Capital Adequacy (E) Task Force

RBC Proposal Form

☐ Capital Adequacy (E) Task Force
☐ Health RBC (E) Working Group
☒ Life RBC (E) Working Group
☐ Catastrophe Risk (E) Subgroup
☐ P/C RBC (E) Working Group
☐ Longevity Risk (A/E) Subgroup
☐ Variable Annuities Capital. & Reserve (E/A) Subgroup
☐ Economic Scenarios (E/A) Subgroup
☐ RBC Investment Risk & Evaluation (E) Working Group

DATE: 7/9/2025

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ON BEHALF OF: Life Risk-Based Capital (E) Working Group

NAME: Philip Barlow, Chair

TITLE: Associate Commissioner of Insurance

AFFILIATION: District of Columbia

ADDRESS: 1050 First Street, NE Suite 801
Washington, DC 20002

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Agenda Item # 2025-14-L
Year 2026

DISPOSITION

ADOPTED:
☐ TASK FORCE (TF) ____________
☐ WORKING GROUP (WG) ____________
☐ SUBGROUP (SG) ____________

EXPOSED:
☐ TASK FORCE (TF) ____________
☐ WORKING GROUP (WG) ____________
☐ SUBGROUP (SG) ____________

REJECTED:
☐ TF ☐ WG ☐ SG ____________

OTHER:
☐ DEFERRED TO ____________
☐ REFERRED TO OTHER NAIC GROUP
☐ (SPECIFY) ____________

IDENTIFICATION OF SOURCE AND FORM(S)/INSTRUCTIONS TO BE CHANGED

☐ Health RBC Blanks
☐ Property/Casualty RBC Blanks
☐ Life and Fraternal RBC Blanks
☐ Health RBC Instructions
☐ Property/Casualty RBC Instructions
☒ Life and Fraternal RBC Instructions
☐ Health RBC Formula
☐ Property/Casualty RBC Formula
☐ Life and Fraternal RBC Formula
☐ OTHER ____________

DESCRIPTION/REASON OR JUSTIFICATION OF CHANGE(S)

This proposal addresses the referral from the GOES (E/A) Subgroup to the Life RBC (E) Working Group (Attachment A) to consider changes to the C3 Phase I calculation and C3 Phase II calculation and the necessary changes to the Life Risk-Based Capital Instructions.

This proposal implements the technical changes for the C3 Phase I and C3 Phase II to update for the adoption of the GOES economic scenario generator and updates the C3 Phase II calculation to not rely on a deep tail CTE(98) metric.

Additional Staff Comments:

** **This section must be completed on all forms.** **Revised 2-2023**

NATIONAL ASSOCIATION OF INSURANCE COMMISSIONERS

MEMORANDUM

TO: Philip Barlow, Chair, Life Risk-Based Capital (E) Working Group
Ben Slutsker, Vice Chair, Life Risk-Based Capital (E) Working Group

FROM: Mike Yanacheak, Chair, Generator of Economic Scenarios (GOES) (E/A) Subgroup
Peter Weber, Vice Chair, GOES (E/A) Subgroup

RE: GOES Amendments to Life RBC Blanks and Instructions

DATE: February 26, 2025

The GOES (E/A) Subgroup has been working to implement a new economic scenario generator for use in statutory reserve and capital calculations for life insurance and annuities. It is planned that the new economic scenario generator will be effective for C3 Phase I and C3 Phase II for year-end 2026. To facilitate the implementation of the new economic scenario generator, the GOES (E/A) Subgroup requests that the Life Risk-Based Capital (E) Working Group:

1. Implement the necessary changes to the Life Risk-Based Capital Blanks and Instructions,
2. Coordinate with the Variable Annuities Capital and Reserve (E/A) Subgroup on recommended changes to the C3 Phase II calculation,
3. Consider changes to the required number of scenarios for the C3 Phase I calculation, if necessary, and,
4. Consider changes to the capital metric for the C3 Phase I calculation, if necessary.

The Subgroup appreciates the Working Group's assistance on this issue and looks forward to the response.

Details Eliminated to Conserve Space

Line (35)
Enter the interest rate risk component from the Cash Flow Modeling for C-3 RBC Requirements Variable Annuities and Similar Products (see Line (37)). The interest rate risk component should be entered on a pre-tax basis using the enacted maximum corporate income tax rate.

