

GOES (E/A) Subgroup: Feedback from Field Test Participants

Model Calibration and UST Flooring

October 2nd, 2024



Agenda

1. Model and Calibration Feedback:
 - a) US Treasury
 - b) Equity
 - c) Corporate

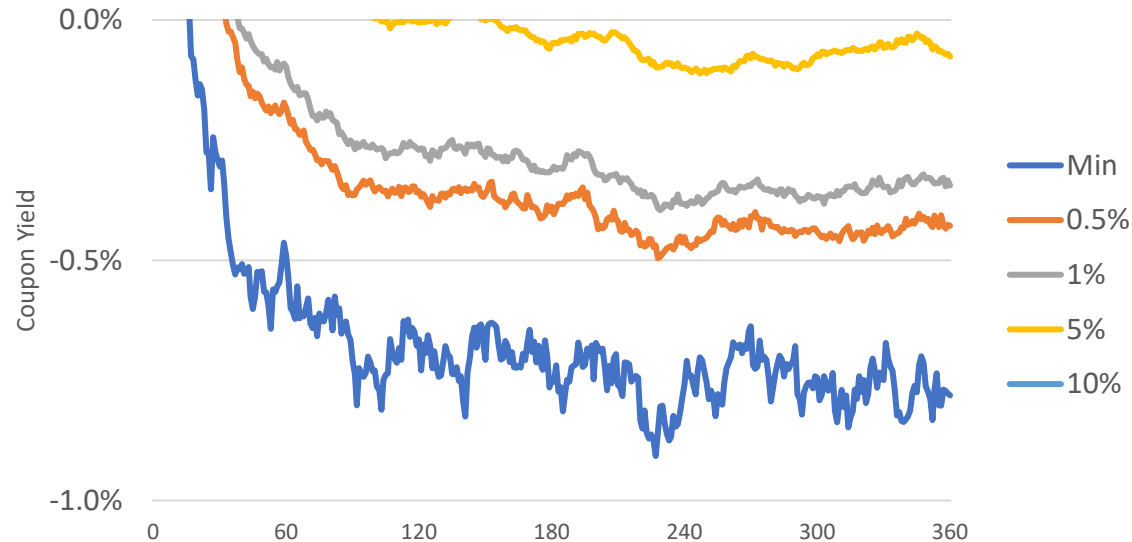
US Treasury Model Field Test Participant Feedback

UST Scenario Feedback - Negative Rates

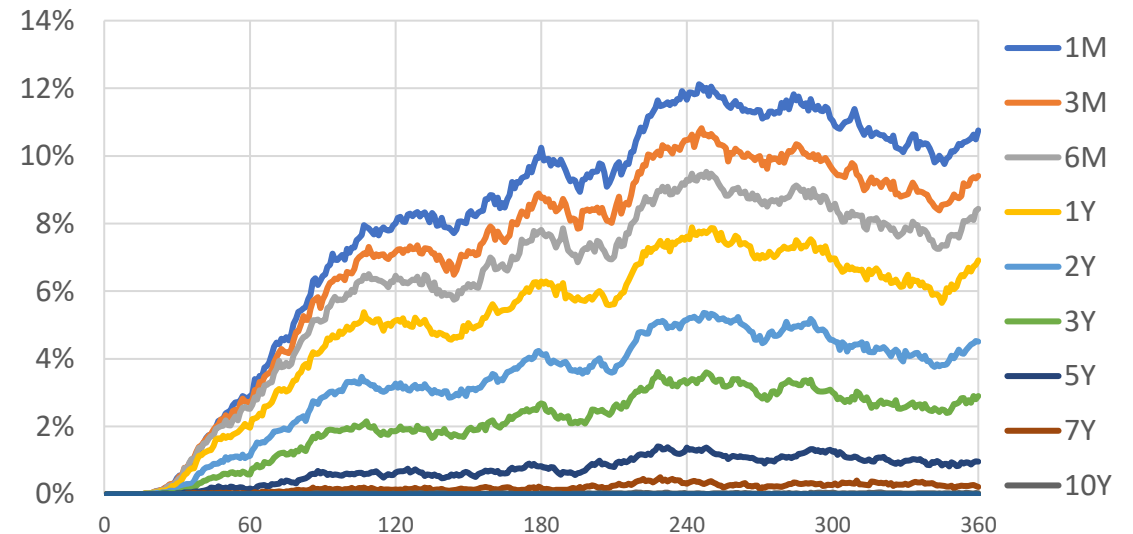
Participant Feedback:

