

ACLI Feedback on 2FTv1 Scenario Set

ACLI Assessment of 2FTv1 (3/19/2024 version) Scenario Set¹

- Equity Model: **Recommended Changes**
 - Use 1FT Run 6 as starting point and adjust as necessary
- Interest Rate Model: **Recommended Changes**
 - Target higher rates in calibration to improve T5 results for YE2023
 - Future work to address frequency of negative interest rates
 - Future work to address severity of inversions
- Corporate Model: **No concerns**

1. Analysis using 12/31/2023 scenario set. Additional recommended scenario sets will help assess targeting criteria under different conditions and help inform future work.

Equity Model

- Overall assessment is the results are deficient due to missing Gross Wealth Factor (GWF) targets at higher durations (20+ years) in the right tails.
 - Given the 12/31/2023 curve starts at a higher rate, its unclear why it has a more severe tail in the 20- and 30-year time horizons
 - Unclear what the calibration is targeting, resulting in more severe equity tail distribution

Equity Model

- ACLI recommends starting with 1FT Run 6 rather than 2FTv1 calibration and adjust as necessary to align with the targeting criteria.
 - 1FT Run 6 did not include the interest-equity relationship, so would be a more reasonable starting point given the regulator decision to adopt the interest-equity correlation approach
 - 1FT Run 6 is calibrated to history, so has a more rational basis
 - It is unclear what the basis for the equity calibration used in 2FTv1
 - Parameters are located in the appendix

Equity Model

Worst GWF (across 10k scenarios)							1% tail GWF						
	1	5	10	20	30			1	5	10	20	30	
AIRG	0.40	0.37	0.36	0.40	0.46	AIRG	0.71	0.61	0.66	0.88	1.21		
1FT Run 6	0.43	0.14	0.13	0.31	0.23	1FT Run 6	0.71	0.57	0.59	0.79	1.20		
2FTv1	0.49	0.21	0.14	0.08	0.17	2FTv1	0.70	0.55	0.53	0.63	0.94		
Academy Criteria (Average GWF)	0.46	0.25	0.22	0.25	0.29	Academy Criteria (Average GWF)	0.70	0.58	0.60	0.79	1.15		
5% tail GWF							10% tail GWF						
	1	5	10	20	30		1	5	10	20	30		
AIRG	0.83	0.80	0.91	1.40	2.26	AIRG	0.88	0.92	1.11	1.78	3.04		
1FT Run 6	0.83	0.80	0.92	1.41	2.32	1FT Run 6	0.89	0.94	1.14	1.85	3.20		
2FTv1	0.82	0.79	0.88	1.29	2.03	2FTv1	0.88	0.92	1.11	1.74	2.93		
Academy Criteria (Average GWF)	0.82	0.80	0.91	1.36	2.20	Academy Criteria (Average GWF)	0.88	0.93	1.12	1.81	3.08		

- While 12/31/2023 scenarios produce reasonable results for 5th and higher percentile GWFs, the 12/31/2023 scenarios show noticeably more severe than the AAA criteria for the minimum and bottom 1% of the distribution in years 10, 20, 30.
- FT1 Run 6 would be a better starting point, given its alignment to the criteria and calibration based on history.

Equity Model

ACLI Joint Quadrant Criteria


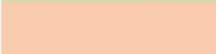
Quadrant	10 Years		30 Years	
	Evaluation Statistic	2FT	Evaluation Statistic	2FT
Low Rate/Low Equity	0.81-0.87	0.79	1.82-2.12	1.71
High Rate/Low Equity	0.87-1.02	0.87	2.12-2.71	2.18

- Joint criteria could be improved for low/low at 30 years; 10 years is slightly outside of target.

Interest Rate Model

- Overall assessment is that interest rates adequately meet the targeting criteria.
- Note initial yield curve does not meet published rate.
- The T5 results can be improved by targeting slightly higher results (see next slide).
 - This is applicable to 12/31/2023; would need to see results at other valuation dates to see if other adjustments are needed under those circumstances

Percentile	12	60	120	240	360
Min	2.30%	0.92%	0.98%	0.95%	1.16%
1.0%	2.81%	1.93%	1.73%	1.72%	1.84%
2.5%	2.96%	2.18%	1.98%	1.98%	2.09%
5.0%	3.09%	2.40%	2.20%	2.22%	2.32%
10.0%	3.25%	2.65%	2.50%	2.52%	2.61%
25.0%	3.53%	3.15%	3.05%	3.12%	3.25%
50.0%	3.85%	3.76%	3.79%	3.95%	4.08%
75.0%	4.21%	4.42%	4.64%	4.93%	5.10%
90.0%	4.53%	5.13%	5.52%	5.96%	6.22%
95.0%	4.73%	5.57%	6.12%	6.65%	6.94%
97.5%	4.92%	5.99%	6.70%	7.32%	7.70%
99.0%	5.12%	6.52%	7.40%	8.29%	8.57%
Max	6.03%	9.31%	9.93%	11.00%	13.82%
Mean	3.88%	3.84%	3.93%	4.13%	4.29%