Line (36)
Total interest rate risk. Equals Line (34) plus Line (35).

Line (37)

Cash Flow Modeling for C-3 RBC Requirements for Variable Annuities and Similar Products:

Overview

The amount reported on Line (35) and Line (37) is calculated using the 7-step process defined below. This calculation applies to all policies and contracts that have been valued following the requirements of AG-43 or VM-21. For contracts whose reserve was determined using the Alternative Methodology (VM-21 Section 7) see step 3 while all other contracts follow steps 1 and 2, then all contracts follow steps 4 - 7.

Step 1 ~~CTE98~~CTE90: The first step is to determine CTE90~~8~~ by applying the one of the two methodologies described in paragraph A below.

Step 2 C-3 RBC: using the formulas in paragraph B, determine the C-3 RBC amount based on the amount calculated in step (1). Floor this amount at $0.

Step 3: Determine the C-3 RBC using the Alternative Methodology for any business subject to that requirements as described in paragraph C.

Step 4: As described in paragraph D below, the C-3 RBC amount is the sum of the amounts determined in steps 2 and 3 above, but not less than zero. The Total Asset Requirement is the Reserve based on the requirements of VM-21 prior to the application of any phase-in, plus the C-3 RBC amount.

Step 5: For a company that has elected a Phase-in for reserves following VM-21 Section 2.B., the C-3 RBC amount is to be phased-in over the same time period following the requirements in paragraph E below.

Step 6: Apply the smoothing rules (if applicable) to the C-3 RBC amount in step (4) or (5) as applicable.

Step 7: Divide the amount from Step 4, 5, or 6 (as appropriate) by (1-enacted maximum federal corporate income tax rate). Split this amount into an interest rate risk portion and a market risk portion, as described in paragraph ~~G~~F.
The interest rate portion of the risk should be included in Line (35) and the market risk portion in Line (37).

The C-3 RBC is calculated as follows:

A. CTE (~~98~~90) is calculated as follows: Except for policies and contracts subject to the Alternative Methodology (See C. below), apply the CTE methodology described in NAIC Valuation Manual VM-21 and calculate the CTE (~~98~~90) as the numerical average of the 10~~2~~% largest values of the Scenario Reserves, as defined by Section 4 of VM-21. In performing this calculation, the process and methods used to calculate the Scenario Reserves use the requirements of VM-21 and should be the same as used for the reserve calculations. The effect of Federal Income Tax should be handled following one of the following two methods:

1. If using the Macro Tax Adjustment (MTA): The modeled cash flows will ignore the effect of Federal Income Tax. As a result, for each individual scenario, the numerical value of the scenario reserve used in this calculation should be identical to that for the same scenario in the Aggregate Reserve calculation under VM-21. Federal Income Tax is reflected later in the formula in paragraph B.1.

2. If using Specific Tax Recognition (STR): At the option of the company, CTE After-Tax (~~98~~90) (CTEAT (9~~8~~0)) may be calculated using an approach in which the effect of Federal Income Tax is reflected in the projection of Accumulated Deficiencies, as defined in Section 4.A. of VM-21, when calculating the Scenario Reserve for each scenario. To reflect the effect of Federal Income Tax, the company should find a reasonable and consistent basis for approximating the evolution of tax reserves in the projection, taking into account restrictions around the size of the tax reserves (e.g., that tax reserve must equal or exceed the cash surrender value for a given contract). The Accumulated Deficiency at the end of each projection year should also be discounted at a rate that reflects the projected after-tax discount rates in that year. In addition, the company should add the Tax Adjustment as described below to the calculated CTEAT (~~98~~90) value.

3. A company that has elected to calculate CTEAT (~~98~~90) using STR may not switch back to using MTA in the projection of Accumulated Deficiencies without prominently disclosing that change in the certification and supporting memorandum. The company should also disclose the methodology adopted, and the rationale for its adoption, in the documentation required by paragraph J below.

4. Application of the Tax Adjustment: Under the U.S. IRC**,** the tax reserve is defined. It can never exceed the statutory reserve nor be less than the cash surrender value. If a company is using STR and if the company's actual tax reserves exceed the projected tax reserves at the beginning of the projection, a tax adjustment is required.

