Memorandum

To: All Fellows, Affiliates, Associates and Correspondents of the Canadian Institute of Actuaries and Other Interested Parties

From: A. David Pelletier, Chair
Actuarial Standards Board

Date: February 3, 2012

Subject: **Initial Communication of a Promulgation of Calibration Criteria for Investment Returns Referenced in the Standards of Practice for the Valuation of Insurance Contract Liabilities: Life and Health (Accident and Sickness) Insurance (Subsection 2360)**

Comment deadline: **March 31, 2012**

INTRODUCTION

According to subsection 2360 of the Standards of Practice:

Model calibration

.01 *It is <u>prescribed</u> that the actuary's calibration of stochastic models used in the valuation of segregated fund guarantees should meet the criteria for investment returns as promulgated from time to time by the Actuarial Standards Board.* [Effective January 1, 2011]

The Actuarial Standards Board (ASB) proposes to promulgate the use of the calibration criteria for equity returns described below, effective October 15, 2012. The process being used to implement this is described in section D of the ASB's Policy on Due Process for the Adoption of Standards of Practice ("Due Process").

RATIONALE

The Standards of Practice outline a minimum insurance contract liability basis with respect to the model calibration for segregated fund business, and reference prescribed criteria for investment returns.

The change to the promulgated calibration criteria for equity returns is being proposed for the following reasons:

1. To reflect more recent market experience. The current calibration criteria are based on data from January 1956 to December 1999, while the proposed calibration criteria are based on data from January 1956 to June 2010, and

2. The introduction of longer-term products and reset features in recent years has created new issues with regard to the calibration of investment returns.

A research paper is being concurrently released by the Canadian Institute of Actuaries (CIA) Committee on Life Insurance Financial Reporting (CLIFR) that provides a rationale for this proposed promulgation for calibration criteria for equity returns.

This promulgation applies to equity returns only. Calibration criteria applicable to returns on fixed-income assets are currently being developed by CLIFR.

The promulgated calibration criteria have been developed using the data since 1956. Data on equity returns for the U.S. market since 1926were available. The choice of the historical period for developing criteria was a challenge and the subject of much debate. The research paper provides the rationale for choosing the 1956 to 2010 period.

As mentioned in subsection 2360 of the Standards of Practice, calibration of investment returns would be promulgated from time to time. The calibration criteria promulgated in this document are expected to be reviewed approximately every five years.

The publication of this promulgation follows the publication of an advisory note by OSFI in December 2010 setting out calibration criteria for investment returns applicable when calculating capital requirements for segregated funds with an internal model. The actuary is reminded that OSFI criteria apply to the calculation of capital requirements only, and that the criteria set out in this document apply to the calculation of insurance contract liabilities. However, nothing prevents the actuary from satisfying the OSFI criteria for calculating insurance contract liabilities, when these criteria are more stringent than those set out in this research paper.

PROMULGATION

The criteria are applied by assessing whether the scenarios that are generated by the model and used for valuation meet the various metrics as defined herein. If a closed-form formula exists for a statistic subject to the criteria, it is sufficient to test that the theoretical value of the statistic calculated using the closed-form formula meets the criteria, as long as a large number of scenarios is used for valuation, and the actuary tests that the discrepancy between the theoretical value and the value calculated with the scenario set is not material.

The actuary is reminded that the promulgated calibration criteria are lower and upper bounds for various statistics, and that the actuary is expected to use sound statistical techniques and up-to-date data to parameterize the model used in valuation. This process could result in more conservative statistics than the promulgated criteria.

To model the investment returns of a specific fund, a proxy for the fund would be constructed. The proxy usually takes the form of a linear combination of market indices. The criteria described below apply to the investment returns generated for equity indices that are used in the composition of the proxies. All calibration criteria apply to returns in local currency.

References are made below to indices of developed non-Asian economies (L1 indices). The developed non-Asian economies are those contained in the following table:

Developed Non-Asian Economies			
Americas	**Europe and Middle East**		**Pacific**
Canada	Austria	Italy	Australia
United States	Belgium	Netherlands	New Zealand
	Denmark	Norway	
	Finland	Portugal	
	France	Spain	
	Germany	Sweden	
	Greece	Switzerland	
	Ireland	United Kingdom	
	Israel		

Criteria have been established for the left and right tails of equity returns, as well as for the mean and volatility of equity returns.

Left Tail Criteria

Two sets of calibration criteria are established for the left tail of equity return distributions, one applicable to indices that are comprised of a diversified basket of L1 indices or of an L1 index of a large economy, and one applicable to small capitalization indices (L2 indices).

The table below provides the maximum values for the 2.5^{th}, 5th and 10th percentiles of the accumulation factors for the one-, five-, 10- and 20-year horizons.

Left tail calibration criteria	One-year			Five-year			10-year			20-year		
	2.5^{th}	5th	10th	2.5^{th}	5th	10th	2.5^{th}	5th	10th	2.5^{th}	5th	10th
L1 indices	0.74	0.81	0.88	0.70	0.80	0.95	0.80	0.95	1.20	1.25	1.65	2.25
L2 indices	0.68	0.76	0.85	0.60	0.70	0.90	0.70	0.90	1.20	1.10	1.55	2.35

The criteria for equity returns are to be applied to a given index by working through the following decision tree:

Case 1: If a large proportion of the index is comprised of a diversified basket of L1 indices, of an L1 index of a large economy, or of L2 indices, then the relevant set of calibration criteria applies to this index.

