AMERICAN ACADEMY *of* ACTUARIES

**Update to Actuarial Guideline MAR from the American Academy of Actuaries' Life Reserves Work Group**

**Presented to the National Association of Insurance Commissioners' Life and Health Actuarial Task Force**

**Washington, DC - June 2006**

The American Academy of Actuaries is a national organization formed in 1965 to bring together, in a single entity, actuaries of all specializations within the United States. A major purpose of the Academy is to act as a public information organization for the profession. Academy committees, task forces and work groups regularly prepare testimony and provide information to Congress and senior federal policy-makers, comment on proposed federal and state regulations, and work closely with the National Association of Insurance Commissioners and state officials on issues related to insurance, pensions and other forms of risk financing. The Academy establishes qualification standards for the actuarial profession in the United States and supports two independent boards. The Actuarial Standards Board promulgates standards of practice for the profession, and the Actuarial Board for Counseling and Discipline helps to ensure high standards of professional conduct are met. The Academy also supports the Joint Committee for the Code of Professional Conduct, which develops standards of conduct for the U.S. actuarial profession.


Life Reserves Work Group

Dave Neve, F.S.A., M.A.A.A., Co-Chair
Tom Kalmbach, F.S.A., M.A.A.A., Co-Chair

Jose Andrade-Cora, A.S.A., M.A.A.A.
Cliff Angstman, F.S.A., M.A.A.A.
Mary Bahna-Nolan, F.S.A., M.A.A.A.
Aryeh Bak, F.S.A., M.A.A.A.
Mike Barsky, F.S.A., M.A.A.A.
Jeff Beckley, F.S.A., M.A.A.A.
Phillip Beyer, F.S.A., M.A.A.A.
Bruce Bohlman, F.S.A., M.A.A.A.
Peter Boyko, F.S.A., M.A.A.A.
Cecil Bykerk, F.S.A., M.A.A.A.
Keith Dall, F.S.A., M.A.A.A.
Arnold Dicke, F.S.A., M.A.A.A.
Bob DiRico, A.S.A., M.A.A.A.
Armand DePalo, F.S.A., M.A.A.A.
Alan Emmer, F.S.A., M.A.A.A.
Todd Erkis, F.S.A., M.A.A.A.
Gary Falde, F.S.A., M.A.A.A.
Steve Ferrara, F.S.A., M.A.A.A.
Randy Freitag, F.S.A., M.A.A.A.
Bruce Friedland, F.S.A., M.A.A.A.
Elinor Friedman, F.S.A., M.A.A.A.
Carl Friedrich, F.S.A., M.A.A.A.
Dieter Gaubatz, F.S.A., F.C.I.A., M.A.A.A.
Nathan Greenlee, F.S.A., M.A.A.A.
Jim Haire, F.S.A., M.A.A.A.
Dale Hall, F.S.A., M.A.A.A.
Joan Hentschel, F.S.A., M.A.A.A
Michael Holloway, F.S.A., M.A.A.A.
Leslie Joseph, F.S.A., M.A.A.A.
Jeff Lane, F.S.A., M.A.A.A.
Dennis Martin, F.S.A., F.C.I.A., M.A.A.A.
Peter Marion, F.S.A., M.A.A.A.
Dwayne McGraw, F.S.A., M.A.A.A.
Esther Milnes, F.S.A., M.A.A.A.
Kory Olsen, F.S.A., M.A.A.A.
Michael Palace, F.S.A., M.A.A.A.
Tony Phipps, F.S.A., M.A.A.A.
Richard Plush, F.S.A., M.A.A.A.
Alan Routhenstein, F.S.A., M.A.A.A.
Karen Rudolph, F.S.A., M.A.A.A.
Lance Schulz, F.S.A., M.A.A.A.
Larry Segal, F.S.A., M.A.A.A.
Carolyn Stontz, F.S.A., M.A.A.A.
Steve Strommen, F.S.A., M.A.A.A.
Wayne Stuenkel, F.S.A., M.A.A.A.
Mike Taht, F.S.A., M.A.A.A.
Peter Van Beaver, F.S.A., M.A.A.A.
Jeff Vipond, F.S.A., M.A.A.A.
David Weinsier, F.S.A., M.A.A.A.
John Weum, F.S.A., M.A.A.A.

**ACTUARIAL GUIDELINE MAR**
**REQUIREMENTS FOR ESTABLISHING MARGINS FOR PRUDENT BEST ESTIMATE VALUATION ASSUMPTIONS WHEN DETERMINING RESERVES BASED ON THE PRINCIPLES-BASED LIFE RESERVES MODEL REGULATION**

**Table of Contents**



## I. Scope

This Guideline applies to all Individual Life Insurance policies subject to the Principles-based Reserves For Life Products Model Regulation (referred to throughout this Guideline as the "Model Regulation."). Margins for assumptions for other supplemental benefits, and riders that are not directly identified in the scope are to be based on actuarial judgment unless otherwise specified by regulation or guidelines.

