MEETING MATERIALS
SUPPLEMENTAL PACKET

LIFE ACTUARIAL (A) TASK FORCE

August 11-12, 2024

NAIC SUMMER NATIONAL MEETING

August 11-12, 2024

TABLE OF CONTENTS

PAGE

3 Agenda Item #6: Hear a Presentation on GOES Model Office Testing

43 Agenda Item #8: Additional ACLI Resource on the Admissibility of Negative IMR

53 Agenda Item #13: Hear an Update from the Academy Life Practice Council

Agenda Item 6

Hear a Presentation on GOES Model Office Testing

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MODEL OFFICE GOES FIELD TEST

Impact to VM-20 and VM-21 results

August 11, 2024

A business of Marsh McLennan

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TABLE OF CONTENTS

ID	SECTION TITLE	PAGE
1	GOES FIELD TEST SCENARIOS	4
2	VM-20 MODEL OFFICE RESULTS	7
3	VM-21 MODEL OFFICE RESULTS	13
4	VM-20 APPENDIX	21
5	VM-21 APPENDIX	30

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GOES FIELD TEST SCENARIOS

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FIELD TEST SCENARIO SETS

Model office testing was performed on the AIRG scenario set, GOES Field Test scenario sets 1-5 as applicable, and the alternative baseline

Scenario Set	Description	Starting yield curve				
		3-mo	1-yr	10-yr	20-yr	30-yr
AIRG	AIRG as of 12/31/2023	5.40%	4.79%	3.88%	4.20%	4.03%
FT1 GOES Baseline	Conning scenarios as of 12/31/23	*Same as AIRG*				
FT2 Low Rate Shock	Conning scenarios with a starting UST yield curve as of 3/9/20 but with 12/31/23 starting credit spreads	0.33%	0.31%	0.54%	0.87%	0.99%
FT3 Up Rate Shock	Conning Scenarios with a starting UST yield curve as of 10/31/89 but with 12/31/23 starting credit spreads	8.61%	7.76%	7.93%	N/A	7.98%
FT4 Normal Yield Curve	Conning scenarios with a starting UST yield curve as of 12/31/04 but with 12/31/23 starting credit spreads	2.22%	2.75%	4.24%	4.85%	N/A
FT5 Down Equity Shock[1]	Conning scenarios as of 12/31/23 (same as Field Test 1)	*Same as AIRG / baseline*				
FT6 Alternative Baseline	Conning scenarios as of 12/31/23 but with the alternative yield curve fitting proposed by ACLI	*Same as AIRG / baseline*				

1. Scenario Set 5 was not run for VM-20 given it would have no impact to Term or ULSG model office results as there are no equities modeled
Source: *https://naic.conning.com/scenariofiles*

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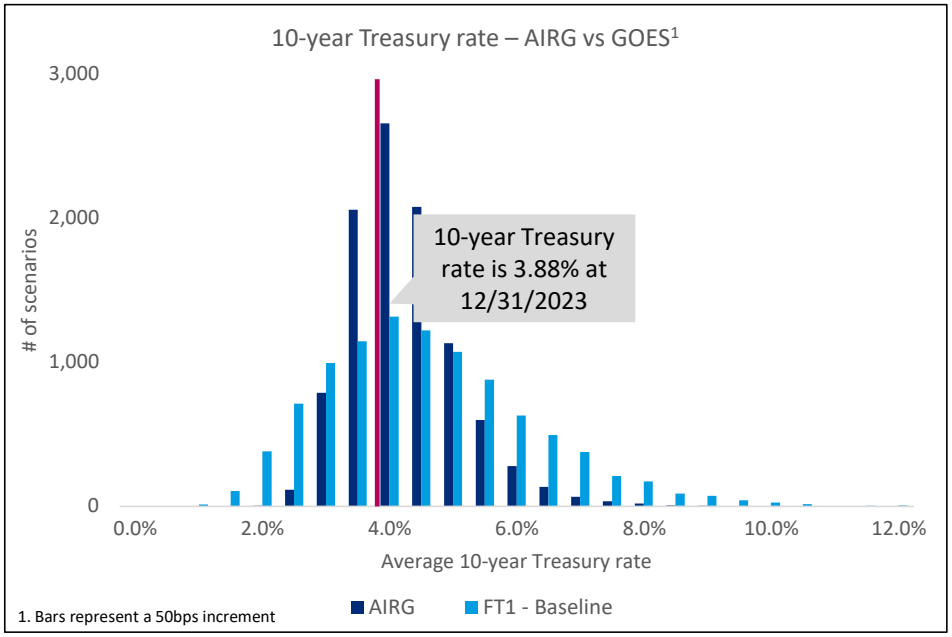
COMPARISON OF GOES AND AIRG SCENARIO SETS: INTEREST RATES AND EQUITY RETURNS

Volatility of interest rates across the 10,000 scenario set is increased under the GOES; **median equity growth rates are well aligned** between GOES and AIRG but **tail scenarios are significantly more adverse** under the GOES

Dispersion of average 10-year Treasury rates over 30 years of projection



Comparison of gross wealth factor ("GWF") by percentile and year ((GOES FT1 / AIRG) – 1)

	1-yr	5-yr	10-yr	15-yr	20-yr	25-yr	30-yr	50-yr
Min	22%	-43%	-62%	-77%	-81%	-70%	-64%	-47%
1%	-2%	-10%	-20%	-21%	-30%	-24%	-24%	-33%
2.50%	-2%	-4%	-10%	-10%	-14%	-17%	-19%	-21%
5%	-1%	-1%	-4%	-4%	-8%	-12%	-12%	-14%
10%	0%	-1%	-1%	-3%	-3%	-6%	-5%	-10%
25%	1%	2%	3%	2%	1%	0%	-1%	-4%
50%	2%	3%	3%	3%	2%	2%	3%	2%
75%	1%	1%	2%	1%	2%	1%	1%	0%
90%	0%	-1%	-2%	-1%	-3%	-2%	-2%	-2%
95%	-1%	-3%	-2%	-6%	-5%	-6%	-7%	-4%
97.50%	-1%	-5%	-4%	-7%	-10%	-9%	-9%	-6%
99%	-3%	-7%	-9%	-10%	-13%	-11%	-14%	-3%
Max	-2%	-19%	-24%	-15%	-5%	-37%	-38%	82%

GOES scenarios are showing increased interest rate volatility and lower equity growth rates in the tail in comparison to AIRG

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VM-20 RESULTS

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EXECUTIVE SUMMARY: VM-20 MODEL OFFICE GOES IMPACT ANALYSIS

The impact of the enhanced ESG under GOES is amplified for the SERT scenario set due to increased volatility and deterministic shocks; the SR is less impacted given offsetting impacts within the CTE70 scenarios reserve

Analysis performed

Leveraged Term and ULSG model office to produce and analyze the impact of GOES on the calculation of the:

1. Deterministic Reserve ("DR")
2. Stochastic Exclusion Ratio Test ("SERT")
3. Stochastic Reserve ("SR")

Analyzed changes in VM-20 reserves and exclusion test calculations, consistently with field test requirements. A 1,000 scenario subset was picked based on the significance criteria and all results were produced as of the 12/31/2023 valuation date.

Key takeaways

1 Deterministic applications are more impacted by changes in the ESG
The SERT scenario set is showing higher rate volatility than under the AIRG, which leads to amplified shocks in the non-baseline scenario and an increase to the DR and SERT results under the GOES

2 The SERT has a ratio that was determined based on the AIRG scenarios and may need to be revisited
The 6% SERT ratio was developed under the AIRG and may no longer produce expected results given the higher rate volatility magnifies the impact of the shocks applied and drives the SERT up for the Term and ULSG model office

3 Applications using the complete set are reasonably close to the AIRG results at the CTE70 level
The increased rate volatility of the GOES produces a higher CTE98 given only the few extreme scenarios are considered. At the CTE70 level, unlike for VAs there is no CSV flooring at the scenario reserve level under VM-20 and the decrease in reserves for less extreme outcomes mitigates the movement of the SR between the two ESGs.

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VM-20 MODEL OFFICE DESCRIPTION

Model assumptions and product features were selected based on industry benchmarks to be a simplified representation of products currently offered

Projection model details	▪ **Term:** 20-year term policies issued in 2018
	▪ **ULSG:** Universal life with shadow design lifetime secondary guarantee issued in 2020
	▪ Time 0 reserves held in cash and reinvested at the start date of projection
	▪ Reinvestment strategy uses 50% A/AA corporate bonds
	  ▪ **Term**: 2-year bonds
	  ▪ **ULSG**: 10-year bonds

Best estimate assumptions	▪ Follows industry benchmark assumptions ▪ Mortality experience is 100% credible with 25 years of sufficient data ▪ UL crediting rate is dynamic and based on NAER less a spread, varying for each stochastic scenario
Prudent estimate assumptions	▪ VM-20 prescribed mortality margins based on credibility and sufficient data period ▪ **Term:** 100% shock lapse after level-term period ▪ **ULSG:** Minimal lapse when policy maintained in-force by NLG (i.e. CSV = 0)

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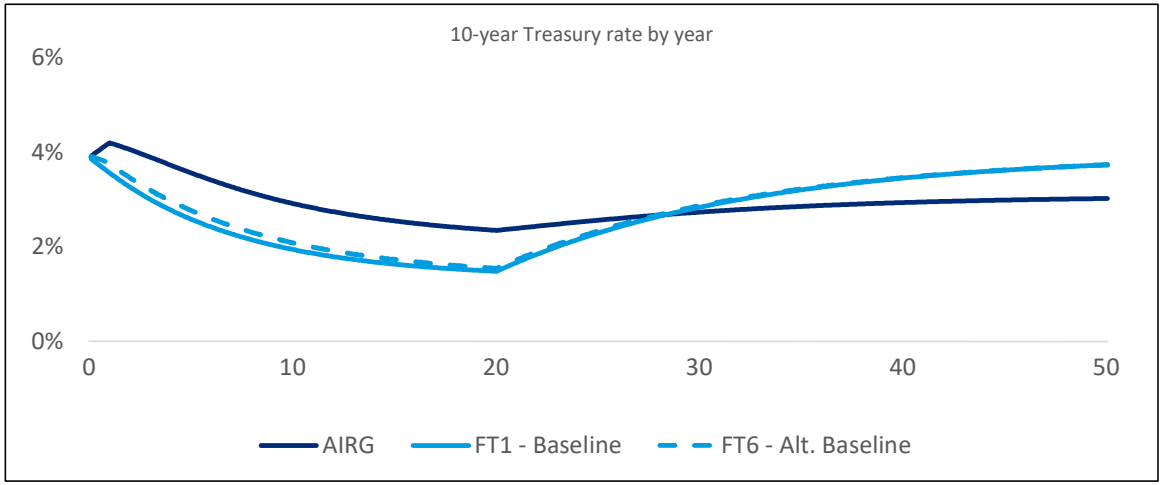
DETERMINISTIC RESERVE – BASELINE SCENARIO IMPACT

The Deterministic Reserve ("DR") is produced using scenario 12 of the SERT scenario set

Term and ULSG Results (000s)

Scenario Set	Term DR	Change from AIRG	ULSG DR	Change from AIRG
AIRG	108		2,325	
FT1 Baseline	129	+19%	2,879	+24%
FT6 Alt. Baseline	134	+24%	2,765	+19%

SERT Scenario #12 (DR)



