Recommended Models for ESG Field Testing

3/17/22

NAIC NATIONAL ASSOCIATION OF INSURANCE COMMISSIONERS

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Background

- For over a year, regulators on the ESG Drafting Group have been meeting with subject-matter experts to develop a recommendation to the Life Actuarial (A) Task Force and the Life RBC (E) Working Group for scenario sets to use in field testing a new prescribed ESG for reserves and capital calculations.

- This presentation provides their high-level recommendations on the Treasury, Equity, and Corporate models to include in field testing.

- The ESG field test is planned to begin during the first week of June, so it is necessary to bring more regulators and interested parties into the discussions. These recommendations will be exposed for comment until close of business April 7th, 2022.

- Links to documentation and additional information are included on slide 9 of this presentation. **After the updates noted on slide 4 have been made, scenario files will be added to Conning's website and links to additional resources will be added to slide 9 (e.g., scenario statistics).**

Summary of Recommended ESG Models for Field Testing

Model	Field Test Recommendation
Treasury	1. Field test two GEMS® Treasury model candidates
	a. Conning Calibration and Generalized Fractional Floor
	b. Alternative Calibration and Shadow Floor i. Note: The Alternative Calibration will be adjusted ahead of field testing
Equity	2. Utilize the existing GEMS® equity model with equity-Treasury linkage based on the short Treasury rate for field testing. Additionally, apply the following calibration updates:
	a. Update the equity model calibration to account for changes made to the Treasury model
	b. Apply a Sharpe-ratio approach with a 5% corridor to set the expected returns for the diversified international equity, aggressive international equity, and US aggressive equity indices
Corporate	3. Include GEMS® corporate model in initial field testing with the calibration updated for consistency with other generated returns on a risk/reward basis.

Overview of Recommended Treasury Models for Field Test

Model #1. Conning Calibration and Generalized Fractional Floor

- The Conning calibration, paired with a floor, was designed to meet the acceptance criteria that were chosen by regulators for the Treasury scenarios.
- A generalized fractional floor (see Appendix 1) has been applied to the scenarios resulting from the Conning calibration to reduce the frequency and severity of negative interest rates.

Pros:

- Achieves the acceptance criteria for "Low for Long" Treasury rates while also producing a significant representation of high interest rates
- The generalized fractional floor with a 40 BP threshold and a 20% factor allows for significant control of negative interest rates without severe compression of the scenario distribution in early projection years

Cons:

- The calibration generates more frequent and severe negative interest rates than several commenters feel is reasonable
- The highest rate produced in the set of 10,000 scenarios is 39%*
- The frequency of yield curve inversions is elevated vs. history, and inversions can persist for many years
- For scenarios that are inverted, the average level of inversions is significantly higher than historical average levels of inversion

*Across 10,000 scenarios projected for 100 years, 0.16% of 1 year UST rates are between 20-25% and 0.03% are greater than 25%. Over the first 30 years, 1.6% of scenarios have rates of 20% or more.

Overview of Recommended Treasury Models for Field Test

Model #2. Alternative Calibration and Shadow Floor

- The Alternative Calibration was designed to produce realistic term premiums and yield curve behavior over time and fit a wide variety of historical yield curves. It was also adapted to meet regulator objectives.
- A shadow-rate floor methodology has been applied to reduce the frequency and severity of negative interest rates produced by the Alternative Calibration.

Pros:

- Significantly closer alignment of inversion frequencies and levels between scenarios and historical data
- Shadow floor methodology is specifically designed to preserve the arbitrage-free scenario property

Cons:

- Compressed distribution of scenarios in the earlier projection periods
- Less reflection of high interest rate scenarios
- High negative rate frequency in early years

Overview of Recommended Equity Model for Field Test

GEMS® Equity Model with Equity-Treasury Linkage

- The GEMS® Equity Model is designed to produce realistic equity return behavior and includes volatility clustering, jumps in returns that are more frequent during volatile periods, dividend cash flows that are negatively correlated with price returns, and fat return distribution tails.
- The GEMS® Equity Model also includes a linkage to the Treasury model, which produces lower average cumulative equity returns when interest rate levels are lower and vice-versa.