   The CTEAT (~~98~~90) must be increased on an approximate basis to correct for the understatement of modeled tax expense. The additional taxable income at the time of claim will be realized over the projection and will be approximated using the duration to worst, i.e., the duration producing the lowest present value for each scenario. The method of developing the approximate tax adjustment is described below.

   The increase to CTEAT (~~98~~90) may be approximated as the corporate tax rate times f times the difference between the company's actual tax reserves and projected tax reserves at the start of the projections. For this calculation, f is calculated as follows**:** For the scenarios reflected in calculating CTE (90~~8~~), the ~~Scenario Greatest Present Value~~ scenario reserve is determined and its associated projection duration is tabulated. At each such duration, the ratio of the number of contracts in force (or covered lives for group contracts) to the number of contracts in force (or covered lives) at the start of the modeling projection is calculated. The average ratio is then calculated over all CTE (~~98~~90) scenarios and f is one minus this average ratio. If the Alternative Method is used, f is approximated as 0.5.

B. Determination of RBC amount using stochastic modeling:

1. If using the MTA: Calculate the RBC Requirement by the following formula in which the statutory reserve is the actual reserve reported in the Annual Statement. ~~i~~In the second term – i.e., the difference between statutory reserves and tax reserves multiplied by the Federal Income Tax Rate – may not exceed the portion of the company's non-admitted deferred tax assets attributable to the same portfolio of contracts to which VM-21 is applied in calculating statutory reserves:

   ~~25% x~~ ((CTE (~~98~~90) ~~+ Additional Standard Projection Amount –~~ ~~Statutory Reserve~~ SR) x (1 – Federal Income Tax Rate) – (Statutory Reserve – Tax Reserve) x Federal Income Tax Rate

2. If the company elects to use the STR: The C-3 RBC is determined by the following formula:

   ~~25% x~~ (CTEAT (~~98~~90) ~~+ Additional Standard Projection Amount –~~ ~~Statutory Reserve~~ SR)

Guidance Note: The SR is the CTE70 (best efforts) + E × max[0, CTE70 (adjusted) – CTE70 (best efforts)], before consideration of the Additional Standard Projection Amount, Asset Adequacy Reserves, or Voluntary Reserves. Voluntary reserve means any reserve that is not required by AG-43, VM-21 and/or a state in which the company is doing business. ~~The Additional Standard Projection Amount is calculated using the methodology outlined in Section 6 of VM-21.~~

C. Determination of C-3 RBC using Alternative Methodology: This calculation applies to all policies and contracts that have been valued following the requirements of AG-43 or VM-21, for which the reserve was determined using the Alternative Methodology (VM-21 Section 7). The C-3 RBC amount is determined by applying the methodology as defined in Appendix 2 to these instructions.

D. The C-3 RBC amount is the sum of the amounts determined in paragraphs B and C above, but not less than zero. The TAR is defined as the Reserve determined according to VM-21 plus the C-3 RBC amount. All values are prior to any consideration of Phase-in allowances for either reserve or C-3 RBC~~, or any C-3 RBC smoothing allowance~~. The RBC values are post-tax.

E. Phase in: A company that has elected to phase-in the effect of the new ~~reserve~~ economic scenario generator requirements following VM-21 Section 2.C~~B.~~ shall phase in the effect on C-3 RBC ~~over the same time period~~, using the following steps:

- 1. Begin with the C-3 RBC amount from step 7 for Dec. 31, ~~2019~~ 2025 LR027 Line (37) instructions for all business within the scope of the Variable Annuities modeling requirements as of 12/31/~~19~~25. ~~Add to this any voluntary reserves which were subtracted from TAR when the C-3 RBC amount reported for 2019 was determined. Also a~~Add to this the amount of C-3 RBC computed in the same manner as the 2025~~19~~ value for any reinsurance ceded that is expected to be recaptured in 2026~~0~~ and in the scope of the Variable Annuities modeling requirements. This amount is 20~~19~~25 RBC
- 2. Determine the C-3 RBC amount as of 12/31/~~19~~25 using paragraphs A, B, C, and D for the same inforce business as in 1. ~~Exclude any voluntary reserves in these calculations.~~ Labeled as 20~~19~~25 RBC New
- Determine the phase-in amount (PIA) as the excess of 20~~19~~25RBC New over 20~~19~~25RBC
- For 12/31/202~~0~~6, compute the C-3 RBC following paragraphs A ~~– 108~~D above, then subtract PIA times (2/3)
- For 12/31/202~~1~~7, compute the C-3 RBC following paragraphs A – D above, then subtract PIA times (1/3)