Commentary

- Per VM-20 Appendix 1 the DR scenario (#12) **shocks Treasury rates for years 1-20** and should be **one standard deviation** from the baseline scenario
- The **volatility of GOES** scenarios result in a significantly **larger downward shock** than under AIRG
- **Long-term rates are higher** in the GOES scenario sets than AIRG
- There is minimal impact to results between the GOES FT1 baseline and FT6 alternative baseline
- **Starting assets are held in cash and reinvested at time 0.** The use of 2-year bonds for Term (10-year bonds for ULSG) allows the analysis to reflect the impact of differences in the yield curve at multiple durations; **more robust Asset-Liability Matching ("ALM") practices would mitigate impacts**
- As a result of the significantly lower rates in earlier durations, GOES baseline scenarios are producing a roughly **20% increase to the DR** for both Term and ULSG

The GOES DR scenario has significantly lower Treasury rates for years 1-20 and results in an increase to the DR for Term and ULSG

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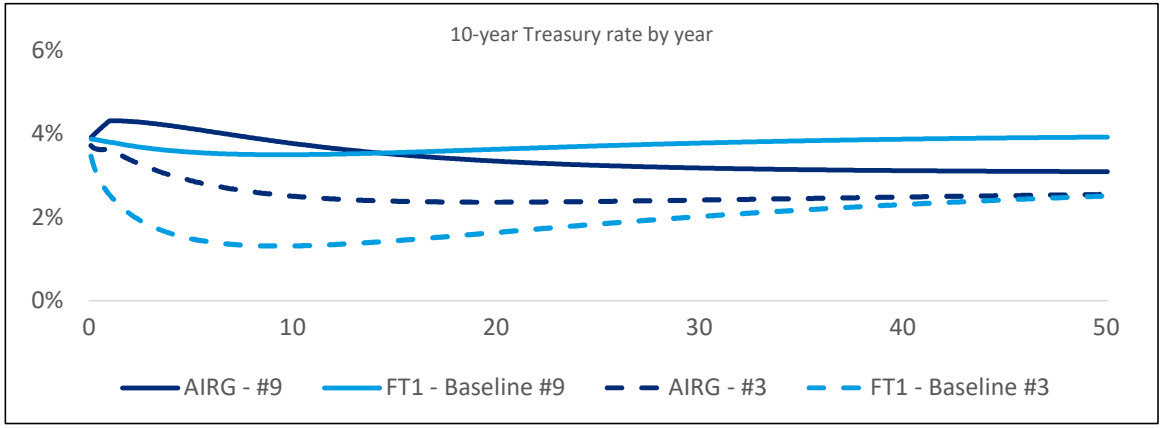
SERT RESULTS – BASELINE

SERT results across the AIRG and GOES Field Test sensitivity scenarios are summarized in the table below, the passing threshold is 6%

Term and ULSG results (000s)

	Term		ULSG	
Scenario Set	Max reserve (#3 pop down)	SERT ratio	Max reserve (#3 pop down)	SERT ratio
AIRG	95	**3.6%**	1,625	**8.6%**
FT1 Baseline	129	**6.3%**	2,281	**19.0%**
FT6 Alt. Baseline	136	**6.6%**	2,240	**20.2%**

SERT #9 – Baseline vs SERT #3 pop down



Commentary

- Under GOES, the **baseline SERT scenario (#9)** which is an un-shocked yield curve, is showing slightly **lower Treasury rates in early projection years** and **higher Treasury rates in later years**, due to a higher mean reversion parameter
- Per VM-20 Appendix 1, the **pop down scenario** is described as having an **interest rate shock** selected to maintain the cumulative shock at the 10% level.
- The **wider dispersion** of Treasury rates under GOES results in a **significantly larger shock to Treasury rates**
- The **maximum reserve** calculation for the SERT is **increased significantly** and results in **higher SERT ratios** than under AIRG for the same liability profile
- The determination of the **SERT ratio may need to be reviewed** or the **scenario generation process may need to be further calibrated** to ensure the Exclusion Test's objectives are appropriately met

Similarly to the DR scenario, the SERT baseline (#9) and pop down (#3) scenario sets are showing a wider dispersion of rates than AIRG

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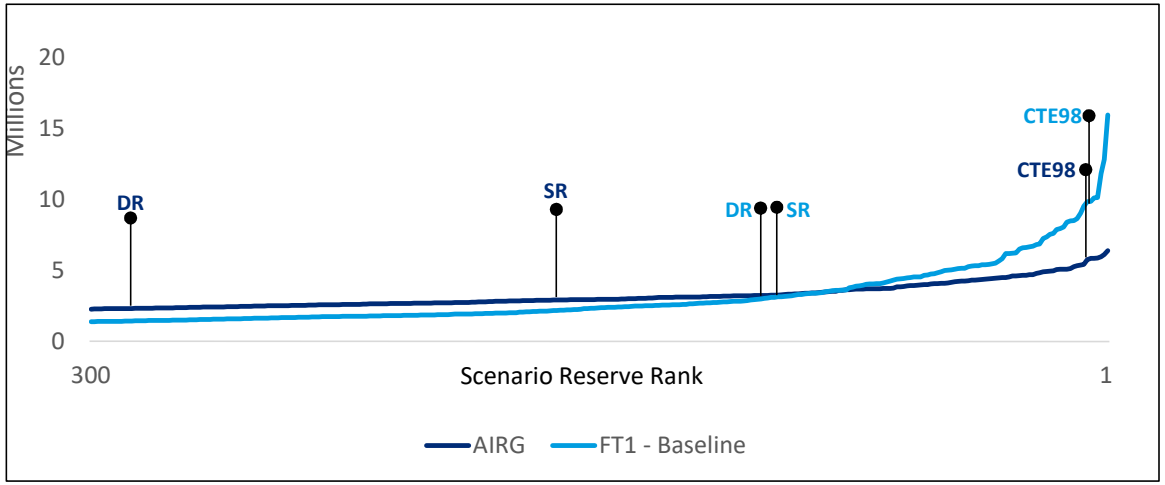
STOCHASTIC RESERVE – BASELINE SCENARIO IMPACT

The Stochastic Reserve ("SR") was produced using a 1,000 scenario subset of the AIRG and GOES scenario sets

ULSG Results (000s)

Scenario Set	DR	Change from AIRG	SR	Change from AIRG	CTE98	Change from AIRG
AIRG	2,325		3,229		5,417	
FT1 Baseline	2,879	+24%	3,167	-2%	9,336	+72%
FT6 Alt. Baseline	2,765	+19%	2,847	-12%	8,247	+52%

CTE70 Scenario Reserves



Commentary

- The GOES scenarios set are producing results that are **largely consistent with AIRG at the CTE70 level**
- The **spread between the "worst" and "best" CTE70 scenario** is much **wider under GOES**, explained by the broader range of yield curve paths
- For nearly **two thirds of the CTE70 scenarios**, the **AIRG is producing higher reserves than under GOES**
- The deep **tail scenarios are significantly more severe under GOES**. In comparison to the AIRG, the CTE98 increases over 70% for FT1 and 50% for FT6
- Given there is **no scenario reserve flooring under VM-20**, The sharp **increase in tail scenario reserves** is partially offset by the small **favorable impact from scenarios below VaR90** where AIRG produced higher reserves than GOES
- Under GOES, the **SR is higher than the DR** by a significantly **smaller margin than under AIRG**, driven by the strengthening of the DR

The impact of the sharp increase in deep tail scenarios is mitigated by the decrease in less adverse scenarios included in the CTE70

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VM-21 RESULTS

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EXECUTIVE SUMMARY: VM-21 MODEL OFFICE GOES IMPACT ANALYSIS

The targeted model office was used to draw insights into field test results and develop a better understanding of how the GOES algorithm impacts projections under a range of starting economic conditions

Analysis performed

Leveraged prior archetype analysis to select 3 key cohorts to analyze under the new field test scenario sets:

1. Mature business / Strong guarantee / At-the-money
2. New business / Strong guarantee / Out-of-the-money
3. New business / Weak guarantee / In-the-money

Produced CTE70 and CTE98 results to analyze changes in VM-21 reserves and capital requirements, consistently with field test requirements. A 1,000 scenario subset was picked based on the significance criteria and all results were produced for the 12/31/2023 valuation date.

Key takeaways

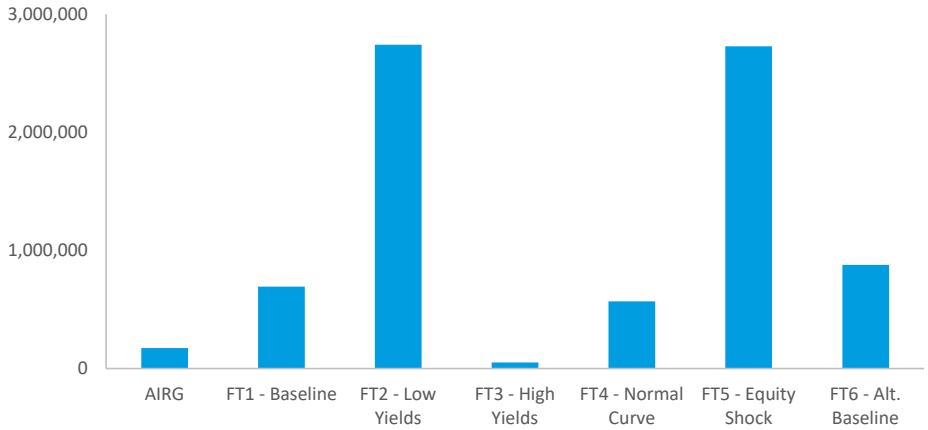
1 *FT1 vs AIRG* **FT1 produces higher reserves than the AIRG:** Analysis of tail scenario confirmed that accumulated Gross Wealth Factors ("GWF") are lower in the FT1 results than in the AIRG scenarios and interest rates are lower in earlier years, both of which lead to higher CTEs

2 *FT2-5 vs FT1* **Sensitivity scenario sets produced impacts consistent with expectations:** Lower yield curves lead to higher reserves due to lower reinvestment income, and vice versa; lower equity returns increase reserves due to guarantees becoming more in-the-money

3 *Alternative baseline vs FT1* **Alternative baseline produces higher reserves than FT1:** The proposed adjustments to the fit of the yield curve produced higher reserves, given that reinvestment rates are tied to the 10-year Treasury rates and longer tenors do not impact reinvestment rates

CTE70 (adjusted) in excess of CSV by scenario set (New / Strong / OTM)

Economic scenarios: AIRG, GOES Scenario Sets 1-5, alternative baseline



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MODEL COMPONENTS AND FUNCTIONALITY

Component	Description of functionality
Liability modeling	• Liability cash flows for model office comprised of the following product features: – Base variable annuity contract and a variety of GMxB (GLWB, GMDB, GMIB) with typical features and charges • Modeled on a direct basis only (i.e., without reinsurance)
Asset modeling	• Guardrail VM-21 prescribed strategy**:** 10-year bonds with ratings A and AA consistent with the guardrail prescribed under VM-21
Calculations	• Outer loop cash flows under best estimate assumptions and input deterministic scenarios • Pre-tax asset and liability projections under input stochastic scenarios reflecting all cashflows under prudent best estimate and VM-21 prescribed assumptions • Inforce asset iteration at valuation date under input stochastic scenarios to achieve no GPVAD • Fair value of living benefit riders on annual timesteps to support implicit hedging approach
Assumption sets	• Best estimate • Prudent best estimate • VM-21 standard projection prescribed
Hedging	• Employs the "cost of reinsurance" method (i.e., implicit method) in the best efforts run, option cost is charged at time 0 and rider fees and claims are removed
Reporting	• Stochastic reserve (CTE70 pre-tax under adjusted and best efforts hedge) • Standard projection add-on under CTEPA method (CTE70 under prescribed in excess of SR, subject to CTE70 – CTE65 unfloored buffer) • C3 at 100% RBC (CTE98 pre-tax and subsequent calculations). Note: C3 will be unsmoothed