## II. Definitions

Definitions used in this Guideline are specified in the Model Regulation.

## III. General Requirements

The Stochastic Reserve is based on a <<insert risk level>> CTE (Conditional Tail Expectation) level, which is determined by taking the numerical average of the <<insert 1 minus the risk level>> percent largest values of the Scenario Reserves.

***[Drafting note: LHATF will need to establish the CTE risk level. The LRWG has been assuming a 65 CTE risk level for modeling analysis.]***

## IV. Requirements for Setting Mortality Assumption Margins

A. The Industry Mortality Table to be used to blend with the experience mortality curves is the 2001 Valuation Basic Table.

B. The Industry Mortality Table may be adjusted by the most recent Society of Actuaries (SOA) intercompany mortality study that has been adopted by the NAIC to reflect emerging experience.

C. If the 2001 Valuation Basic Table or the Credibility Adjusted Table is adjusted for mortality improvement from the effective date for that table to the experience weighted average date underlying the data used to develop the

experience mortality curves, such adjustment must use the mortality improvement factors published in the most recent SOA intercompany mortality study.

D. The Credibility Procedure used to blend the experience mortality curves with the industry mortality table shall be the Poisson distribution of deaths with a 90% probability of being correct within a 3% margin of error. This distribution provides for full credibility if the underlying experience mortality study has at least 3,007 deaths. The credibility weighting factor for experience mortality data is equal to the square root of the quantity (N divided by 3,007) where N is the number of deaths in the underlying experience mortality study.

E. The "Normalized Method" will be used to allocate credibility to subcategories of data. This method is described in pages 17-21 of the paper "Expected Mortality: Fully Underwritten Canadian Individual Life Insurance Policies" published July, 2002 by the Canadian Institute of Actuaries.

## V. Requirements for Setting Policyholder Behavior Assumption Margins

***[Drafting Note: LHATF may wish to prescribe requirements for establishing Margins ~~requirements~~ for policyholder behavior assumptions.]***

## VI. Requirements for Setting Expense Assumption Margins

***[Drafting Note: LHATF may wish to prescribe requirements for establishing Margins ~~requirements~~ for expense assumptions.]***

## VII. Requirements for Setting Asset Assumption Margins

A. Asset Defaults and Investment Expenses

***[Drafting Note: LHATF may wish to prescribe requirements for establishing Margins for ~~Prudent Best Estimate asset~~ default costs ~~assumptions~~ and investment expenses. ~~expense assumptions that include an appropriate Margin over Best Estimate assumptions.~~]***

The Model Regulation requires that ~~LHATF may also wish to establish an aggregate cap on~~ the spread over Treasuries on the fixed income portion of the reinvestment assets for each Projection Interval be subject to an aggregate cap. ~~.~~ The aggregate cap could be determined as follows:

(a) After applying the Prudent Best Estimate assumption for asset defaults and investment expense to the gross earned rate for each reinvestment asset, the resulting net asset earned rate for each reinvestment asset can then be expressed as a Treasury Rate plus a spread.

(b) The weighted average spread over Treasuries for all assets for each Projection Interval cannot exceed a prescribed level of X bp. If this occurs, the spread over the Treasury rate for each reinvestment asset would be proportionally reduced for each Projection Interval to produce a weighted average aggregate cap equal to X, and the Prudent Best Estimate assumption for asset defaults and investment expenses would be adjusted accordingly~~.~~]

***[Drafting Note: other approaches to define the aggregate cap may be acceptable.]***

B. The Deterministic Scenario:

1. Prescribed Interest Rates Path. The path of U.S. Treasury rates used to determine the Deterministic Reserve will begin with the market yield curve on the valuation date (based on ~~t~~Treasury yields reported by <<insert source>>. The yield curve 120 months or more after the valuation date will be the "ultimate" yield curve shown below. The yield curve on any date between the valuation date and 120 months after the valuation date will be linearly interpolated between the starting yield curve and the "ultimate" yield curve.

   These rates are based on the distribution of Treasury rates from 1954-2003 and approximate the 65CTE of the distribution of yield curves obtained from the recalibrated C3 Phase I generator (where the CTE is measured at the low end of the distribution of rates). The yield rates shown below for the ultimate yield curve are annual effective rates (not coupon rates or bond-equivalent yields) for a bond with semi-annual coupons.

| | | | | | |
|---|---|---|---|---|---|
| 1yr or less | 3.33% | 11 | 4.32% | 21 | 4.45% |
| 2 | 3.65% | 12 | 4.35% | 22 | 4.46% |
| 3 | 3.84% | 13 | 4.36% | 23 | 4.47% |
| 4 | 3.96% | 14 | 4.38% | 24 | 4.47% |
| 5 | 4.05% | 15 | 4.39% | 25 | 4.48% |
| 6 | 4.13% | 16 | 4.41% | 26 | 4.49% |
| 7 | 4.19% | 17 | 4.42% | 27 | 4.49% |
| 8 | 4.23% | 18 | 4.43% | 28 | 4.49% |
| 9 | 4.27% | 19 | 4.44% | 29 | 4.50% |
| 10 | 4.30% | 20 | 4.45% | 30yrs or more | 4.50% |

For example, if the 5-year Treasury rate on the valuation date is 2.85%, then the 5-year Treasury rate assumed in the deterministic scenario would increase by 0.01% each month for 120 months and then level off at 4.05%, which is the 5-year treasury rate in the ultimate yield curve shown above. The same linear interpolation would be performed for every point on the yield curve.