 *passes criteria*
 *fails criteria*

10-year Geom Avg		30-year Geom Avg	
1st	99th	1st	99th
<	>	<	>
2.24%	7.94%	2.10%	9.77%
-0.52%	-0.54%	-0.25%	-1.21%
TRUE	FALSE	TRUE	FALSE

- Targets along the low tail are reasonable and are reasonably passing
- Targets on the high tail could be improved by targeting slightly higher rates; this should not cause the low tail to fail

Appendix

S&P Parameters

	1FT (1a)	1FT (6)	FNM	2FT
Fixed Return	0.015987	0.0793	0.015987	0.082504
Risk Premium Coefficient	3.595725	0.2447	3.595725	0.092565
Variable Jump Intensity	139.5882	2.9186	139.5882	139.5882
Jump Size Mean	-0.0525	-0.1419	-0.0525	-0.0525
Jump Size Volatility	0.0575	0.07	0.0575	0.0575
Initial Value	0.012479	0.0196	0.012479	0.013729
Alpha	0.005774	0.0205	0.005774	0.005774
Beta	0.462695	1.0474	0.462695	0.462695
Sigma	0.07468	0.1318	0.07468	0.07468

- **Initial value:** The initial variance at the start of projection; set equal to target
- **Alpha:** Controls the mean version level of variance process
- **Beta:** Parameter controlling the mean reversion speed of the variance process
- **Sigma:** The instantaneous variance of the variance process

Equity Model

Linkage - 12/31/2021

Run 1a

	1 Yr	5 Yr	10 Yr	20 Yr	30 Yr
Min	0.50	0.28	0.24	0.39	0.39
1.0%	0.71	0.59	0.59	0.83	1.17
2.5%	0.77	0.68	0.75	1.06	1.60
5.0%	0.82	0.78	0.87	1.34	2.11
10.0%	0.87	0.89	1.05	1.69	2.86
15.0%					
25.0%	0.97	1.09	1.40	2.54	4.88
30.0%					
50.0%	1.07	1.35	1.88	4.01	8.99
70.0%					
75.0%	1.16	1.64	2.57	6.49	16.98
85.0%					
90.0%	1.25	1.96	3.41	10.25	31.70
95.0%	1.31	2.20	4.03	13.66	47.46
97.5%	1.35	2.45	4.70	17.57	66.82
99.0%	1.41	2.77	5.65	23.40	101.45
Max	1.81	4.53	13.89	55.97	457.07

No Linkage - 12/31/2021

Run 6

S&P 500	1 Yr	5 Yr	10 Yr	20 Yr	30 Yr
Min	0.43	0.14	0.13	0.31	0.23
1.0%	0.71	0.57	0.59	0.79	1.20
2.5%	0.77	0.68	0.76	1.08	1.73
5.0%	0.83	0.80	0.92	1.41	2.32
10.0%	0.89	0.94	1.14	1.85	3.20
15.0%					
25.0%	0.99	1.19	1.58	2.90	5.41
30.0%					
50.0%	1.09	1.50	2.17	4.55	9.49
70.0%					
75.0%	1.19	1.82	2.90	6.83	15.89
85.0%					
90.0%	1.28	2.15	3.66	9.84	24.35
95.0%	1.33	2.34	4.22	12.01	31.69
97.5%	1.38	2.52	4.75	14.36	39.67
99.0%	1.43	2.75	5.37	17.12	51.96
Max	1.79	3.97	9.38	33.26	135.23

No Linkage and reflect 20% correlation - 12/31/2023

Run 2FT

S&P 500	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	0.94
2.5%	0.77	0.68	0.71	0.96	1.39
5.0%	0.82	0.79	0.88	1.29	2.03
10.0%	0.88	0.92	1.11	1.74	2.93
15.0%					
25.0%	0.99	1.18	1.55	2.80	5.17
30.0%					
50.0%	1.10	1.49	2.17	4.48	9.28
70.0%					
75.0%	1.20	1.83	2.92	6.96	15.89
85.0%					
90.0%	1.30	2.17	3.76	9.97	25.08
95.0%	1.36	2.39	4.38	12.30	32.53
97.5%	1.41	2.60	4.98	14.50	40.70
99.0%	1.47	2.83	5.68	17.53	50.56
Max	1.82	4.29	9.32	38.28	120.07

- The 12/31/2023 scenarios have more severe equity returns at right tail than both 1FT Run 1a and Run 6. Given the higher initial curve at 12/31/2023 than 12/31/2021, this result seems counterintuitive.

Negative Interest Rates

- **Issue:** Although the frequency of the negative rate improved from 14% in 1FT to 9% in 2FT for the UST1Y, we continue to see excessive % of negative rates occur more than sustained periods.
- **Recommend:** Examine floor options, including development of new floor method. Add targeting criteria to limit sojourn less than 48 months, and 99th percentile in steady state is $\geq 0\%$ for 1 year, 1% for 20 year.

