MEMORANDUM

To: All Fellows, Affiliates, Associates, and Correspondents of the Canadian Institute of Actuaries, and other interested parties

From: Josephine Marks, Chair
Actuarial Standards Board

Steve Bocking, Chair
Designated Group

Date: June 24, 2021

Subject: **Final Communication of Updated Promulgations of the Maximum Net Credit Spread, the Ultimate Reinvestment Rates, and the Calibration Criteria for Stochastic Risk-Free Interest Rates in the Standards of Practice for the Valuation of Insurance Contract Liabilities: Life and Health (Accident and Sickness) Insurance (Subsection 2330)**

Document 221065

1. Introduction

Subsection 2330 of the Practice-Specific Standards of Practice on Insurance Contract Valuation: Life and Health (Accident and Sickness) Insurance (Section 2300) refers to a number of economic parameters that would be promulgated from time to time by the Actuarial Standards Board (ASB). These economic parameters are the maximum net credit spread, the ultimate reinvestment rates (URRs), and the calibration criteria for stochastic risk-free interest rates.

The ASB appointed a designated group to update these promulgations.

An initial communication regarding this promulgation was published on March 29, 2021, with a comment period ending on May 15, 2021. The process being used to implement this is described in section I of the ASB's *Policy on Due Process for the Adoption of Standards of Practice*.

No comments were received following the publication of the initial communication.

The ASB decided to promulgate the use of the economic parameters described below, to be effective October 15, 2021. Due to the impending adoption of IFRS 17 in 2023, the ASB does not anticipate an update to this promulgation prior to IFRS 17.

2. Promulgation of Maximum Net Credit Spread

Paragraph 2330.08 includes a reference to a maximum for the difference between the asset's credit spread and its asset depreciation assumption (the "maximum net credit spread") for assets purchased on or after the 30th anniversary from the balance sheet date:

.08 In all scenarios other than the base scenario, credit spreads include margins for adverse deviations as described in paragraph 2340.14. The actuary would also include an additional provision for adverse deviations by modifying the assumptions, if needed, on each fixed-income asset purchased or sold on or after the 5th anniversary from the calculation date, such that

- For assets purchased or sold on or after the 30th anniversary from the calculation date, the difference between the asset's credit spread and its asset depreciation assumption, the net credit spread is not larger than a maximum promulgated from time to time by the Actuarial Standards Board; and
- For assets purchased or sold between the 5th and 30th anniversary from the calculation date, the net credit spread is not larger than that determined using a uniform transition between the corresponding difference if the asset were purchased on the 5th anniversary from the calculation date and the promulgated maximum if the asset were purchased on the 30th anniversary from the calculation date.

2.1 Proposed Promulgation

The promulgated maximum for the difference between the asset's credit spread and its asset depreciation assumption for assets purchased on or after the 30th anniversary from the calculation date shall be equal to 85 basis points.

2.2 Rationale

The maximum net credit spread was developed using the following approach:

i. The average historical credit spread was calculated for short, medium, and long corporate bonds of various credit ratings over an extended historical period (of at least 25 years);

ii. These credit spreads were adjusted by the average best estimate asset depreciation assumption from current industry practice;

iii. These best estimate credit spreads net of default were adjusted by the margin for adverse deviations of 10% from paragraph 2340.14; and

iv. The maximum credit spread of 85 basis points was developed assuming a representative mix of corporate bonds of short, medium, and long durations.

3. Promulgation of Ultimate Reinvestment Rates

Paragraph 2330.11 includes a reference to ultimate risk-free reinvestment rates (URR) that are used in the construction of the base and prescribed scenarios:

.11 The Actuarial Standards Board will promulgate from time to time the following ultimate risk-free reinvestment rates for use in the base scenario and the prescribed scenarios

- Short-term ultimate risk-free reinvestment rate-high;
- Long-term ultimate risk-free reinvestment rate-high;
- Short-term ultimate risk-free reinvestment rate-median;
- Long-term ultimate risk-free reinvestment rate-median;
- Short-term ultimate risk-free reinvestment rate-low; and
- Long-term ultimate risk-free reinvestment rate-low.

3.1. Proposed Promulgation

The promulgated ultimate (risk-free) reinvestment rates to be used in the base scenario and in the prescribed scenarios are as follows:

- The short-term ultimate risk-free reinvestment rate-high shall be 9.45%;
- The long-term ultimate risk-free reinvestment rate-high shall be 9.80%;
- The short-term ultimate risk-free reinvestment rate-median shall be 3.80%;
- The long-term ultimate risk-free reinvestment rate-median shall be 5.10%;
- The short-term ultimate risk-free reinvestment rate-low shall be 1.20%; and
- The long-term ultimate risk-free reinvestment rate-low shall be 2.90%.