- GEMS has a much higher occurrence of negative rates in the 90-day treasury than historical rates (1981 to present) or the prior scenario generator
- Adjust interest rate model to ensure rates are not excessive especially at the tails
- Conning scenario sets seem to be overly conservative in the tails compared to the prepackaged C3P1 RBC scenario set
- Recalibrate interest rate model to reduce frequency of negative and high interest rates

1 YR UST Negative Rate Percentiles - 10K Scenarios, 12/31/23



Negative UST Frequencies by Maturity - 10K Scenarios, 12/31/23



UST Scenario Feedback - UST Flooring

Participant Feedback:

- Generalized Fractional Floor (GFF) has shortcomings due to its blunt approach such as distorted yield curve shapes, unrealistic term premiums and lack of arbitrage-free scenario sets. We suggest exploring the Shadow Floor from the first field test or potential changes to the GFF.
- A dynamic Generalized Fractional Floor (GFF) is a better option to control the distribution of negative rates.
 - Recently developed enhancements to the GFF effectively control the frequency and severity of extreme low/negative short-term rates and better target the associated Academy's criteria.
 - Extends existing GFF definition by dynamically adjusting GFF factors to target the desired rate level at a given tail severity (e.g. target 0% UST1 at 1% tail in steady state).
 - Applies post scenario generation and requires minimal model updates.

UST Scenario Feedback - Other

Participant Feedback:

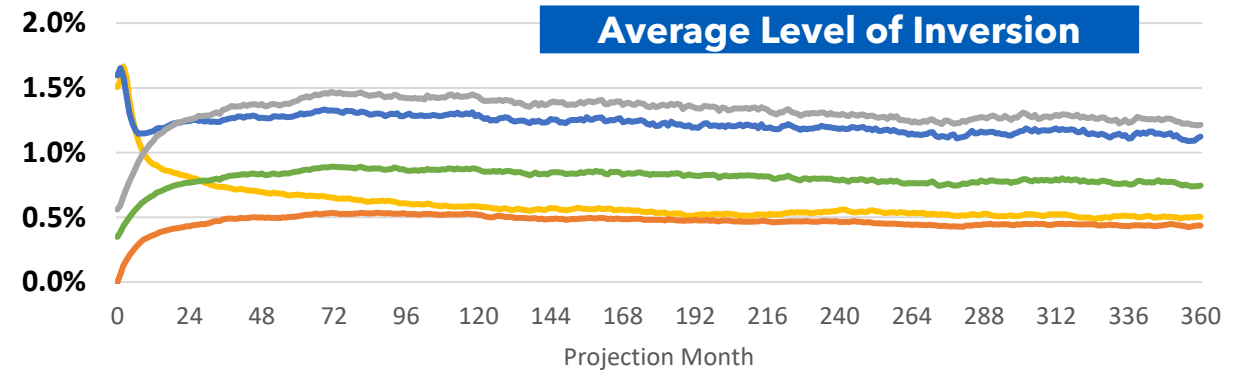
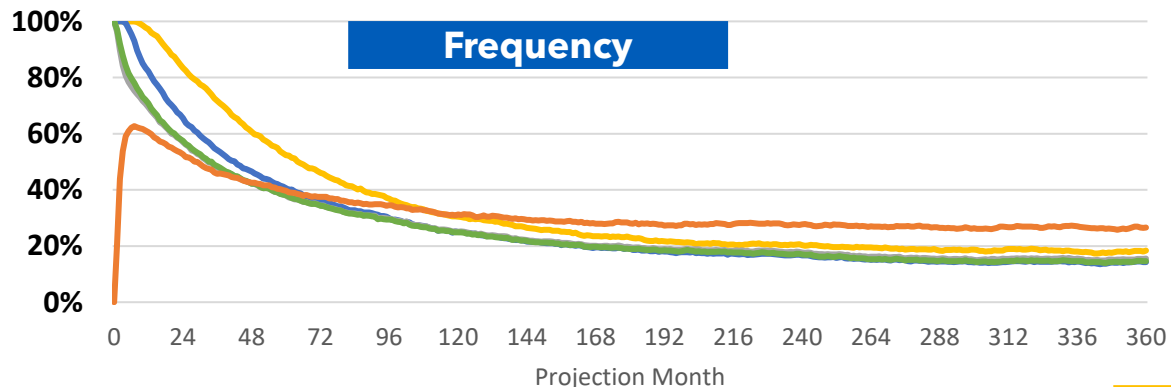
- **Interest Rate Volatility:**

- Volatility is higher in GEMS than the prior scenario but is slightly lower than historical (1981-present)
- We ask the NAIC to consider if the resulting measured interest rate volatility is reasonable vs. observable history for a moderately adverse CTE 70 Best Efforts reserve and CTE 98. Perhaps could use historical volatility plus a margin for CTE Best efforts instead of directly sourcing from the GOES generator which is elevated to meet interest rate scenario acceptance criteria.