~~**Guidance Note:** For a company that has adopted a Phase-in for reserves longer than 3 years, adjust the above formula to reflect the actual period with uniform amortization amounts during that period.~~

~~**Guidance Note:** An adjustment is made for voluntary reserves. Voluntary reserve means any reserve that is not required by AG-43, VM-21 and/or a state in which the company is doing business and was subtracted from TAR in 2019 to determine the RBC.~~

~~F. Smoothing of C-3 RBC amount~~

~~A company should decide whether or not to smooth the C-3 RBC calculated in paragraph D or E above to determine the amount in Line (37). For any business reinsured under a coinsurance agreement that complies with all applicable reinsurance reserve credit "transfer of risk" requirements, the ceding company shall reduce the reserve in proportion to the business ceded while the assuming company shall use a reserve consistent with the business assumed.~~

~~A company may choose to smooth the C-3 RBC calculated in paragraph D or E above. A company is required to get approval from its domestic regulator prior to changing its decision about smoothing from the prior year. In addition, a company that has elected to smooth the risk-based capital is required to get approval from its domestic regulator prior to smoothing if it has experienced a material change in its Clearly Defined Hedging Strategy from the prior. For this purpose, a company's Clearly Defined Hedging Strategy is considered to have experienced a material change if any of the items outlined in VM-21 Section 1.D.2 in the current year differs from that in the prior year.~~

~~To implement smoothing, use the following steps. If a company does not qualify to smooth or a decision has been made not to smooth, go to paragraph G.~~

1. ~~Determine the C-3 RBC amount calculated in paragraph D or E above~~
2. ~~Determine the aggregate reserve for the contracts covered by the Variable Annuity Stochastic modeling requirements.~~
3. ~~Determine the ratio of the C-3 RBC / reserve for current year.~~
4. ~~Determine the C-3 RBC as actually reported for the prior year Lines (35) plus (37) and adjust that amount to a post-tax amount by multiplying by (1- enacted maximum federal corporate income tax rate). Restate the amount to remove the effect of any voluntary reserves held in prior years that materially differ in amount from the voluntary reserves held in the current year.~~

5. Determine the aggregate reserve for the contracts in scope of these requirements for the prior year-end. Restate the aggregate reserve to remove any voluntary reserves held for the prior year-end that materially differ in amount from the voluntary reserves held as of the current year-end.
6. Determine the ratio of the C-3 RBC / reserve for prior year.
7. Determine a ratio as 0.4*(6) plus 0.6*(3) {40% prior year ratio and 60% current year ratio}.
8. Determine the risk-based capital for current year as the product of (7) and (2) {adjust (2) to be actual 12/31 reserve}.

G.F. The amount determined in paragraphs D., E., or FE. above for the contracts shall be divided by (1-enacted maximum federal corporate income tax rate) to arrive at a pre-tax amount. This pre-tax amount shall be split into a component for interest rate risk and a component for market risk. Neither component may be less than zero. The provision for the interest rate risk, if any, is to be reported in Line (35). The market risk component is reported in Line (37).

The amount reported in Line (37) is to be combined with the C-1cs component for covariance purposes.

H.G. The way grouping (of funds and of contracts), sampling, number of scenarios, and simplification methods are handled is the responsibility of the company. However, all these methods are subject to Actuarial Standards of Practice, supporting documentation and justification, and should be identical to those used in calculating the company's statutory reserves following VM-21.

I.H. Certification of the work done to set the C-3 RBC amount for Variable Annuities and Similar products are the same as are required for reserves as part of VM-31. The certification should specify that the actuary is not opining on the adequacy of the company's surplus or its future financial condition.

The certification(s) should be submitted by hard copy with any state requiring an RBC hard copy.

