset-liability matching, valuation, and pricing. Once a comprehensive set of knowledge statements is developed, we would also request the AAA's input as to how the knowledge statements could be met, including what should be satisfied through tested material vs. what may be met through self-study and the AAA's opinion on which knowledge statements are adequately met by exams currently offered by actuarial organizations (e.g., SOA or Canadian Institute of Actuaries). We request your input on this item by December 31, 2024, so that LATF may thoroughly consider it in advance of the Fall 2025 SOA educational updates. We appreciate the AAA's role supporting the professional responsibility of US practicing actuaries.

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Agenda Item 19

Hear an Update from the Insurance Compact's
Product Standards Committee
(No Materials)

Agenda Item 20

Other Matters
(No Materials)