- **Yield Curve Inversions:**

- Inverted yield curves in GEMS occur 16-24% of the time [depending on starting conditions] compared to 9% in the prior scenario and 10% in history
- ...higher/more inverted rates reduced base contract fee revenues from lower bond fund returns in early years compared to [scenarios participant used in their baseline].

Inversion Statistics, 12/31/23



Equity Model Field Test Participant Feedback

E1.T Large Capitalization Equity Gross Wealth Factors

Percentiles	Targets						Simulated						Ratio					
	1	5	10	20	30	50	1	5	10	20	30	50	1	5	10	20	30	50
0	0.46	0.25	0.22	0.25	0.29	0.46	0.49	0.21	0.14	0.08	0.17	0.26	1.08	0.87	0.64	0.29	0.57	0.57
1	0.70	0.58	0.60	0.79	1.15	2.82	0.70	0.55	0.53	0.63	0.94	2.17	1.00	0.95	0.88	0.79	0.82	0.77
5	0.82	0.80	0.91	1.36	2.20	6.38	0.82	0.79	0.88	1.29	2.03	5.47	1.00	1.00	0.96	0.95	0.92	0.86
10	0.88	0.93	1.12	1.81	3.08	9.78	0.88	0.92	1.11	1.74	2.93	8.81	1.00	0.99	0.99	0.96	0.95	0.90
15	0.92	1.02	1.28	2.18	3.84	12.94	0.93	1.02	1.28	2.10	3.73	11.91	1.00	1.00	1.00	0.96	0.97	0.92
25	0.99	1.18	1.54	2.81	5.26	19.23	0.99	1.18	1.55	2.80	5.17	18.42	1.00	1.01	1.01	1.00	0.98	0.96
30	1.01	1.24	1.66	3.12	6.01	22.79	1.01	1.25	1.67	3.13	5.89	22.02	1.00	1.00	1.00	1.00	0.98	0.97
50	1.09	1.48	2.15	4.47	9.23	39.98	1.10	1.49	2.17	4.48	9.28	39.64	1.01	1.01	1.01	1.00	1.01	0.99
70	1.17	1.74	2.71	6.30	14.12	68.89	1.18	1.76	2.75	6.36	14.09	69.20	1.01	1.01	1.02	1.01	1.00	1.00
75	1.19	1.82	2.89	6.93	15.88	80.22	1.20	1.83	2.92	6.96	15.89	80.89	1.01	1.01	1.01	1.00	1.00	1.01
85	1.25	2.02	3.36	8.69	21.06	115.31	1.26	2.03	3.40	8.62	21.02	115.56	1.01	1.01	1.01	0.99	1.00	1.00
90	1.28	2.15	3.71	10.09	25.20	147.92	1.30	2.17	3.76	9.97	25.08	145.91	1.01	1.01	1.01	0.99	1.00	0.99
95	1.34	2.37	4.30	12.33	33.19	210.72	1.36	2.39	4.38	12.30	32.53	211.90	1.01	1.01	1.02	1.00	0.98	1.01
99	1.45	2.82	5.64	18.18	53.74	397.23	1.47	2.83	5.68	17.53	50.56	394.09	1.01	1.00	1.01	0.96	0.94	0.99
100	1.76	4.20	8.98	42.03	140.72	1676.94	1.82	4.29	9.32	38.28	120.07	2292.44	1.03	1.02	1.04	0.91	0.85	1.37

The Large Capitalization (S&P 500) equity fund gross wealth factors (GWFs) are largely aligned with the targets across the bulk of the percentile GWF distribution over the projected durations. The first percentile does show some differences, with lower returns over time in the latest equity calibration compared to the targets.