J.I. An actuarial memorandum should be constructed documenting the methodology and assumptions upon which the required capital for the variable annuities and similar products is determined. Since the starting point for the C-3 RBC calculation is the cash flow modeling used for the reserves, the documentation requirements for reserves (VM-31) should be followed for the C-3 RBC. The reserve report may be incorporated by reference, with this C-3 RBC memorandum focused on identifying differences and items unique to the C-3 RBC process, or at the company's option, the documentation of C-3 RBC may be merged into the VA Report with the differences for C-3 RBC discussed in a separate section of the Memorandum as outlined in VM-31.

These differences that would need to be identified either in the RBC Actuarial Memorandum or the VA Report will typically include:

- The basis for considering federal income tax,
- Whether or not smoothing was applied, and the effect of that smoothing,
- Whether or not a phase in was used, and the impact on the reported values,
- If the company elects to calculate CTEAT (9890) using STR whereby the effect of Federal Income Tax is reflected in the projection of Accumulated Deficiencies, the company should still disclose in the memorandum the Total Asset Requirement and C-3 RBC that would be obtained if the company had elected to use the MTA method.
- Documentation of the alternative methodology calculations, if applicable, and
- Documentation of how the C-3 RBC values were allocated to the interest and market risk components.

This actuarial memorandum will be confidential and available to regulators upon request.

The lines on the alternative calculations page will not be required for 2019 or later.

The total of all annual statement reserves representing exposure to C–3 risk on Line (36) should equal the following:

Exhibit 5, Column 2, Line 0199999
– Page 2, Column 3, Line 6
+ Exhibit 5, Column 2, Line 0299999
+ Exhibit 5, Column 2, Line 0399999
+ Exhibit 7, Column 1, Line 14
+ Separate Accounts Page 3, Column 3, Line 1 plus Line 2 after deducting (a) funds in unitized separate accounts with no underlying guaranteed minimum return and no unreinsured guaranteed living benefits; (b) non-indexed separate accounts that are not cash flow tested with guarantees less than 4%; (c) non-cash-flow-tested experience rated pension reserves/liabilities; and (d) guaranteed indexed separate accounts using a Class II investment strategy.
– Non policyholder reserves reported on Exhibit 7
+ Exhibit 5, Column 2, Line 0799997
+ Schedule S, Part 1, Section 1, Column 12
– Schedule S, Part 3, Section 1, Column 14

APPENDIX 2 – ALTERNATIVE METHOD FOR GMDB RISKS

{Drafting Note: the following is copied from the American Academy of Actuaries June 2005 Report to the NAIC Capital Adequacy Task Force
This Appendix describes the Alternative Method for GMDB exposure in significant detail; how it is to be applied and how the factors were developed. Factor tables have been developed using the Conditional Tail Expectation ("CTE") risk measure at two confidence levels: 65% and 90%. The latter is determined on an "after tax" basis and is required for the RBC C3 Phase II standard for Total Asset Requirement ("TAR"). The former is a pre-tax calculation and should assist the Variable Annuity Reserve Working Group ("VARWG") in formulating a consistent "alternative method" for statutory reserves.

General

1. It is expected that the Alternative Method ("AltM") will be applied on a policy-by-policy basis (i.e., seriatim). If the company adopts a cell-based approach, only materially similar contracts should be grouped together. Specifically, all policies comprising a "cell" must display substantially similar characteristics for those attributes expected to affect risk-based capital (e.g., definition of guaranteed benefits, attained age, policy duration, years-to-maturity, market-to-guaranteed value, asset mix, etc.).

2. The Alternative Method determines the TAR as the sum of the Cash Surrender Value and the following three (3) provisions, collectively referred to as the *Additional Asset Requirement* ("AAR"):
   - Provision for amortization of the outstanding (unamortized) surrender charges – "Charge Amortization" or "CA";
   - Provision for fixed dollar expenses/costs net of fixed dollar revenue – "Fixed Expenses" or "FE"; and
   - Provision for claims (in excess of account value) under the guaranteed benefits net of available spread-based revenue ("margin offset") – "Guaranteed Cost" or "GC".