3.2. Rationale

The ultimate risk-free reinvestment rates in this promulgation were developed with the support of extensive testing, to be reasonably consistent with the range of risk-free interest rates that would be generated by a stochastic model that satisfies the promulgated calibration criteria for stochastic risk-free interest rates, also outlined in this document. The URR-median short-term and long-term rates were set equal to the median value (rounded to the nearest five basis points) of observed historical one-year maturity and 20-year maturity yields respectively. The URR-low and URR-high rates were set using the distribution of yields generated by a stochastic model that satisfies the promulgated calibration criteria. The distributions were assessed 60 years from the projection starting point, and the selected URR-low and URR- high rates were set to approximate the average of the lowest and highest 30 percent of observed risk-free interest rates in the stochastic projections respectively.

4. Promulgation of Calibration Criteria for Stochastic Risk-Free Interest Rates

Paragraph 2370.03 includes a reference to calibration criteria for stochastic risk-free interest rates that would be met when the selection of risk-free interest rate scenarios is stochastic:

.03 Where the interest rate scenarios selected are stochastically modelled, the actuary's calibration of stochastic models should meet the criteria for risk-free interest rates as promulgated from time to time by the Actuarial Standards Board.

4.1. Promulgation

Promulgated calibration criteria are provided for the following:

1. The left and right tail and the mean reversion of the long-term risk-free interest rate;
2. The left and right tail of the short-term risk-free interest rate; and
3. The slope of the risk-free interest rates curve.

All calibration criteria are expressed as bond-equivalent yields.

Calibration for the Long-Term Risk-Free Interest Rate

The long-term risk-free rate is assumed to be a term of 20 years or greater.

Left- and right-tail calibration criteria for the long-term risk-free interest rate are provided for the two-year, 10-year, and 60-year horizons. Risk-free interest rate scenarios at the two-year and 10-year horizons are influenced by the initial starting risk-free interest rate, so calibration criteria at each of a 4.00%, 6.25%, and 9.00% starting long-term risk-free interest rate are provided. At the 60-year horizon, the impact of the starting rate is assumed to be minimal, so only calibration criteria at a single starting rate of 6.25% are provided.

The following table shows the left- and right-tail criteria for the long-term risk-free interest rate.

Horizon		**Two-Year**			**10-Year**			**60-Year**
Initial Rate		4.00%	6.25%	9.00%	4.00%	6.25%	9.00%	6.25%
Left-Tail Percentile	2.5th	2.75%	4.35%	6.55%	2.05%	2.65%	3.90%	1.90%
	5.0th	2.90%	4.65%	6.90%	2.25%	3.05%	4.50%	2.20%
	10.0th	3.10%	4.95%	7.25%	2.55%	3.60%	5.20%	2.60%
Right-Tail Percentile	90.0th	5.20%	7.60%	10.45%	6.75%	9.05%	11.55%	10.00%
	95.0th	5.55%	8.00%	10.90%	7.75%	10.00%	12.70%	11.80%
	97.5th	5.85%	8.35%	11.35%	8.55%	10.90%	13.70%	13.15%

These calibration criteria would be satisfied if the stochastic risk-free interest rate model produces results that are less than or equal to each of the left-tail calibration criteria, and greater than or equal to each of the right-tail calibration criteria, for each of the initial rates.

For all stochastic long-term risk-free interest rate models, the period of mean reversion would not be less than 14.5 years. The period of mean reversion is also referred to as the time constant. In a model with an explicit mean reversion speed of a, the period of the mean reversion is equal to $1/a$. For simple stochastic risk-free interest rate models with an explicit mean reversion factor, this requirement can be satisfied by considering the value of the mean reversion parameter directly. For more complex models, this requirement can be satisfied by using a mathematical proof or using the procedure in appendix A.

Calibration for the Short-Term Risk-Free Interest Rate

The short-term risk-free interest rate is assumed to be the one-year term.

Left- and right-tail calibration criteria for the short-term risk-free interest rate are provided for the two-year and 60-year horizons. Interest rate scenarios at the two-year horizon are influenced by the initial starting interest rate, so calibration criteria at each of a 2.00%, 4.50%, and 8.00% starting short-term risk-free interest rate are provided. At the 60-year horizon, the impact of the starting risk-free interest rate is assumed to be minimal, so only calibration criteria at a single starting risk-free interest rate of 4.50% are provided.

The following table shows the left- and right-tail criteria for the short-term risk-free interest rate.