Pros:

- The GEMS® Equity Model is able to produce scenarios that capture the key dynamics that impact equity returns
- The equity-Treasury linkage will produce scenarios that adequately capture the risk of low equity returns paired with a low interest rate environment
- The equity-Treasury linkage reflects that investors typically demand equity returns in excess of those offered by risk-free assets to compensate for bearing risk.

Cons:

- The inclusion of a linkage between Treasury rate levels and equity returns may add significant volatility and procyclicality to period-to-period calculations of reserves and capital
- Higher starting levels of interest rates will produce scenarios with less reflection of low equity returns paired with low or high interest rate scenarios
- Some commenters believe this linkage to the Treasury model is a simplification not supported by historical data or economic research and may not promote sound risk management

Overview of Recommended Corporate Model for Field Test

GEMS® Corporate Model

- The GEMS® Corporate Model captures the key dynamics that influence bond returns, including stochastic spreads, credit rating transitions, and defaults.
- The bond fund returns produced by the GEMS® Corporate Model will be used to model policyholder separate account investments in bond funds and general account insurer investments in bond funds, where applicable.

Pros:

- The GEMS® Corporate model is able to produce scenarios that reflect the key dynamics of bond fund returns
- Does not require buildout of a separate corporate model

Cons:

- Due to the proprietary nature of the GEMS® Corporate model, full documentation of the model will not be available to the public

Note: An alternative corporate model has been discussed at the ESG Drafting Group meetings and is currently being developed.

Links to Additional Resources – as of 3/17/22

Field Test Candidate Scenario Charts and Statistics:

- These will be added after the updates noted on slide 4 have been made.

ESG Landing Page on Conning Website:

- This site contains previous NAIC scenario releases along with model documentation, information on exposures, a FAQ document, and more.
- This site will be used to deliver scenario files once the ESG is implemented

Documentation:

- Q&A Document
- Treasury Model Documentation
- Corporate Model Documentation
- Equity Model Documentation

Questions and Comments

Please contact Scott O'Neal (soneal@naic.org) with questions or comments

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Appendix 1: Generalized Fractional Floor

- The Conning GEMS Treasury model has the capability of producing negative interest rates, which have been a feature prevalent in other countries currently and in recent history.
- While the basic formula for the generalized fractional floor (see below) is relatively simple, the implementation of the floor in the Conning Calibration is more complex. In this particular implementation, the Treasury model is fit to an implicit yield curve that is chosen such that the actual yield curve is matched at time zero after the floor has been applied.
- Applying a generalized fractional floor methodology to the scenarios from the Conning Treasury calibration allows for increased control of the frequency and severity of negative interest rates.
- After testing, Conning has chosen a threshold value of 40 BPs and a factor of 20% to reduce the frequency and severity of negative interest rates while ensuring that other regulator objectives, such as low for long, are met.

Generalized Fractional Floor Formula:

- If Unfloored Rate < Adjustment Threshold,
  - Floored Rate = Adjustment Threshold + Factor * (Unfloored Rate - Adjustment Threshold)
- Otherwise,
  - Floored Rate = Unfloored Rate

Example:

Unfloored Rate = -1% Threshold = 40BPs Factor = 20%

Floored Rate = 0.4% + 20%*(-1% - 0.4%) = **0.12%**

Appendix 2:
Treasury Model Acceptance Criteria

Item	Category	Acceptance Criteria
1.	Low For Long	a) At least 10% of scenarios should have a 10-year geometric average of the 20-year UST that is below 1.45%* b) At least 5% of scenarios should have a 30-year geometric average of the 20-year UST that is below 1.45%*
2.	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 >= 99th percentile 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 >= 99th percentile 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

*1.45% was the current level of the 20-year UST at 12/31/20.

Appendix 2:
Treasury Model Acceptance Criteria

Item	Category	Acceptance Criteria
3.	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%
4.	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)