   All of these components reflect the impact of income taxes and are explained in more detail later in this Appendix.
   The Risk-Based Capital amount (C-3 RBC) is determined in aggregate for the block of policies as the TAR less the reserve determined based on Section 7 of VM-21.
   Note the following regarding income taxes:
   The company determines the CA and FE amounts by projecting the inforce data and incorporating a 21% tax rate and a post-tax discount rate of 4.54% (= 5.75% x [1-21%]).

   In determining the GC amounts, a "look-up" function is used which provides a GMDB Cost Factor "f" and Base Margin Offset Factor "g". These factors ("f" and "g") represent CTE90 factors on a post-tax basis where a 35% tax rates and 3.74% (= 5.75% x (1-35%)) discount rate has been used. The company needs to multiply these factors by (.79/.65) to adjust the factors for a 21% tax rate basis. It is noted that this adjustment overstates the impact of the lower tax rate as the impact of the higher discount rate has not been reflected.

3. The total AAR (in excess of cash surrender value) is the sum of the AAR calculations for each policy or cell. The result for any given policy (cell) may be negative, zero or positive.

4. For variable annuities without guarantees, the Alternative Method for capital uses the methodology which applied previously to all variable annuities. The charge is 11% of the difference between fund balance and cash surrender value if the current surrender charge is based on fund balance. If the current surrender charge is based on fund contributions, the charge is 2.4% of the difference for those contracts for which the fund balance exceeds the sum of premiums less withdrawals and 11% for those for which that is not the case. In all cases, the result is to be multiplied by 0.79 to adjust for Federal Income Tax. For in-scope contracts, such as many payout annuities with no cash surrender value and no performance guarantees, there is no capital charge.

5. For variable annuities with death benefit guarantees, the AAR for a given policy is equal to: $R \times (CA + FE) + GC$ where:

CA (Charge Amortization)	= Provision for amortization of the outstanding (unamortized) surrender charges
FE (Fixed Expense)	= Provision for fixed dollar expenses/costs net of fixed dollar revenue
GC (Guaranteed Cost)	= Provision for claims (in excess of account value) under the guaranteed benefits net of available spread-based revenue ("margin offset")

The components *CA*, *FE* and *GC* are calculated separately. *CA* and *FE* are defined by deterministic "single-scenario" calculations which account for asset growth, interest, inflation and tax at prescribed rates. Mortality is ignored. However, the actuary determines the appropriate "prudent best estimate" lapses/withdrawal rates for the calculations. The components *CA*, *FE* and *GC* may be positive, zero or negative. $R = h(\circ)$ is a "scaling factor" that depends on certain risk attributes $\tilde{\theta}$ for the policy and the product portfolio.

6. The "Alternative Method" factors and formulas for GMDB risks (component *GC*) have been developed from stochastic testing using the 10,000 "Pre-packaged" scenarios (March 2005). The pre-packaged scenarios have been fully documented under separate cover – see http://www.actuary.org/pdf/life/c3supp_march05.pdf at the American Academy of Actuaries' website.

7. The model assumptions for the AltM Factors (component GC) are documented in the section of this Appendix entitled *Component GC*.

8. The table of *GC* factors that has been developed assumes male mortality at 100% of the MGDB 94 ALB table, and uses a 5-year age setback for female annuitants. Companies using the Alternative Method may use these factors, or may use the procedure described in Methodology Note C3-05 in the report "Recommended Approach for Setting Risk- Based Capital Requirements for Variable Annuities and Similar Products Presented by the American Academy of Actuaries' Life Capital Adequacy Subcommittee to the National Association of Insurance Commissioners' Capital Adequacy (E) Task Force (June 2005)" to adjust for the actuary's Prudent Best Estimate of mortality. If the company does not have a Prudent Best Estimate mortality assumption, the company may use the procedure described in Methodology Note C3-05 to adjust to the 2012 IAM as modified in VM-21 Section 11.C. Once a company uses the modified method for a block of business, the option to use the unadjusted table is no longer available for that part of its business.

9. There are five (5) major steps in using the *GC* factors to determine the "*GC*" component of the AAR for a given policy/cell:

   a) Classifying the asset exposure;
   b) Determining the risk attributes;
   c) Retrieving the appropriate nodes from the factor grid;
   d) Interpolating the nodal factors, where applicable (optional);
   e) Applying the factors to the policy values.