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DRIVING CHARACTERISTICS: SPECIFICATIONS

In-force archetypes were created using a model office creation toolkit and varied by driving characteristics. A wide range was used in determining variation in driving characteristics in order to capture a range of impacts to compare against field testing

Characteristic	Variations	Values
GMWB guarantee strength	Weak guarantee	**Rollup rate:** 3% **Income rates:** 4.0% - 5.5% based on attained age
	Strong guarantee	**Rollup rate: 7**% **Income rates:** 5.5% - 7.0% based on attained age
Hedging	Hedged	**Hedge modeling:** Implicit method
	Unhedged	**Hedge modeling:** None
Block maturity	New	**Issue year:** 2022 **Average age:** 66 **Percentage of GMWB contracts taking income:** 20%
	Mature	**Issue year:** 2007 **Average age:** 75 **Percentage of GMWB contracts taking income:** 75%
Moneyness	OTM / ATM / ITEM	**OTM:** Benefit Base is 90%-100% of AV **ATM:** Benefit Base is 100%-110% of AV **ITM:** Benefit Base is 110%-140% of AV
Other	Static inputs	**M/F sex split:** 50/50 **Q/NQ split:** 65/35 **Equity allocation:** 70%

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IN-FORCE ARCHETYPES: GMWB/GMDB COMBO

16 different GMWB/GMDB combo archetypes were used in the initial model office testing. 3 cohorts outlined below are the focus for this analysis, based on their representativeness of industry results

Archetype	LB rider	DB rider	Hedging	Guarantee strength	Block maturity	Moneyness
1	Rollup GMWB	ROP GMDB	Implicit	Strong	New	ITM
2	Rollup GMWB	ROP GMDB	Implicit	Strong	New	OTM
3	Rollup GMWB	ROP GMDB	Implicit	Strong	Mature	ITM
4	Rollup GMWB	ROP GMDB	Implicit	Strong	Mature	ATM
5	Rollup GMWB	ROP GMDB	Implicit	Weak	New	ITM
6	Rollup GMWB	ROP GMDB	Implicit	Weak	New	OTM
7	Rollup GMWB	ROP GMDB	Implicit	Weak	Mature	ITM
8	Rollup GMWB	ROP GMDB	Implicit	Weak	Mature	ATM
9	Rollup GMWB	ROP GMDB	None	Strong	New	ITM
10	Rollup GMWB	ROP GMDB	None	Strong	New	OTM
11	Rollup GMWB	ROP GMDB	None	Strong	Mature	ITM
12	Rollup GMWB	ROP GMDB	None	Strong	Mature	ATM
13	Rollup GMWB	ROP GMDB	None	Weak	New	ITM
14	Rollup GMWB	ROP GMDB	None	Weak	New	OTM
15	Rollup GMWB	ROP GMDB	None	Weak	Mature	ITM
16	Rollup GMWB	ROP GMDB	None	Weak	Mature	ATM

Focus for this analysis

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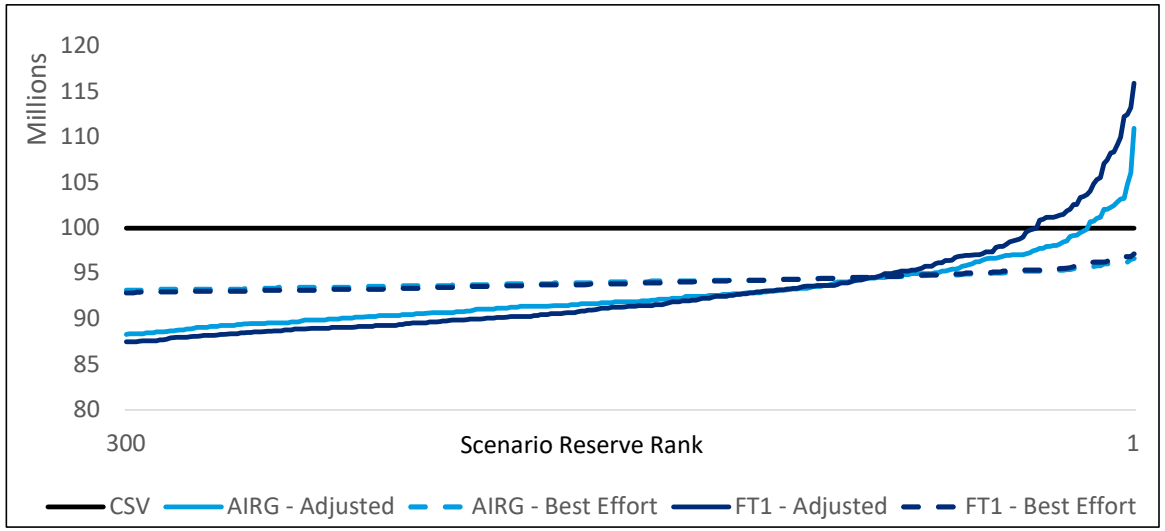
STOCHASTIC RESERVE – BASELINE SCENARIO IMPACT

The Mature / Strong / ATM cohort scenarios reserves for the CTE70 are graphed for AIRG and FT1 under the unfloored adjusted and best effort runs

Unfloored CTE70 adjusted scenario reserve metrics

Scenario Set	CTE70	CTE80	CTE90	CTE95	CTE98
AIRG	93	94	97	99	102
FT1 - Baseline	93	95	99	102	107

Unfloored CTE70 scenario reserves



Commentary

- GOES scenarios are producing **larger adjusted scenario reserves than AIRG for tail scenarios**
- Severity of adverse impact to tail scenarios are the result of **increased volatility to equity returns and Treasury rates under GOES**
  - **Equity returns in tail scenarios are lower** than under the AIRG, leading to increased claims and reduced fees
  - **Treasury rates in tail scenarios are lower than under AIRG and may go negative**, leading to lower investment income and higher discounted claims
  - Deep tail scenarios exhibit low equity returns and Treasury rates
- **CSV flooring at the scenario level has a significant impact under GOES**, preventing impacts from less adverse scenarios from offsetting the increase to tail scenario reserves
- The profile of the underlying inforce may have a significant impact to CTE70 and impact of flooring

Results from the GOES are more adverse than AIRG the further we go in the tail, with a 5% increase to CTE98 adjusted

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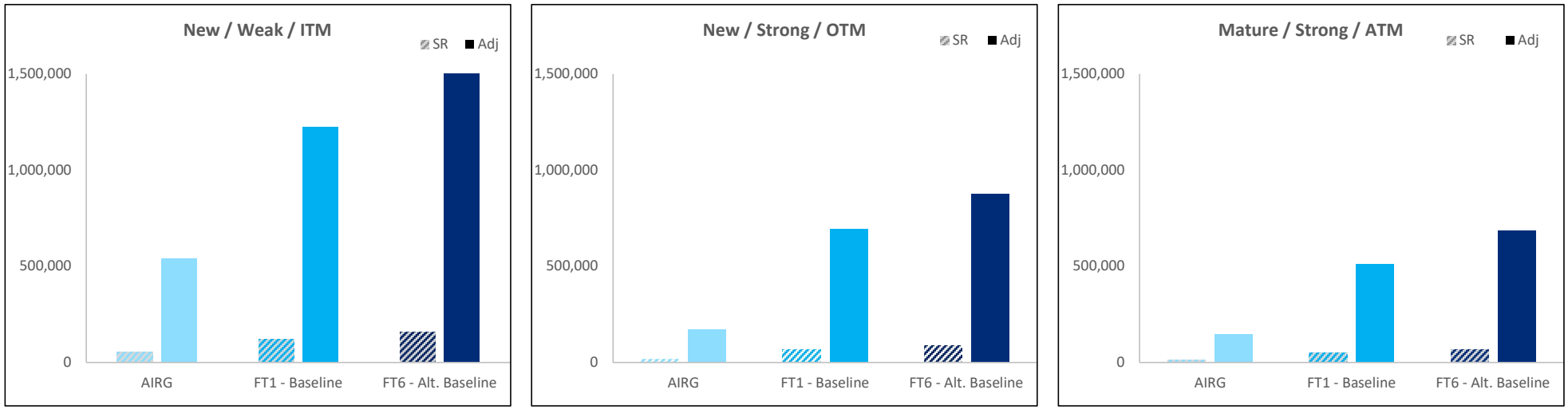
BASELINE SCENARIOS – RESERVES COMPARISON

Comparison of VM-21 reserves in excess of CSV for all three cohorts, outlining the difference between the **AIRG**, the **GOES baseline**, and the **alternative baseline** reserves

VM21 SR and CTE (adjusted) ("Adj") reserves in excess of CSV



CTE70 (adjusted) by archetype (000s)

Archetype	AIRG [A]	GOES FT1 [B]	GOES Alt. Baseline [C]	([B] – [A]) / [A]	([C] – [B]) / [B]
New / Weak / ITM	540	1,223	1,542	126%	26%
New / Strong / OTM	171	693	876	303%	26%
Mature / Strong / ATM	145	509	684	251%	34%

GOES FT1 produces higher reserves than the AIRG as a result of compressed equity returns in the tail and lower Treasury rates in early durations. The alternative baseline produced similar but slightly more adverse results than FT1

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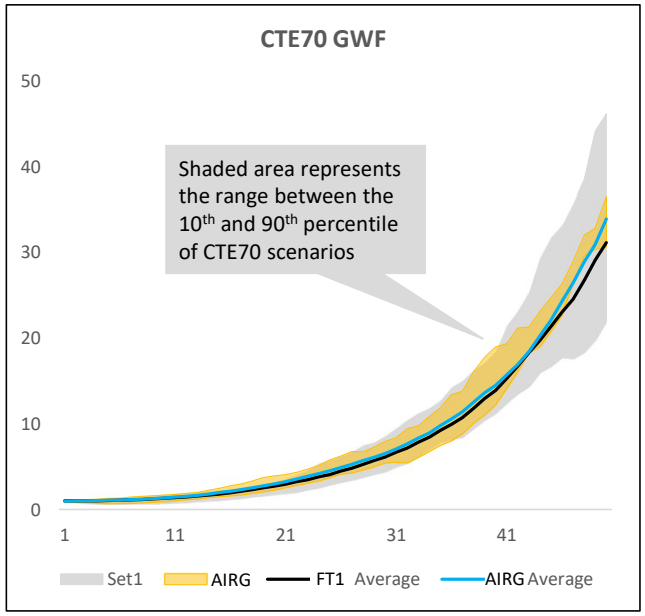
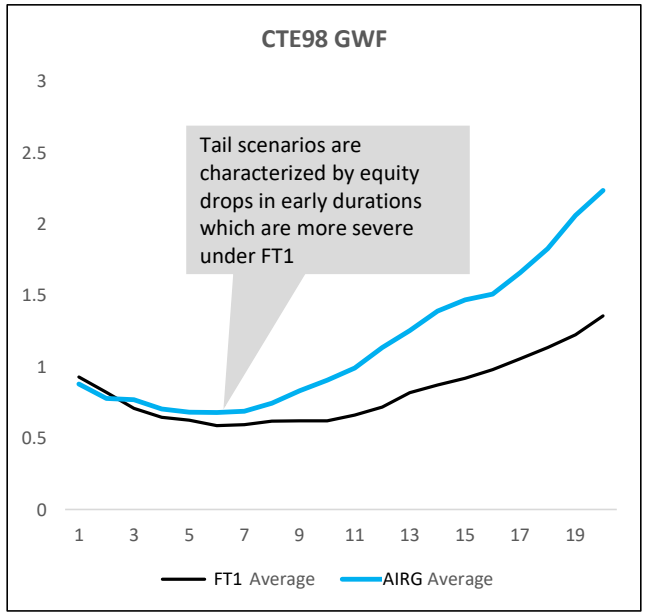
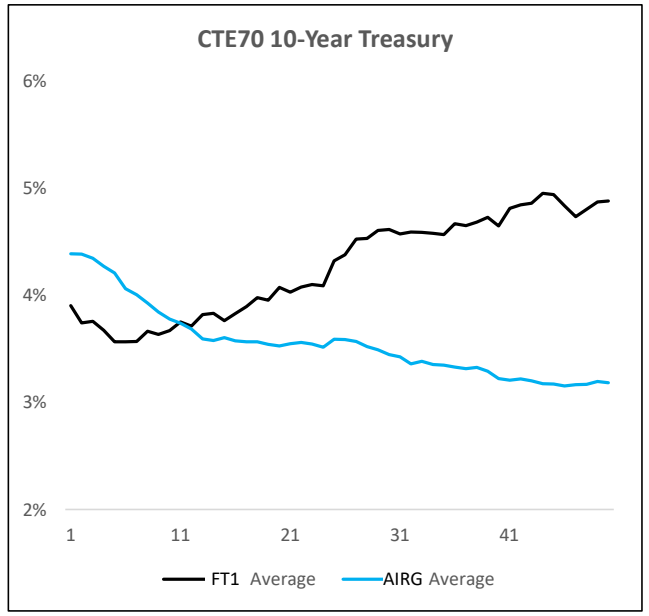
BASELINE SCENARIOS – SCENARIO ANALYSIS – MATURE / STRONG / ATM COHORT