YE2021 Scenarios (First 360 months)

% of Scenarios with Negative Rates in

	1M	3M	6M	1Y	2Y	3Y	5Y	7Y	10Y	20Y	30Y
at least 1 month	99%	93%	82%	77%	68%	59%	41%	24%	7%	0%	0%
>= 12 months	83%	74%	68%	61%	52%	43%	26%	13%	3%	0%	0%
>= 24 months	73%	65%	59%	52%	43%	34%	19%	9%	1%	0%	0%
>= 36 months	66%	57%	51%	45%	36%	28%	15%	6%	1%	0%	0%
>= 48 months	59%	51%	45%	39%	31%	23%	11%	4%	0%	0%	0%
>= 60 months	54%	45%	40%	34%	26%	19%	9%	3%	0%	0%	0%
>= 120 months	30%	24%	20%	16%	11%	7%	2%	0%	0%	0%	0%
>= 180 months	15%	11%	9%	6%	4%	2%	0%	0%	0%	0%	0%
>= 240 months	6%	4%	3%	2%	1%	0%	0%	0%	0%	0%	0%
Max neg months	359	356	345	341	332	323	286	219	118	-	-

YE2023 Scenarios (First 360 months)

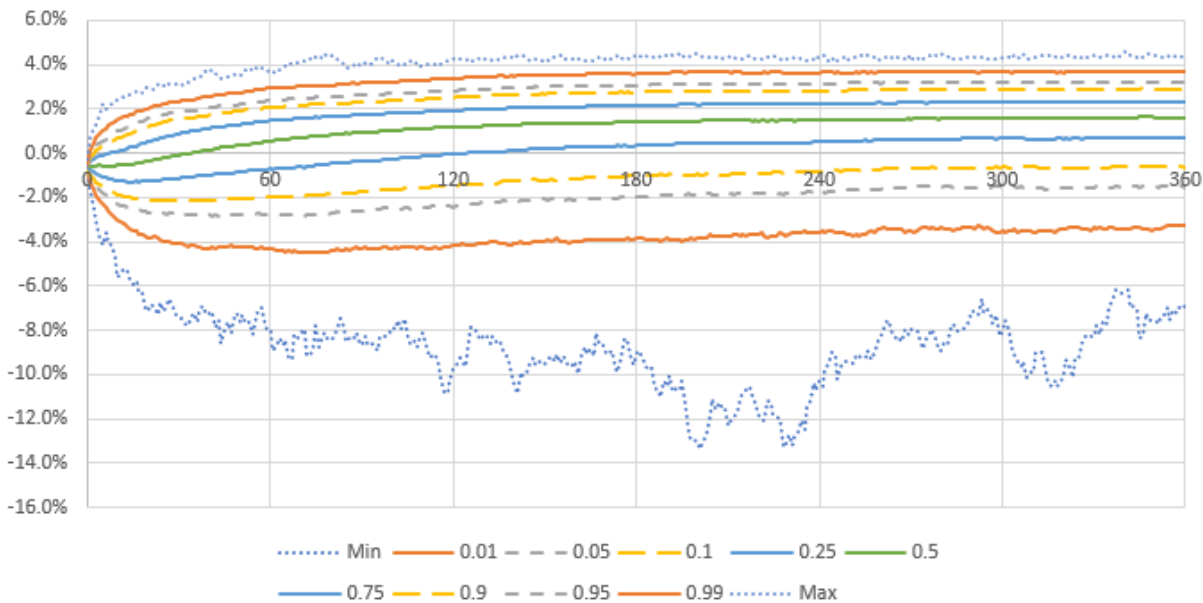
% of Scenarios with Negative Rates in

	1M	3M	6M	1Y	2Y	3Y	5Y	7Y	10Y	20Y	30Y
at least 1 month	65%	61%	58%	53%	44%	34%	18%	8%	1%	0%	0%
>= 12 months	49%	46%	42%	37%	28%	20%	9%	3%	0%	0%	0%
>= 24 months	40%	37%	34%	29%	21%	14%	5%	2%	0%	0%	0%
>= 36 months	33%	30%	27%	22%	15%	10%	4%	1%	0%	0%	0%
>= 48 months	27%	24%	21%	18%	12%	7%	2%	0%	0%	0%	0%
>= 60 months	23%	20%	17%	14%	9%	5%	1%	0%	0%	0%	0%
>= 120 months	8%	6%	5%	4%	2%	1%	0%	0%	0%	0%	0%
>= 180 months	2%	2%	1%	1%	0%	0%	0%	0%	0%	0%	0%
>= 240 months	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Max neg months	320	315	299	287	263	231	173	124	42	-	-

Severity of Inversions

- **Issue:** Severity of inversions excessive but consistent with 12/31/2019 + 200bps run.
- **Recommend:** No initial solution but will work with regulators and the Academy. Examine approaches to reduce severity; will still be high when initial curve is inverted. Recommend targeting Academy proposed boundaries.

2FT - Spread_1Y_20Y



1FT (12/31/2019 + 200bps) - Spread_1Y_20Y