Equity Model Feedback

Participant Feedback:

- Recalibrate equity scenarios to more closely match American Academy of Actuaries gross wealth factor calibration targets in the tail.
- The GOES equity path shows greater volatility compared to the AIRG.
- Extremely low tail equity calibration should be revisited.
- Adjust equity calibration to bring tail GWFs more in line with updated AAA criteria (ACLI proposal).
- Use Run 6 equity calibration from the field test one as basis and make further adjustments to the parameters to better align with the Academy's criteria.
- GOES uses a Stochastic Volatility with Jumps which produces fatter tails.
- [The lack of an Equity-Treasury linkage is] punitive to companies that fair value hedge guarantees only

GOES Equity Gross Wealth Factors (GWFs)

SP500	1 Yr	5 Yr	10 Yr	20 Yr	30 Yr
Min	0.49	0.21	0.14	0.08	0.17
1.0%	0.70	0.55	0.53	0.63	0.93
2.5%	0.77	0.68	0.71	0.96	1.39
5.0%	0.82	0.79	0.88	1.29	2.02
10.0%	0.88	0.92	1.11	1.74	2.93
25.0%	0.99	1.18	1.55	2.80	5.17
50.0%	1.10	1.49	2.17	4.48	9.28
75.0%	1.20	1.83	2.92	6.96	15.89
90.0%	1.30	2.17	3.76	9.97	25.08
95.0%	1.36	2.39	4.38	12.31	32.53
97.5%	1.41	2.60	4.98	14.51	40.74
99.0%	1.47	2.83	5.69	17.54	50.60
Max	1.82	4.29	9.32	38.28	120.07

AIRG Equity GWFs

SP500	1 Yr	5 Yr	10 Yr	20 Yr	30 Yr
Min	0.41	0.32	0.26	0.35	0.38
1.0%	0.70	0.62	0.66	0.83	1.22
2.5%	0.76	0.72	0.77	1.10	1.69
5.0%	0.82	0.81	0.92	1.41	2.25
10.0%	0.89	0.93	1.12	1.83	3.09
25.0%	0.98	1.16	1.51	2.74	5.11
50.0%	1.09	1.45	2.09	4.27	8.84
75.0%	1.19	1.81	2.88	6.80	15.35
90.0%	1.30	2.22	3.81	10.15	24.98
95.0%	1.37	2.48	4.44	12.92	34.25
97.5%	1.44	2.72	5.17	15.65	45.88
99.0%	1.52	3.06	6.18	20.49	60.45
Max	1.92	4.77	11.86	66.94	235.95

GOES/AIRG Equity GWF Ratio

SP500	1 Yr	5 Yr	10 Yr	20 Yr	30 Yr
Min	120%	68%	54%	22%	44%
1.0%	100%	88%	81%	76%	76%
2.5%	101%	94%	92%	87%	82%
5.0%	100%	98%	95%	91%	90%
10.0%	100%	99%	99%	95%	95%
25.0%	100%	102%	103%	102%	101%
50.0%	101%	103%	104%	105%	105%
75.0%	101%	101%	102%	102%	104%
90.0%	100%	98%	99%	98%	100%
95.0%	99%	97%	99%	95%	95%
97.5%	98%	96%	96%	93%	89%
99.0%	97%	92%	92%	86%	84%
Max	95%	90%	79%	57%	51%

Corporate Model Field Test Participant Feedback

Corporate Model Feedback

Participant Feedback:

- GOES Corporate bond fund excess return reflects both:
 - low risk-adjusted excess return relative to other asset classes and various historical periods of observed performance
 - much higher volatilities vs. observed Barclays Agg Corporate Bond index historical volatilities.
- We believe the elevated volatility of the Corporate bond fund is due to both the elevated interest rate volatility noted previously as well as potentially additional volatility from modeling downgrade-driven spread widening and forced sales in the GOES Corporate Model methodology
- We understand GOES Bond Fund Modelling is based on modeling Passive bond fund strategies (e.g. Indices) which dampens the return profile. This may result in GOES understating the net spread earned on Active Bond Funds.
 - In periods of high stress, Passive or Index Bond Funds have strict credit quality targets to adhere to which can force buys and sells at inopportune times. Consider the following:
 - In a highly volatile market, if bonds are downgraded, then Passive Bond Fund managers must sell these downgraded bonds to conform to their AAA/AA target (for example)
 - This distressed sale will generate losses as fund managers must incur the mark-to-market loss from the downgrade
 - Active fund managers are not forced to sell in such environments and instead can strategically purchase more bonds at higher yields, while holding downgraded bonds to maturity