Comparison of average accumulated gross wealth factors ("GWF") and 10-Year Treasury curve for CTE70 and CTE98 scenarios over 50 years of projection for the Mature / Strong Guarantee / ATM cohort

Mature / Strong Guarantee / ATM Cohort







Average equity return from GOES scenarios is similar to AIRG at the CTE70 and CTE98 levels but more disbursed and adverse in the tail; lower GOES rates in earlier years are producing adverse results despite reverting to a higher mean in later years

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VM-20 APPENDIX

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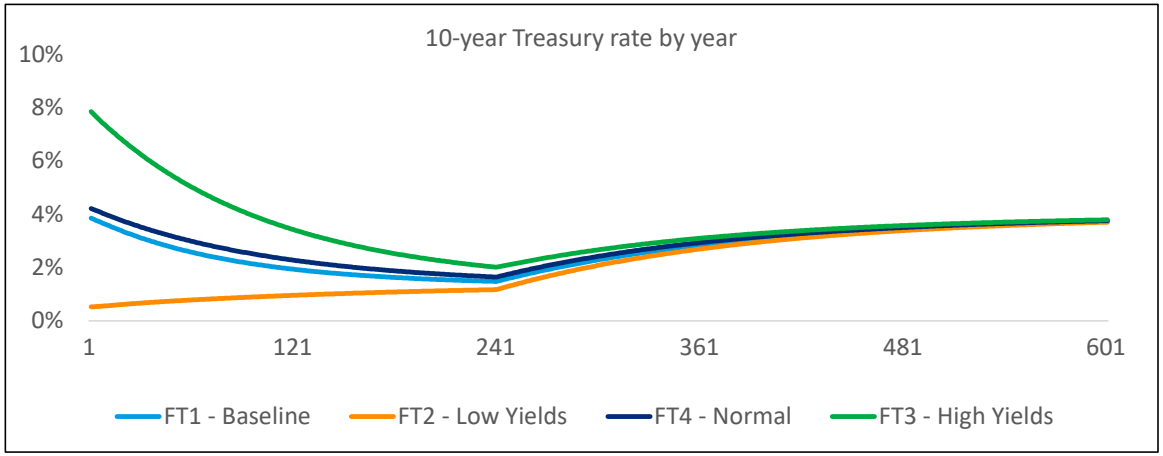
DETERMINISTIC RESERVE – SENSITIVITY IMPACT

The DR for Term and ULSG is sensitive to changes in starting economic conditions as a result of the direct impact to reinvestment rates

Term and ULSG Results (000s)

Scenario Set	Term DR	Change from FT1	ULSG DR	Change from FT1
FT1 Baseline	129		2,879	
FT2 Low Yields	190	+47%	4,908	+70%
FT3 High Yields	66	-49%	1,438	-50%
FT4 Normal	145	+13%	2,579	-10%

SERT Scenario #12 (DR)



Commentary

- Sensitivities represent an immediate **upward/downward shock of 300-400bps** to the yield curve
- Starting conditions have a **magnified impact under the model office testing** given **starting assets are held in cash** and immediately reinvested
- **Long-term rates are consistent** across the GOES scenario sets, having largely the same rates in years 35+
- The normal yield curve results in **lower ULSG DR from increase in 10-year rates**, however the **Term DR increases due to the significant decrease to 2-year rates** in comparison to FT1
- Adverse impact of low rates is amplified on the ULSG block where minimum guarantees are met
- Impacts would be **mitigated by a well-matched ALM strategy**

The GOES sensitivity scenarios are producing results consistent with expectations and commensurate with the level of shock from FT1

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DETAILED SERT RESULTS (1/6)

For the AIRG, the Term SERT is **3.6%** and the ULSG SERT is **8.6%**

	Term		ULSG	
SERT Scenario	Adjusted DR	PV Benefits	Adjusted DR	PV Benefits
1 – Pop up, high equity	17,249	853,419	493,229	5,172,664
2 – Pop up, low equity	17,249	853,419	493,229	5,172,664
3 – Pop down, high equity	95,431	1,032,560	1,625,270	7,021,762
4 – Pop down, low equity	95,431	1,032,560	1,625,270	7,021,762
5 – Up/down, high equity	41,014	901,337	988,137	5,926,786
6 – Up/down, low equity	41,014	901,337	988,137	5,926,786
7 – Down/up, high equity	77,722	996,295	1,152,120	6,337,214
8 – Down/up, low equity	77,722	996,295	1,152,120	6,337,214
9 – Baseline scenario	61,301	953,527	1,094,300	6,171,967
10 – Inverted yield curves	51,209	925,168	1,019,830	6,025,669
11 – Volatile equity returns	61,301	953,527	1,094,300	6,171,967
12 – DR scenario	77,727	987,319	1,411,780	6,634,456
13 – Delayed pop up, high equity	57,939	949,009	650,896	5,610,208
14 – Delayed pop up, low equity	57,939	949,009	650,896	5,610,208
15 – Delayed pop down, high equity	64,140	957,393	1,423,780	6,584,595
16 – Delayed pop down, low equity	64,140	957,393	1,423,780	6,584,595

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DETAILED SERT RESULTS (2/6)

For the GOES FT1 (baseline), the Term SERT is **6.3%** and the ULSG SERT is **19.0%**

	Term		ULSG	
SERT Scenario	Adjusted DR	PV Benefits	Adjusted DR	PV Benefits
1 – Pop up, high equity	3,699	830,460	248,628	4,789,552
2 – Pop up, low equity	3,699	830,460	248,628	4,789,552
3 – Pop down, high equity	128,733	1,120,480	2,281,370	8,196,172
4 – Pop down, low equity	128,733	1,120,480	2,281,370	8,196,172
5 – Up/down, high equity	35,482	897,648	923,877	5,894,201
6 – Up/down, low equity	35,482	897,648	923,877	5,894,201
7 – Down/up, high equity	95,110	1,051,560	1,107,580	6,508,717
8 – Down/up, low equity	95,110	1,051,560	1,107,580	6,508,717
9 – Baseline scenario	67,224	978,862	1,083,370	6,302,588
10 – Inverted yield curves	35,072	891,641	925,357	5,943,389
11 – Volatile equity returns	67,224	978,862	1,083,370	6,302,588
12 – DR scenario	96,739	1,038,730	1,765,260	7,291,807
13 – Delayed pop up, high equity	60,784	969,837	383,767	5,376,755
14 – Delayed pop up, low equity	60,784	969,837	383,767	5,376,755
15 – Delayed pop down, high equity	72,314	986,108	1,924,980	7,362,403
16 – Delayed pop down, low equity	72,314	986,108	1,924,980	7,362,403

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DETAILED SERT RESULTS (3/6)

For the GOES FT2 (low yields), the Term SERT is **1.3%** and the ULSG SERT is **13.2%**

	Term		ULSG	
SERT Scenario	Adjusted DR	PV Benefits	Adjusted DR	PV Benefits
1 – Pop up, high equity	86,437	1,067,910	1,076,410	7,054,036
2 – Pop up, low equity	86,437	1,067,910	1,076,410	7,054,036
3 – Pop down, high equity	159,918	1,222,400	3,397,630	10,406,430
4 – Pop down, low equity	159,918	1,222,400	3,397,630	10,406,430
5 – Up/down, high equity	117,697	1,126,040	2,259,320	8,728,363
6 – Up/down, low equity	117,697	1,126,040	2,259,320	8,728,363
7 – Down/up, high equity	143,737	1,195,310	1,969,770	8,499,278
8 – Down/up, low equity	143,737	1,195,310	1,969,770	8,499,278
9 – Baseline scenario	144,027	1,190,910	2,235,970	8,791,965
10 – Inverted yield curves	98,475	1,076,070	1,828,900	8,079,739
11 – Volatile equity returns	144,027	1,190,910	2,235,970	8,791,965
12 – DR scenario	155,456	1,211,850	3,025,930	9,877,925
13 – Delayed pop up, high equity	137,150	1,181,750	1,143,540	7,390,597
14 – Delayed pop up, low equity	137,150	1,181,750	1,143,540	7,390,597
15 – Delayed pop down, high equity	148,061	1,196,650	3,306,200	10,116,570
16 – Delayed pop down, low equity	148,061	1,196,650	3,306,200	10,116,570

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DETAILED SERT RESULTS (4/6)

For the GOES FT3 (high yields), the Term SERT is **8.3%** and the ULSG SERT is **19.4%**

	Term		ULSG	
SERT Scenario	Adjusted DR	PV Benefits	Adjusted DR	PV Benefits
1 – Pop up, high equity	(33,288)	706,052	72,637	3,704,300
2 – Pop up, low equity	(33,288)	706,052	72,637	3,704,300
3 – Pop down, high equity	77,232	962,188	1,294,460	5,960,121
4 – Pop down, low equity	77,232	962,188	1,294,460	5,960,121
5 – Up/down, high equity	(15,348)	741,923	286,636	4,100,933
6 – Up/down, low equity	(15,348)	741,923	286,636	4,100,933
7 – Down/up, high equity	40,643	887,458	534,501	4,790,656
8 – Down/up, low equity	40,643	887,458	534,501	4,790,656
9 – Baseline scenario	10,110	807,906	427,374	4,475,089
10 – Inverted yield curves	(5,347)	765,194	389,525	4,362,985
11 – Volatile equity returns	10,110	807,906	427,374	4,475,089
12 – DR scenario	38,800	867,187	894,655	5,192,771
13 – Delayed pop up, high equity	5,411	801,510	96,353	4,017,285
14 – Delayed pop up, low equity	5,411	801,510	96,353	4,017,285
15 – Delayed pop down, high equity	14,371	813,713	955,208	5,144,659
16 – Delayed pop down, low equity	14,371	813,713	955,208	5,144,659

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DETAILED SERT RESULTS (5/6)

For the GOES FT4 (normal curve), the Term SERT is **6.6%** and the ULSG SERT is **21.1%**