Case 2: If the index does not fall under Case 1, but the actuary has sufficient credible data about returns for the index in question, then:

a. Perform a model test. The model would first be fitted to the S&P TSX Composite total returns from January 1956 to June 2010 inclusive (end-of-month values). The model outputs are then compared to the calibration criteria for L1 indices. If the model outputs satisfy those criteria, then the form of the model is acceptable and the actuary can proceed to the second step. If not, then the actuary would change the model form.

b. Fit the model to the available data for the index. The model is then used to generate returns.

c. A final test is to review the Sharpe ratio of the model outputs. The Sharpe ratio is to be calculated using the expectation and the standard deviation of the one-year accumulation factor. The Sharpe ratio would not exceed 0.40 with an assumed risk-

free rate of 4.00%. If necessary, the fitted parameters for the mean from Step b. would be adjusted downward until this Sharpe criterion is satisfied.

Case 3: If the index does not fall under Case 1 or Case 2, then the criteria to be applied are derived from criteria for L1 indices with an adjustment for the expected differences in mean returns and volatility. Details are provided in the appendix.

Mean and Volatility Criteria

The minimum value for the standard deviation of the one-year accumulation factor for U.S. broad-based indices is 16.5%. For all other L1 indices, the minimum value for the standard deviation is 17.5%. For L2 indices, the minimum value for the standard deviation is 23%.

The range for the expectation of the one-year accumulation factor is 8% to 12% for all L1 indices, and 11% to 15% for L2 indices.

These criteria are summarized in the following table:

Mean and volatility criteria	Minimum for the mean	Maximum for the mean	Minimum for the volatility
U.S. broad-based indices	8%	12%	16.5%
L1 indices other than U.S. indices	8%	12%	17.5%
L2 indices	11%	15%	23%

Right Tail Criteria

The table below provides the minimum values for the differences between the 90th, 95th and 97.5^{th} percentiles and the median of the accumulation factors for the one-year horizon. These criteria are met if the differences between the right tail percentiles and the median are greater or equal to the criteria. These criteria apply to L1 and L2 indices.

Right tail calibration criteria	One-year		
	90th	95th	97.5^{th}
L1 and L2 indices	0.18	0.24	0.30

CRITERIA FOR THE ADOPTION OF STANDARDS OF PRACTICE

The proposed equity return calibration criteria promulgation meets the criteria set out in section B of the ASB's Policy on Due Process for the Adoption of Standards of Practice.

1. It advances the public interest through the use of a consistent basis for establishing equity return models for segregated fund business.

2. It provides for the appropriate application of professional judgement within a reasonable range. The proposed calibration criteria allow the actuary to use any model that fits with the promulgated criteria for equity return.

3. Use of the proposed decision tree and tables is practical for actuaries with relevant training. The calibration does not require use of a specific model, only that the scenarios used fit the calibration criteria.

4. The specified decision tree and tables are considered to be unambiguous.

PROPOSED EFFECTIVE DATE

It is proposed that the calibration criteria would be used for valuations on or after October 15, 2012, and that early implementation in 2012 would be permitted.

FUTURE TIMING

The intended date for the final communication of the calibration criteria is June 2012.

COMMENTS

Comments on the proposed changes are invited **by March 31, 2012**. Please send your comments, preferably in an electronic form, to Chris Fievoli at chris.fievoli@actuaries.ca with a copy to Alexis Gerbeau alexis.gerbeau@standardlife.ca. No other specific forums for submitting comments are planned.

ADP

APPENDIX: LEFT TAIL CRITERIA

The left tail criteria for the accumulation factors of an index falling in case 3 of the decision tree are:

$$AF(F, p, t) = AF(TSX, p, t) \times \exp(\mu_{Diff} \times t + \sigma_{Diff} \times \Phi^{-1}(p) \times \sqrt{t})$$

where,

$AF(F, p, t)$	is the left tail criterion for index F for the pth percentile at horizon t;
$AF(TSX, p, t)$	is the left tail criterion for broad-based indices of non-Asian economies for the pth percentile at horizon t;
$\Phi^{-1}(p)$	is the inverse cumulative distribution function of the normal distribution;
σ_{TSX}	is the sample standard deviation for the TSX;
σ_{F}	is the sample standard deviation for the index;
σ_{Diff}	is equal to $\sigma_F - \sigma_{TSX}$, the differential in the standard deviation of the two indices;
μ_{TSX}	is the sample mean for the TSX;
μ_{F}	is the mean for the index, calculated using the Sharpe ratio as: $\mu_F = r + \sigma_F \times (\mu_{TSX} - r) / \sigma_{TSX;}$
μ_{Diff}	is equal to $\mu_F - \mu_{TSX}$, the differential in the mean of the two indices; and
r	is the risk-free rate, established at 4% for this promulgation.

The sample volatilities for the TSX and the index would be calculated using the longest common historical period available. The sample mean for the TSX would be calculated using the data from 1956.

At a minimum, the index would be no less volatile than the TSX. If appropriate, the assumed volatility would be adjusted upward to reflect the stated objectives of the index.