Calibration Criteria for the Short-Term Risk-Free Rate (One-Year Maturity)

Horizon		**Two-Year**			**60-Year**
Initial Rate		2.00%	4.50%	8.00%	4.50%
Left-Tail Percentile	2.5th	0.45%	1.20%	2.90%	0.60%
	5.0th	0.65%	1.55%	3.65%	0.75%
	10.0th	0.90%	2.10%	4.55%	0.80%
Right-Tail Percentile	90.0th	4.25%	7.50%	11.00%	9.95%
	95.0th	5.10%	8.35%	12.00%	11.90%
	97.5th	5.95%	9.10%	12.90%	13.65%

These calibration criteria would be satisfied if the stochastic risk-free interest rate model produces results that are less than or equal to each of the left-tail calibration criteria, and greater than or equal to each of the right-tail calibration criteria, for each of the initial risk-free interest rates.

Calibration for the Slope of the Risk-Free Interest Rates Curve

The slope of the yield curve is defined as the long-term risk-free interest rate less the short-term risk-free interest rate. Calibration criteria for the slope are provided for the 60-year horizon.

The following table shows the criteria for the slope of the risk-free interest rates curve.

60-Year Slope Calibration Criteria

Percentile	Calibration Criteria
5th	-1.00%
10th	-0.10%
90th	2.50%
95th	3.00%

These calibration criteria will be satisfied if the distribution of the slope values produced by the model at the 60-year horizon are less than or equal to each of the left-tail calibration criteria and are greater than or equal to each of the right-tail calibration criteria.

4.2. Rationale

A revised educational note supplement that provides the basis for the promulgated calibration criteria for stochastic risk-free interest rates is being concurrently released by the Canadian Institute of Actuaries Committee on Life Insurance Financial Reporting. As noted in the revised educational note supplement, models that satisfy the calibration criteria will be appropriate for use when actual risk-free interest rates are lower than the reference initial risk-free interest rates used for the calibration criteria (which were selected for consistency with the previous research paper published on the calibration of the long-term risk-free interest rate).

5. Criteria for the Adoption of Standards of Practice

The promulgations of the maximum net credit spread, URRs and calibration criteria for stochastic risk-free interest rates meet the criteria set out in section C of the ASB's *Policy on Due Process for the Adoption of Standards of Practice*. Specifically the following:

1. The public interest is advanced through the use of consistent criteria for establishing risk-free interest rate assumptions and thereby constraining risk-free interest rate assumptions to a reasonable range.
2. Provision is made for the appropriate application of professional judgment within a reasonable range. The proposed calibration criteria allow the actuary to use any model that fits with the promulgated calibration criteria for stochastic risk-free interest rates.

3. Use of the proposed calibration criteria and URRs is practical for actuaries with relevant training.
4. The proposed promulgation is considered to be unambiguous.

6. Due Process

Due process was followed in developing this promulgation document, as described in section I of the ASB's *Policy on Due Process for the Adoption of Standards of Practice*.

7. Effective Date

The promulgations are effective October 15, 2021 with the final communication of the promulgations. Early implementation is permitted.

JM, SB

Appendix A

Satisfaction of the mean reversion criterion can be demonstrated with the following procedure (unchanged):

1. Sort scenarios for lowest to highest long-term rate at projection year T0, where T0 is sufficiently long to accumulate substantial dispersion in rates, but not so long as to be beyond most expected reinvestments. For a typical long-term guaranteed block, T0 might be in the range of five to 10 years.
2. Group the scenarios by rate quartile at T0, from lowest (Quartile 1) to highest (Quartile 4). Calculate the magnitude of dispersion of low-rate scenarios from central scenarios dispersion (T0) = average rate (T0) within combined (quartile 2 and quartile 3) – average rate (T0) within quartile 1.
3. Using the same scenario grouping (ranked at T0, *not* re-ranked at T0+10) calculate 10- year-later dispersion (T0+10, ranked T0) = average rate (T0+10) within combined (quartile 2 and quartile 3) – average rate (T0+10) within quartile 1.
4. The mean reversion criterion over the projection period from T0 to T0 +10 is satisfied if dispersion (T0+10, ranked T0) > = 0.5 * dispersion (T0).
5. If the actuary can demonstrate that the model rate of mean reversion is similarly robust across other projection periods, this single test would be sufficient. If not, the test would be repeated across sufficient financially meaningful periods to demonstrate sustained periods of low rates.
6. Should periods of sustained high rates be financially stressful for a particular application in the opinion of the actuary, the demonstration would be repeated for these rates (quartile 4 relative to quartiles 2and 3).