	Term		ULSG	
SERT Scenario	Adjusted DR	PV Benefits	Adjusted DR	PV Benefits
1 – Pop up, high equity	6,258	849,923	121,181	4,449,371
2 – Pop up, low equity	6,258	849,923	121,181	4,449,371
3 – Pop down, high equity	145,429	1,173,560	2,148,180	7,952,060
4 – Pop down, low equity	145,429	1,173,560	2,148,180	7,952,060
5 – Up/down, high equity	41,613	925,015	701,451	5,456,106
6 – Up/down, low equity	41,613	925,015	701,451	5,456,106
7 – Down/up, high equity	110,728	1,101,590	984,999	6,242,408
8 – Down/up, low equity	110,728	1,101,590	984,999	6,242,408
9 – Baseline scenario	78,484	1,018,640	894,911	5,928,428
10 – Inverted yield curves	57,251	960,937	832,806	5,779,862
11 – Volatile equity returns	78,484	1,018,640	894,911	5,928,428
12 – DR scenario	112,727	1,088,010	1,623,410	6,983,448
13 – Delayed pop up, high equity	71,359	1,008,630	276,677	5,100,664
14 – Delayed pop up, low equity	71,359	1,008,630	276,677	5,100,664
15 – Delayed pop down, high equity	84,220	1,026,810	1,753,520	7,004,933
16 – Delayed pop down, low equity	84,220	1,026,810	1,753,520	7,004,933

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DETAILED SERT RESULTS (6/6)

For the GOES FT6 (alt. baseline), the Term SERT is **6.6%** and the ULSG SERT is **20.2%**

	Term		ULSG	
SERT Scenario	Adjusted DR	PV Benefits	Adjusted DR	PV Benefits
1 – Pop up, high equity	3,105	832,757	182,369	4,625,085
2 – Pop up, low equity	3,105	832,757	182,369	4,625,085
3 – Pop down, high equity	135,689	1,141,120	2,239,610	8,129,965
4 – Pop down, low equity	135,689	1,141,120	2,239,610	8,129,965
5 – Up/down, high equity	36,418	903,522	816,814	5,693,502
6 – Up/down, low equity	36,418	903,522	816,814	5,693,502
7 – Down/up, high equity	101,458	1,070,350	1,059,930	6,412,212
8 – Down/up, low equity	101,458	1,070,350	1,059,930	6,412,212
9 – Baseline scenario	70,605	990,675	999,211	6,144,417
10 – Inverted yield curves	43,427	916,890	888,180	5,886,588
11 – Volatile equity returns	70,605	990,675	999,211	6,144,417
12 – DR scenario	102,269	1,054,930	1,692,090	7,156,675
13 – Delayed pop up, high equity	63,901	981,275	330,632	5,255,209
14 – Delayed pop up, low equity	63,901	981,275	330,632	5,255,209
15 – Delayed pop down, high equity	75,945	998,279	1,837,700	7,201,478
16 – Delayed pop down, low equity	75,945	998,279	1,837,700	7,201,478

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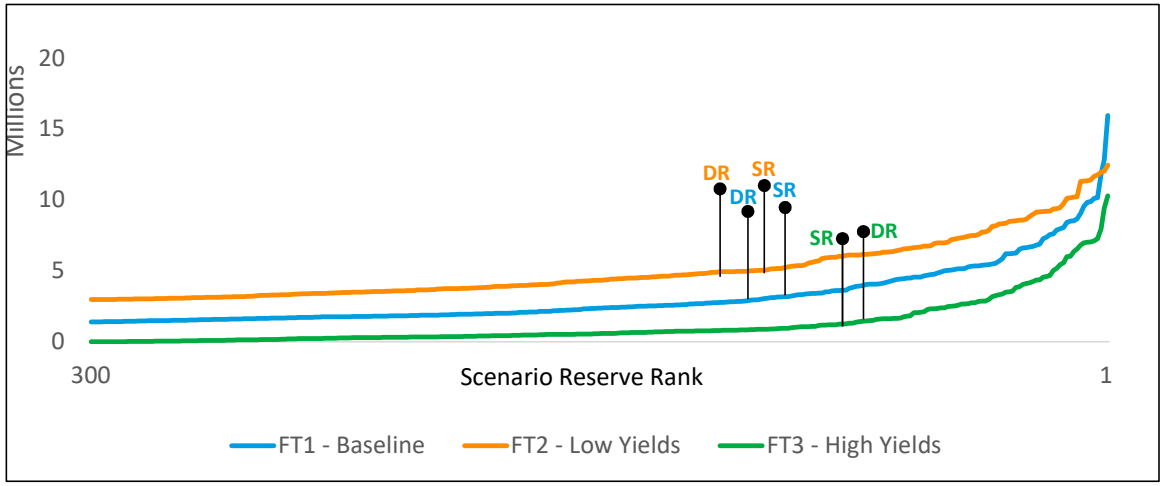
STOCHASTIC RESERVE – SENSITIVITY SCENARIO IMPACT

The Stochastic Reserve ("DR") was produced using the 1,000 scenario subset of the GOES low rate and high rate sensitivity scenario sets

ULSG Results (000s)

Scenario Set	DR	SR (CTE70)	Change from FT1	CTE98	Change from FT1
FT1 Baseline	2,879	3,167		9,336	
FT2 Low Yields	4,908	5,036	+59%	10,556	+13%
FT3 High Yields	1,438	1,237	-61%	6,482	-31%
FT1 Baseline (20Yr)	2,229	2,677	-15%	7,897	-15%

CTE70 Scenario Reserves



Commentary

- Under the GOES **baseline and low rate scenario sets**, the **SR is the dominant reserve** but the DR is producing a similar reserve
- Under the **high rate scenario set, the DR is the binding reserve** and some of the CTE70 scenarios produce a reserve of 0, indicating sufficiency of the DR
- The **severity of the deep tail** in the low rate scenario set is **mitigated by the increase in starting assets**
- The impact of shocks to the starting yield curve is significant at the CTE70 level but reduced at the CTE98 level
- Under an **alternate reinvestment strategy comprised of 20-year bonds**, results stayed largely consistent but the **gap between the DR and SR expanded** reflecting the broader dispersion of rates and impact of flooring

The relationship between the DR and SR is largely maintained across the GOES baseline and sensitivity scenario sets

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VM-21 APPENDIX

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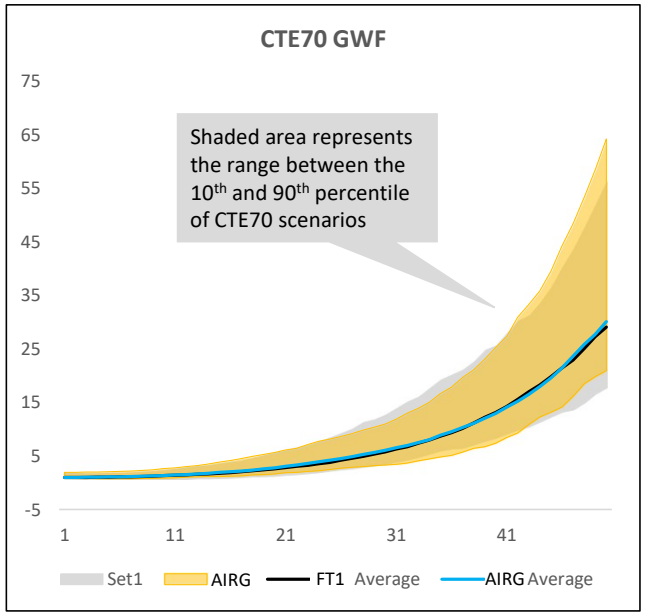
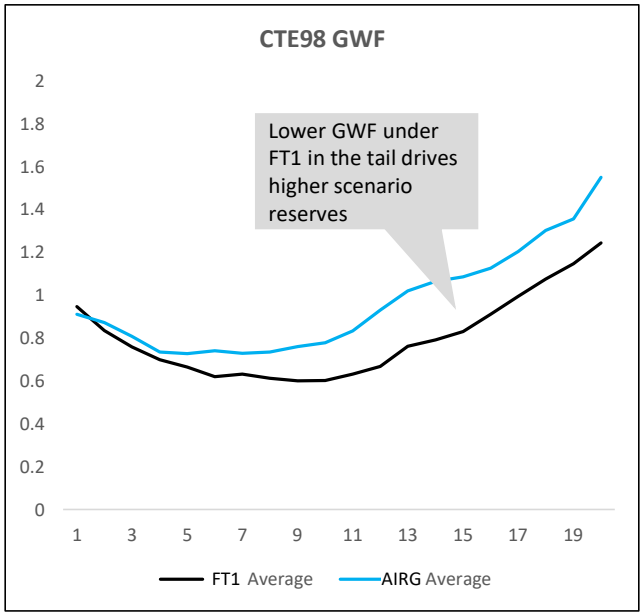
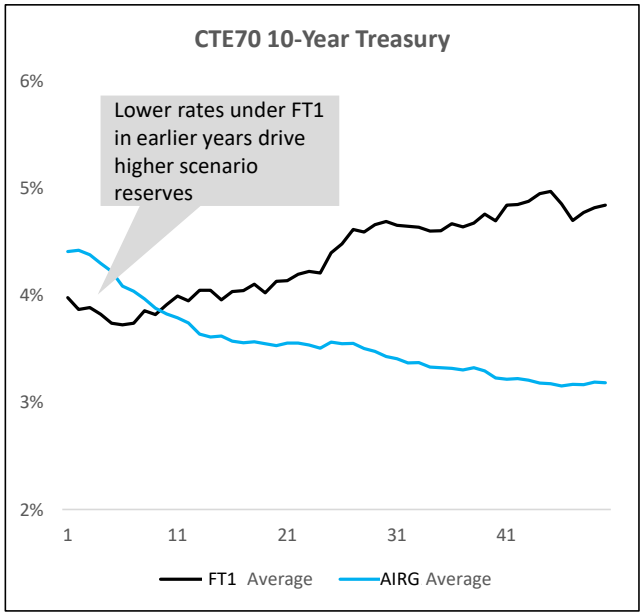
BASELINE SCENARIOS – SCENARIO ANALYSIS – NEW / WEAK / ITM COHORT

Comparison of average accumulated gross wealth factors ("GWF") and 10-Year Treasury curve for CTE70 and CTE98 scenarios over 50 years of projection for the New / Weak Guarantee / ITM cohort

New / Weak Guarantee / ITM Cohort







Average equity return from GOES scenarios is similar to AIRG at the CTE70 level, however tail scenarios are more adverse; lower GOES rates in earlier years are producing adverse results despite reverting to a higher mean in later years