***[Drafting Note: The table above was developed assuming LHATF chooses 65 CTE as the reserve risk level. Should LHATF choose a different risk level, the table may need to be updated. ~~This table may also need to be adjusted after LHATF establishes Margins on all other assumptions, to ensure that the resulting aggregate Margin for all valuation assumptions is not overly conservative (or not conservative enough) to achieve the targeted risk level for the Reported Reserve.~~]***

2. Prescribed Equity Rate Path. The path of equity returns used to determine the Deterministic Reserve will be based on a single path of S&P 500 returns for General Account assets, and a single set of paths of future fund performances for Separate Account assets. The method used to determine these paths will be prescribed.

***[Drafting Note: Further work is needed to define the approach determine these paths]***

C. Stochastic Scenarios:

1. Interest Rates Paths. U.S. Treasury rates shall ~~may~~ be modeled using:

   a. T~~t~~he American Academy of Actuaries' C3 Phase I interest rate generator, as recalibrated and adopted by the NAIC, or~~.~~

   b. A prescribed set of <<insert description of pre-packaged interest rate scenarios>>, or

   ***[Drafting Note: it is anticipated LHATF will establish a set of pre-packaged set of interest rate scenarios similar to those used for C3 Phase II RBC requirements.]***

   c. Predetermined Scenario Sets, or

   ***[Drafting Note: it is anticipated that LHATF will establish Predetermined Scenario Sets similar to the 12 and 50 scenario sets used for C3 Phase I, but developed for the purpose of calculating the Stochastic Reserve for life products. If this option is chosen, then the Stochastic Reserve will be determined using a prescribed weighting of the Scenarios, rather than using the CTE metric.]***

   ~~b.~~d. ~~Alternatively, U.S. Treasury rates may be based on~~ A~~a~~n interest rate generator developed by the company as long as the following prescribed calibration standards are met:

   <<insert calibration standards>>

   ***[Drafting Note: it is anticipated that LHATF will establish calibration standards similar to those used for C3 Phase II.]***

2. Equity Return Paths. ~~The actuary may use scenarios for~~ S&P 500 returns and separate account fund performance shall be modeled using: ~~based on~~

   a. The << insert prescribed equity return generator and model parameters>>, or

   ~~a.~~b. T~~t~~he American Academy of Actuaries' << insert pre-packaged scenarios>>, or~~.~~

   ***[Drafting Note: it is anticipated LHATF will establish a set of pre-packaged set of interest rate scenarios similar to those used for C3 Phase II RBC requirements.]***

   c. Predetermined Scenario Sets, or

   ***[Drafting Note: it is anticipated that LHATF will establish Predetermined Scenario Sets for the purpose of calculating the Stochastic Reserve for life products. If this option is chosen, then the Stochastic Reserve will be determined using a prescribed weighting of the Scenarios, rather than using the CTE metric.]***

   d. An equity return ~~–~~model developed by the company as long as the following prescribed calibration standards are met:

   <<insert calibration standards>>

   ***[Drafting Note: it is anticipated that LHATF will establish calibration standards similar to those used for C3 Phase II. Although the calibration points in the C3 Phase II requirement only go out 20 years, the requirement provides some guidance for returns beyond 20 years. As the life insurance policies being valued here can have an expected lifetime well in excess of 20 years, LHATF may wish to consider whether this guidance is appropriate for these products. In addition, the pre-packaged scenarios only go out 30 years. As the life insurance policies being valued here can have an expected lifetime well in excess of 30 years, it may be necessary to develop pre-packaged scenarios with a longer time horizon. Alternatively, the existing pre-packaged scenarios could be extended so that they have the same returns as in the first 30 years.]***

3. For considerations as to Other Funds, Correlation of Funds, Number of Scenarios and Efficiency in Estimation, Frequency of Projection and Time Horizon the actuary will use the following:

   <<insert requirements>>

   ***[Drafting Note: it is anticipated that LHATF will establish requirements for these items similar to those used for C3 Phase II.]***

4. Integrated Scenarios

   ***[Drafting Note: When developing projections for variable products or general account products which are backed in part by equity assets, it will be necessary to project both equity returns and interest rate paths. LHATF may wish to define acceptable methods for integrating these two types of scenarios, and may want to con~~si~~der approaches similar to those allowed in C3 Phase II.]***