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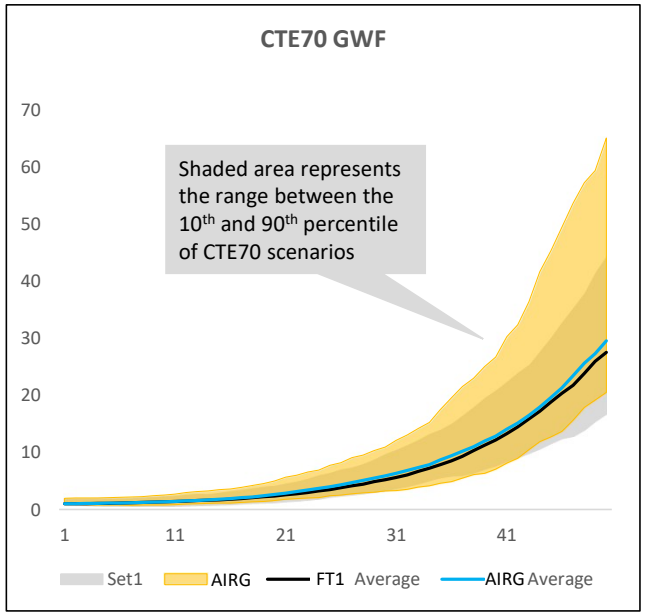
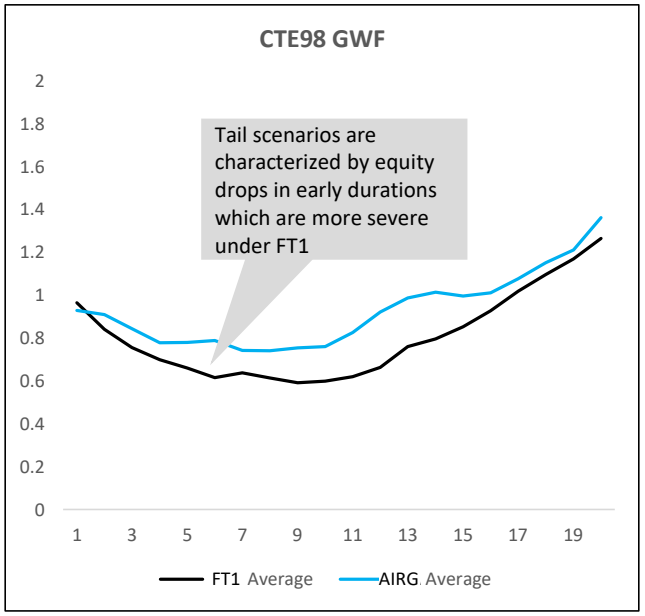
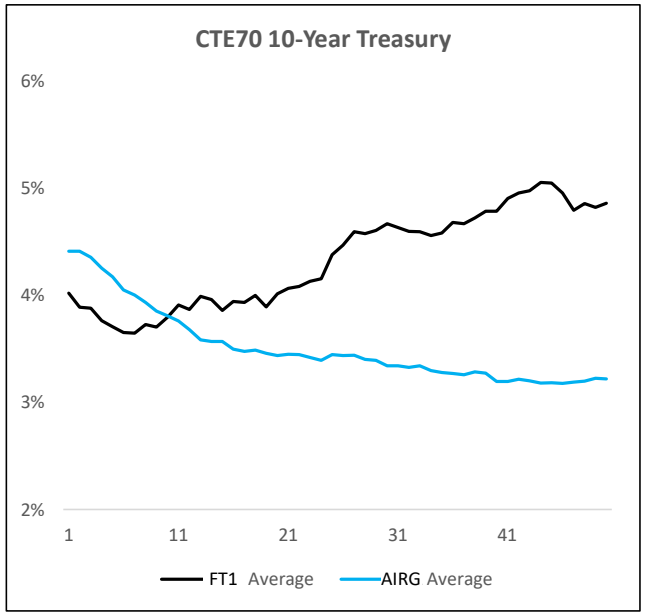
BASELINE SCENARIOS – SCENARIO ANALYSIS – NEW / STRONG / OTM COHORT

Comparison of average accumulated gross wealth factors ("GWF") and 10-Year Treasury curve for CTE70 and CTE98 scenarios over 50 years of projection for the New / Strong Guarantee / OTM cohort

New / Strong Guarantee / OTM Cohort







Average equity return from GOES scenarios is similar to AIRG at the CTE70 and CTE98 levels, however tail scenarios for GOES are more adverse; lower GOES rates in earlier years are producing adverse results despite reverting to a higher mean in later years

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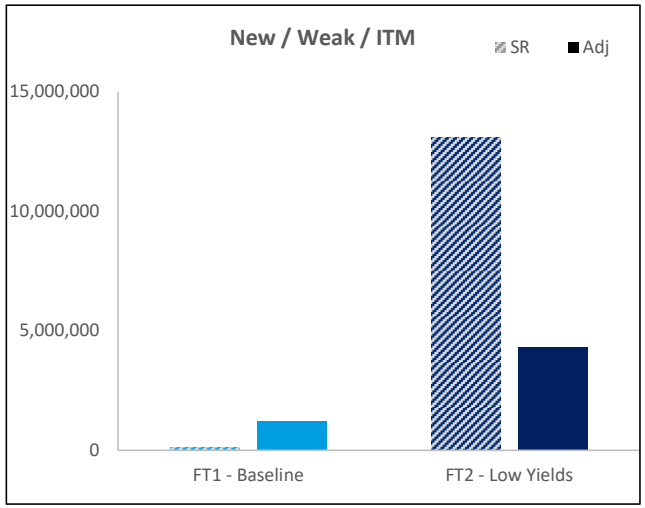
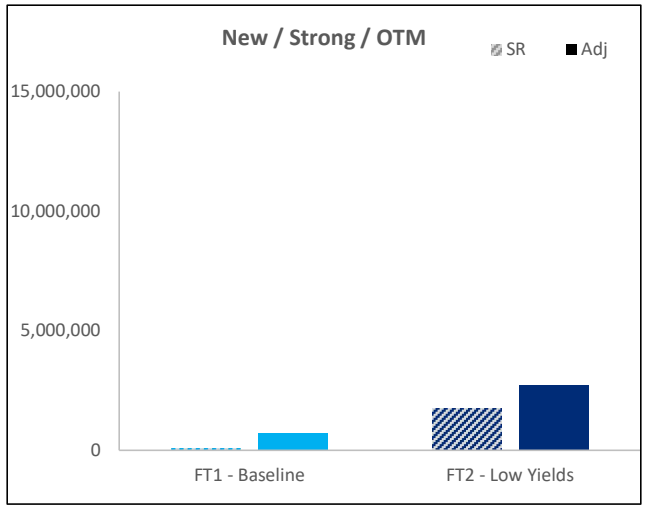
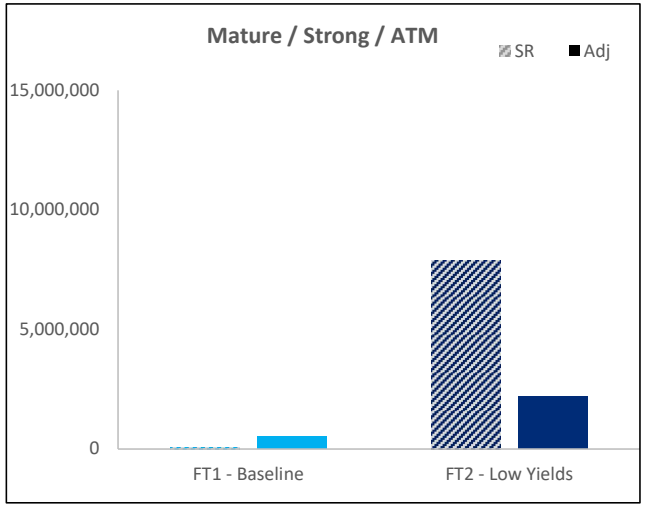
SENSITIVITY SCENARIOS – RESERVES (FT2 – LOW YIELDS)

Comparison of VM-21 reserves in excess of CSV for all three cohorts, outlining the difference between the **GOES baseline**, and the **low starting yield curve** scenario set reserves

VM21 SR and CTE (adjusted) ("Adj") reserves in excess of CSV







CTE70 (adjusted) by archetype (000s)

Archetype	FT1 [A]	FT2 [B]	([B] – [A]) / [A]
New / Weak / ITM	1,223	4,304	251%
New / Strong / OTM	693	2,741	295%
Mature / Strong / ATM	509	2,199	331%

The FT2 scenarios are producing significantly higher reserves than the baseline scenario set due to the compressed yield curve and high prevalence of negative interest rates for sustained periods, implicit hedge results are adversely impacted by the low yields

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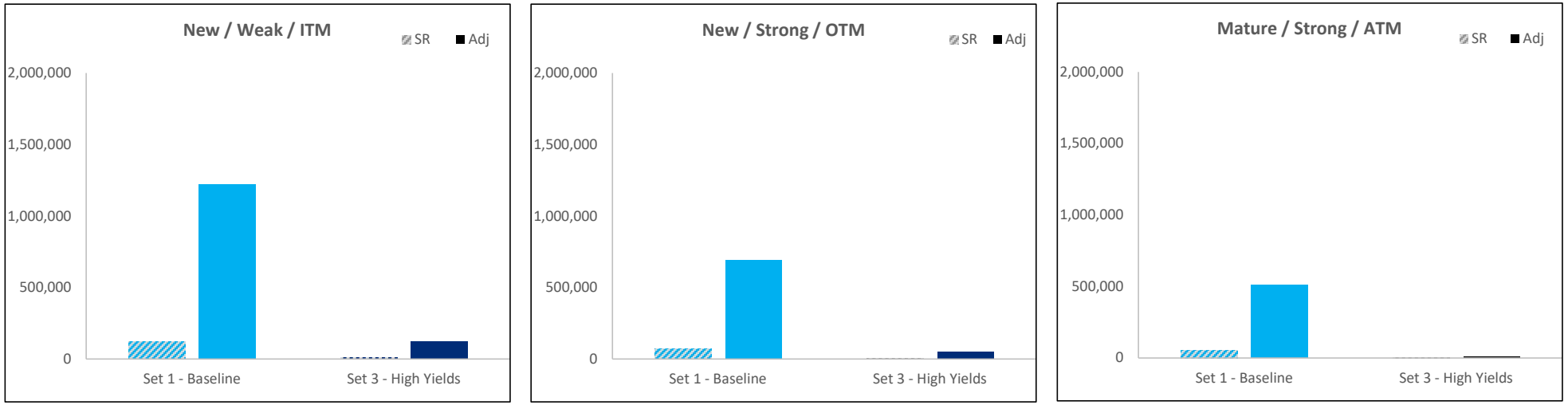
SENSITIVITY SCENARIOS – RESERVES (FT3 – HIGH YIELDS)

Comparison of VM-21 reserves in excess of CSV for all three cohorts, outlining the difference between the **GOES baseline**, and the **high starting yield curve** scenario set reserves

VM21 SR and CTE (adjusted) ("Adj") reserves in excess of CSV



CTE70 (adjusted) by archetype (000s)

Archetype	FT1 [A]	FT3 [B]	([B] – [A]) / [A]
New / Weak / ITM	1,223	121	-91%
New / Strong / OTM	693	50	-93%
Mature / Strong / ATM	509	5	-99%

The FT3 scenarios are producing significantly lower reserves than the baseline scenario set due to the favorable yield curve; we note that a significant portion of scenario reserves are floored at the CSV under this sensitivity

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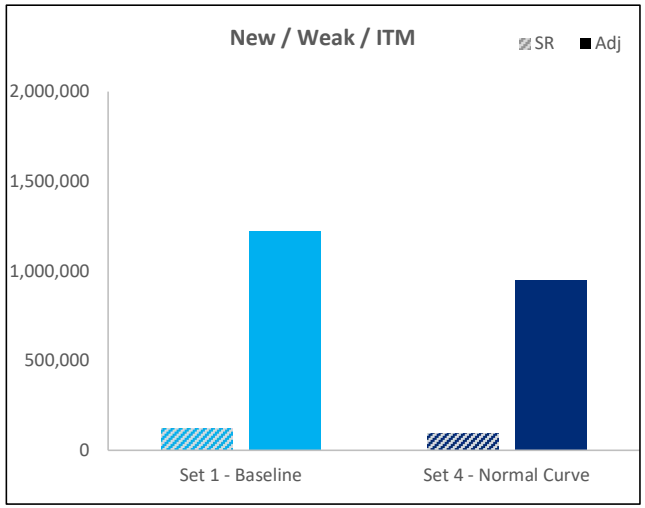
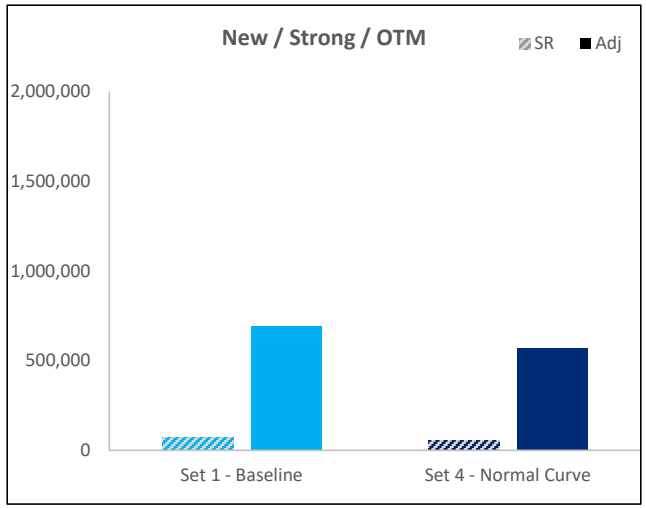
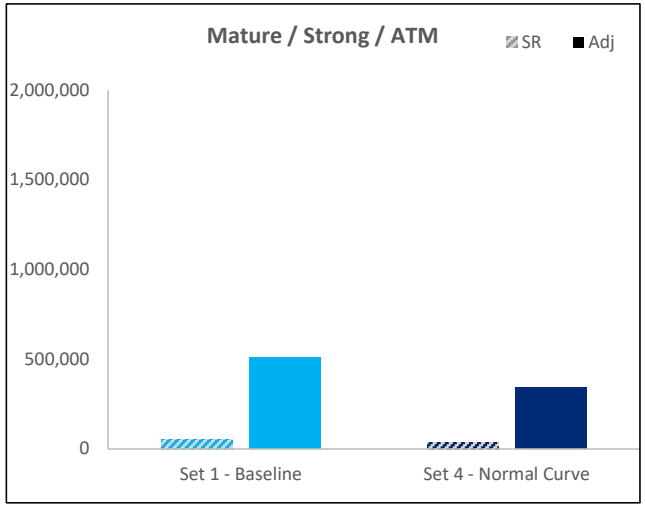
SENSITIVITY SCENARIOS – RESERVES (FT4 – NORMAL CURVE)

Comparison of VM-21 reserves in excess of CSV for all three cohorts, outlining the difference between the **GOES baseline**, and the **non-inverted yield curve** scenario set reserves

VM21 SR and CTE (adjusted) ("Adj") reserves in excess of CSV







CTE70 (adjusted) by archetype (000s)

Archetype	FT1 [A]	FT4 [B]	([B] – [A]) / [A]
New / Weak / ITM	1,223	947	-23%
New / Strong / OTM	693	556	-18%
Mature / Strong / ATM	509	339	-33%

The FT4 scenarios are producing slightly lower reserves than the baseline scenario set due to slightly higher yields from the non-inverted curve; the reinvestments are anchored to 10-year A & AA Corporate Bond returns

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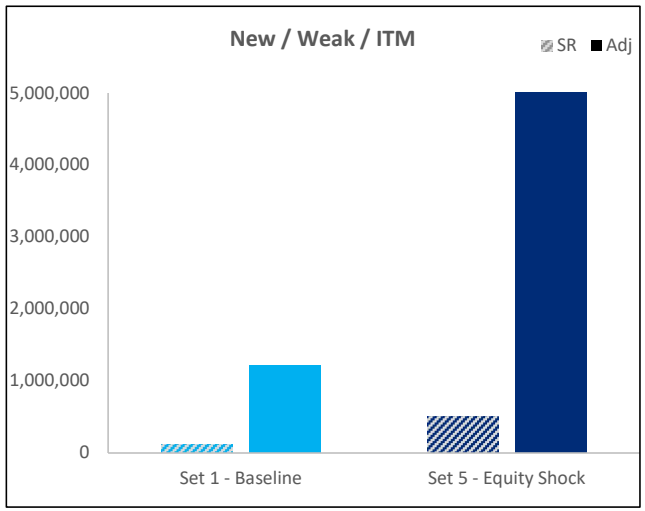
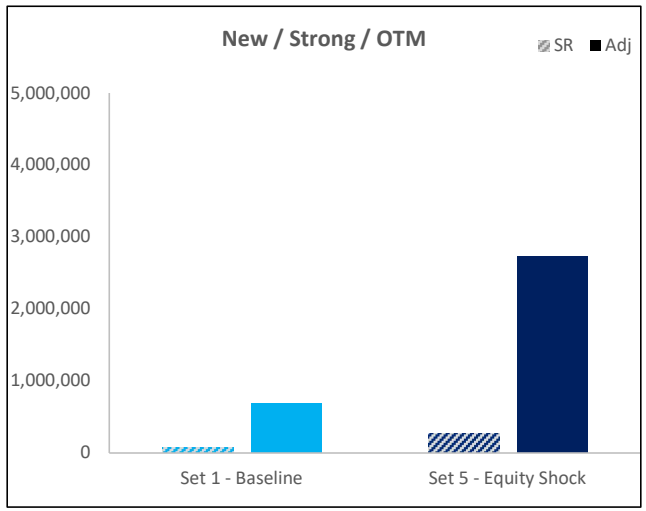
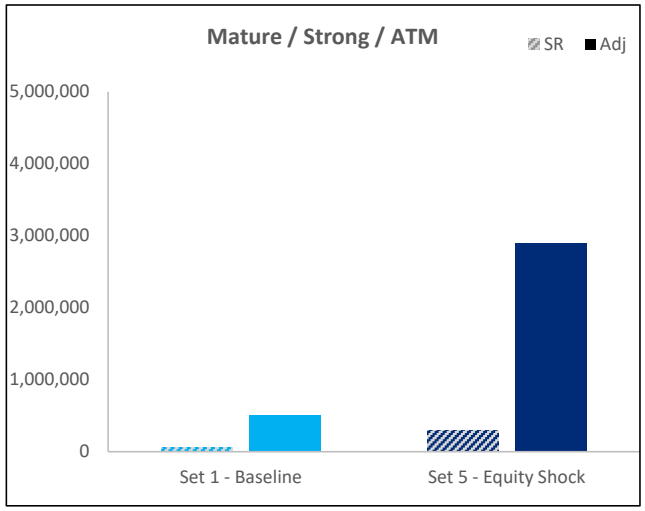
SENSITIVITY SCENARIOS – RESERVES (FT5 – EQUITY SHOCK)

Comparison of VM-21 reserves in excess of CSV for all three cohorts, outlining the difference between the **GOES baseline**, and the **25% equity shock** scenario set reserves

VM21 SR and CTE (adjusted) ("Adj") reserves in excess of CSV







CTE70 (adjusted) by archetype (000s)

Archetype	FT1 [A]	FT5 [B]	([B] – [A]) / [A]
New / Weak / ITM	1,223	5,016	310%
New / Strong / OTM	693	2,726	293%
Mature / Strong / ATM	509	2,899	469%

A 25% decrease to the S&P 500 market has a significant impact to results due to the significant immediate increase to the moneyness and decrease in fee base, pushing more scenario reserves beyond the CSV floor

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Agenda Item 8

Additional ACLI Resource on the Admissibility of

Negative IMR

Safeguards to ensure that negative IMR remains a sound asset

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Negative IMR and Asset Adequacy Analysis

- We believe there are adequate safeguards in place to ensure that allowing negative IMR does not cause any unrecognized reserve or capital inadequacies.
- We view "appropriate allocation" as requiring that any IMR that is allowed on a statutory balance sheet be reflected in asset adequacy analysis
- The examples that follow illustrate the effectiveness of the Asset Adequacy Testing (AAT) safeguard in ensuring company solvency even with an admitted negative IMR.

Assumptions:

- **Assets**
  - 10-year Zero-Coupon Bond
  - Par Value: $1,000
  - Interest Rate: 3%,
- **Liabilities**
  - 10-year 3% endowment maturing for 1,344
    - Cashflow matched with current assets
  - Formulaic reserves: $1,000
  - Valuation Rate: 3%,
- **Assume no AAT deficiency prior to sale of assets**

1

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Balance Sheet, Income Statement View

Portfolio Balance Sheet	12/31/22	12/31/32
Assets		
Bonds	1,000	1,344 (1)
Total Assets	1,000	1,344
Liabilities		
Policy Reserves	1,000	1,344 (2)
AAT Reserves	0	0
IMR Liability	0	0
Total Liabilities	1,000	1,344

Portfolio Income Statement	12/31/22 – 12/31/32
Income	
Net Investment Income before IMR	344 (1)
IMR Amortization	0
Benefits and Expenses	
Benefits	0
Addition to Reserves	344 (2)
Net Income (loss)	**0**

(1) 10-year zero coupon bond with 3% interest rate would earn $344 in investment income.

(2) Policy reserves with valuation rate of 3% would increase by $344 over ten years until maturity.

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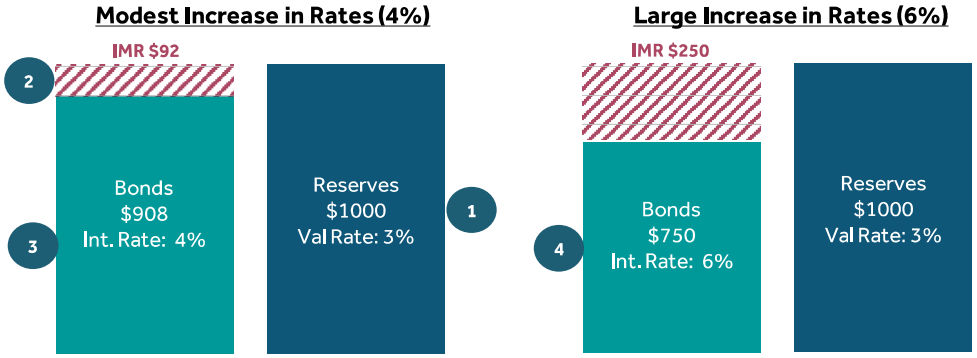
Asset Adequacy Analysis[1] is an effective safeguard in all rate environments

1. Formulaic reserves are unchanged at $1,000. There are no surrenders in this scenario.

2. Invested assets that are yielding a return are reduced by the amount of negative IMR that is admitted into statutory accounting.

3. Original bonds of $1,000 at 3% are sold at a capital loss and the proceeds are reinvested at a higher rate (e.g. 4%). Theoretically, the IMR plus the higher yield assets should recreated the original 3% assets keeping the AAT outcome the same.

4. If rates were higher at the time of the asset sale, a larger IMR would be generated which would further reduce the amount of investable assets reflected in AAT, but the reinvested assets would have a higher yield to preserve the AAT outcome.



	At Issue	Rates move to new level	
Interest Rates	3%	4%	6%
PV(Assets) at time = 0	$1,000	$908	$750
Liability CF at Maturity (in 10 years)	$1,344	$1,344	$1,344
Asset CF at Maturity (in 10 years)	$1,344	$1,344	$1,344
Reserve Inadequacy at time = 0	**$0**	**$0**	**$0**
IMR	**$0**	**-$92**	**-$250**

AAT is an effective safeguard in ensuring that the admitted IMR can be supported by margins of the inforce block. In this example, there should be no impact to surplus at the higher interest rates.

3

1. Asset Adequacy Analysis starts with **assets = liabilities**

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Balance Sheet, Income Statement View (Rates at 4% on 12/31/22)

Portfolio Balance Sheet	12/31/22 Before Asset Sale	12/31/22 After Asset Sale	12/31/32
Assets			
Bonds	1,000	908	1,344 (1)
Total Assets	1,000	908	1,344
Liabilities			
Policy Reserves	1,000	1,000	1,344
AAT Reserves	0	0 (3)	0
IMR Liability	0	(92) (2)	0
Total Liabilities	1,000	908	1,344

Portfolio Income Statement	12/31/22 – 12/31/32
Income	
Net Investment Income before IMR	436 (1)
IMR Amortization	(92) (2)
Benefits and Expenses	
Benefits	0
Addition to Reserves	344
Net Income (loss)	**0**

1. Original bonds of $1,000 earning 3% are sold at a capital loss and the proceeds are reinvested at a higher rate of 4%. New bonds would earn cumulative investment income of $436 over ten years.
2. Capital losses of $92 is transferred into negative IMR liability which is amortized over ten years. This example assumes negative IMR is an admitted asset.
3. No reserve inadequacy confirmed in asset adequacy analysis. The assets including negative IMR are sufficient to cover the liabilities.

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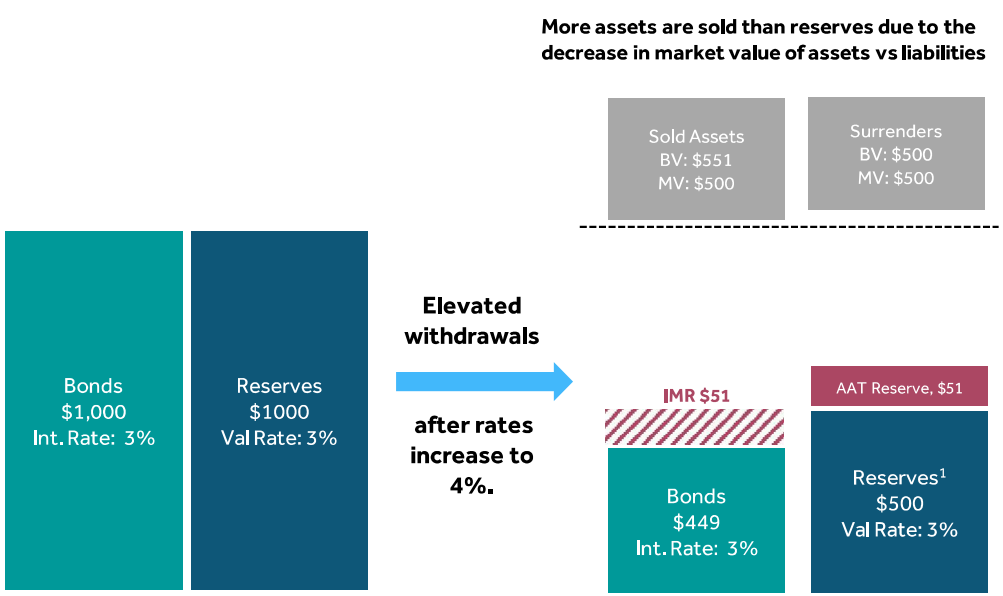
Asset Adequacy Analysis[1] combined with surrender activity

- **When assets are sold to fund excess withdrawals (no reinvestment), the negative IMR generated can be tested through AAT to ensure the IMR combined with the remaining, unsold assets can support the remaining liabilities.**
- **If the IMR cannot be supported (i.e. AAT fails), then the losses will be reflected in surplus.**



	At Issue	Rates move to new level combined with 50% surrender
Interest Rates	3%	4%
PV(Assets) at time = 0	$1,000	$449
Liability CF at Maturity (in 10 years)	$1,344	$672
Asset CF at Maturity (in 10 years)	$1,344	$603
Reserve Inadequacy at time = 0	**$0**	**$51**
IMR	**$0**	**-$51**

In this example, rising rates combined with surrender activity causes AAT to fail.

Surplus is reduced by $51.

1. Asset Adequacy Analysis starts with **assets = liabilities**

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Balance Sheet, Income Statement View (Rates at 4% on 12/31/22)

	12/31/22 Before Asset Sale and Surrender	12/31/22 After Asset Sale and Surrender	12/31/22 After Asset Sale, Surrender and AAT	12/31/32
Portfolio Balance Sheet				
Assets				
Bonds	1,000	449 (1)	449	672 (5)
Extra Assets for AAT	0	0	51 (4)	0
Total Assets	1,000	449	500	672
Liabilities				
Policy Reserves	1,000	500 (2)	500	672
AAT Reserves	0	0	51 (4)	0
IMR Liability	0	(51) (3)	(51)	0
Total Liabilities	1,000	449	500	672
Surplus Balance Sheet				
Surplus Assets	100	100	49 (4)	66

Portfolio Income Statement	12/31/22–12/31/32	
Income		
Net Investment Income before IMR	172	(5)
IMR Amortization	(51)	(3)
Benefits and Expenses		
Benefits	0	
Addition to Reserves	121	(6)
Addition to AAT Reserves on 12/31/22	51	(4)
Net Income (loss)	**(51)**	

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Balance Sheet, Income Statement View (Rates at 4% on 12/31/22)

Balance Sheet	12/31/22 Before Asset Sale and Surrender	12/31/22 After Asset Sale and Surrender	12/31/22 After Asset Sale, Surrender and AAT	12/31/32
Assets				
Bonds	1,000	449 (1)	449	672 (5)
Extra Assets for AAT	0	0	51 (4)	0
Total Assets	1,000	449	500	672
Liabilities				
Policy Reserves	1,000	500 (2)	500	672
AAT Reserves	0	0	51 (4)	0
IMR Liability	0	(51) (3)	(51)	0
Total Liabilities	1,000	449	500	672

Extra assets of $51 would be deducted from a surplus account to support the additional AAT reserves which would result in a surplus impact of **($51)**.

Income Statement	12/31/22 – 12/31/32	
Income		
Net Investment Income before IMR	172	(5)
IMR Amortization	(51)	(3)
Benefits and Expenses		
Benefits	0	
Addition to Reserves	121	(6)
Addition to AAT Reserves on 12/31/22	51	(4)
Net Income (loss)	**(51)**	

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Balance Sheet, Income Statement View

1. Original bonds of $551 earning 3% are sold at a capital loss to fund excess policy withdrawals (not available to be reinvested at 4%). Remaining bonds of $449 continue to earn 3% for ten years.

2. Excess policy surrenders of $500 after interest rates increase to 4%. Remaining liability of $500 at valuation rate of 3% is being supported by bonds of $449 that continue to earn 3%.

3. Capital losses of $51 are transferred into negative IMR liability and is amortized over ten years. This example assumes the IMR is an admitted asset.

4. Asset adequacy analysis starts with assets of $500 ($449 of bonds and $51 of negative IMR) equal to liabilities of $500, but it reveals that additional assets are needed to fund a deficiency of $68 in ten years. Assets are transferred from surplus to support the additional AAT reserves that are established so the company takes a surplus hit of $51. The additional assets of $51 (now in the portfolio) are assumed to earn 3% in this example.

5. Total assets of $500 ($449 of the original bonds plus the $51 added due to AAT) earn investment income at a 3% rate (cumulative income of $172 over ten years).

6. Policy reserves increase to $672 by maturity (increase of $172) while AAT reserves decrease to $0 by maturity (decrease of $51), which results in a net increase in reserves of $121. No further deficiencies after taking the upfront hit to surplus in 12/31/22.

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Agenda Item 13

Hear an Update from the

Academy Life Practice Council

Academy Life Practice Council Update

Life Actuarial Task Force (LATF) Meeting

August 12, 2024

Amanda Barry-Moilanen
Policy Analyst, Life

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- Life GAAP Reporting Committee
- Life Products Committee
  - Index-Linked Variable Annuity Subcommittee
  - Life Underwriting and Risk Classification Subcommittee
  - Life Illustrations Subcommittee
  - Non-Guaranteed Elements Subcommittee
- Life Valuation Committee
  - Variable Annuity Reserves and Capital Subcommittee
  - Annuity Reserves and Capital Subcommittee
  - Life and Health Valuation Law Manual Review Subcommittee
  - Life Reserves Subcommittee
  - PBR Implementation Subcommittee
- Tax Committee

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Annual Meeting—Envision Tomorrow

- Join us at Envision Tomorrow *(Oct. 15-16, 2024 | Grand Hyatt Washington, Washington, D.C.)*
- LPC Breakout Sessions
  - Financial Security: Annuities & Long-Term Care
  - Solvency Regulation: How Did We Get Here?

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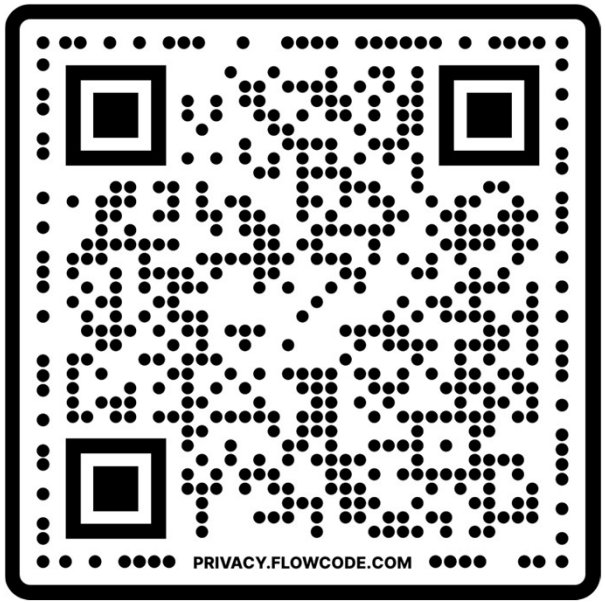
2024 Life & Health Law Valuation Manual

5



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Recent Activity

Released a resource and discussion guide on guaranteed living benefits.

Delivered comments to LATF on “Reinsurance AAT Concepts" and "Reinsurance AAT Attribution Analysis" exposures.

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Recent Activity—(Cont'd)

Delivered comments to Financial Accounting Standards Board (FASB) on the exposure draft of Chapter 6: Measurement, of Concepts Statement No. 8, Conceptual Framework for Financial Reporting

Delivered comments to the Risk-Based Capital Investment Risk and Evaluation (E) Working Group on the Oliver Wyman Report on Asset-Backed Securities Residual Tranches exposed by the Working Group at the Spring National Meeting.

Delivered comments to the Variable Annuities Capital and Reserve (E/A) Subgroup on the exposure draft of APF 2024-07 that proposes updates to the VM-21 Standard Projection Amount assumptions.

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Recent Activity—(Cont'd)

Delivered comments to LATF on LATF's "AAT Reinsurance Exposure 031724."

Delivered comments to Risk-Based Capital Investment Risk and Evaluation (E) Working Group on the exposed interim residual tranche proposal by Everlake Life Insurance Company.

Delivered comments to the Colorado Division of Insurance on the ACLI draft proposed quantitative testing regulation, "Concerning Quantitative Testing of External Consumer Data and Information Sources, Algorithms, and Predictive Models Used for Life Insurance Underwriting for Unfairly Discriminatory Outcomes."

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Ongoing Activity

- Ongoing support for the VM-22 Field Test
- Updating the Model Governance Practice Note
- Updating the Illustrations Practice Note
- Updating the Credit for Life Reinsurance Practice Note
- Updating the Asset Adequacy Analysis Practice Note
- Developing a Non-Guaranteed Elements Practice Note
- Developing a VM-22 Practice Note

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Academy Webinars and Events

Recent

- In-person PBR Bootcamp
- Update on NAIC Generator of Economic Scenarios (GOES) Project

Upcoming

- Additional PBR Webinar(s)
- VM-22 Update Webinar
- Envision Tomorrow

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Thank you

Questions?

For more information, please contact Amanda Barry-Moilanen (barrymoilanen@actuary.org)

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