   Categorizing the asset value for the given policy or cell involves mapping the entire exposure to one of the eight (8) prescribed "fund classes". Alternative Method factors are provided for each asset class.
   The second step requires the company to determine (or derive) the appropriate attributes for the given policy or cell. These attributes are needed to calculate the required values and access the factor tables:

   - Product form ("Guarantee Definition"), *P*.
   - Adjustment to guaranteed value upon partial withdrawal ("GMDB Adjustment"), *A*.
   - Fund class, *F*.
   - Attained age of the annuitant, *X*.
   - Policy duration since issue, *D*.
   - Ratio of account value to guaranteed value, ϕ.
   - Total account charges, *MER*.

   Other required policy values include:
   - Account value, *AV*.
   - Current guaranteed minimum death benefit, *GMDB*.

- Net deposit value (sum of deposits less sum of withdrawals), *NetDeposits*[2].
- Net spread available to fund guaranteed benefits ("margin offset"), α.

The next steps – retrieving the appropriate nodes from the factor grid and interpolation – are explained in the section entitled *Component GC* of this Appendix. Tools are provided to assist the company in these efforts (see Appendix 9), but their use is not mandatory. This documentation is sufficiently detailed to permit the company to write its own lookup and extraction routines. A calculation example to demonstrate the application of the various component factors to sample policy values is shown in the section *Component GC* of this Appendix.

10. The total account charges should include all amounts assessed against policyholder accounts, expressed as a level spread per year (in basis points). This quantity is called the Management Expense Ratio ("MER") and is defined as the average amount (in dollars) charged against policyholder funds in a given year divided by average account value. Normally, the MER would vary by fund class and be the sum of investment management fees, mortality & expense charges, guarantee fees/risk premiums, etc. The spread available to fund the GMDB costs ("margin offset", denoted by α) should be net of spread-based costs and expenses (e.g., net of maintenance expenses, investment management fees, trail commissions, etc.), but may be increased for Revenue Sharing as can be reflected in modeling (i.e., had the Alternative Method not been elected) by adhering to the requirements set forth in section 6 of the *Modeling Methodology*. The section of this Appendix on *Component GC* describes how to determine *MER* and α. 'Time-to-maturity' is uniquely defined in the factor modeling by $T = 95 - X$. (This assumes an assumed maturity age of 95 and a current attained age of X.) Net deposits are used in determining benefit caps under the GMDB Roll-up and Enhanced Death Benefit ("EDB") designs.

11. The GMDB definition for a given policy/cell may not exactly correspond to those provided. In some cases, it may be reasonable to use the factors/formulas for a different product form (e.g., for a "roll-up" GMDB policy near or beyond the maximum reset age or amount, the company should use the "return-of-premium" GMDB factors/formulas, possibly adjusting the guaranteed value to reflect further resets, if any). In other cases, the company might determine the RBC based on two different guarantee definitions and interpolate the results to obtain an appropriate value for the given policy/cell. However, if the policy form (definition of the guaranteed benefit) is sufficiently different from those provided and there is no practical or obvious way to obtain a good result from the prescribed factors/formulas, the company must select one of the following options:
    a) Model the "C3 Phase II RBC" using stochastic projections according to the approved methodology;
    b) Select factors/formulas from the prescribed set such that the values obtained conservatively estimate the required capital; or
    c) Calculate company-specific factors or adjustments to the published factors based on stochastic testing of its actual business. This option is described more fully in the section of this Appendix on *Component GC*.

12. The actuary must decide if existing reinsurance arrangements can be accommodated by a straight-forward adjustment to the factors and formulas (e.g., quota-share reinsurance without caps, floors or sliding scales would normally be reflected by a simple pro-rata adjustment to the "gross" *GC* results). For more complicated forms of reinsurance, the company will need to justify any adjustments or approximations by stochastic modeling. However, this modeling need not be performed on the whole portfolio but can be undertaken on an appropriate set of representative policies. See the section of this Appendix on *Component GC*.

[2] Net deposits are required only for certain policy forms (e.g., when the guaranteed benefit is capped as a multiple of net policy contributions).

Component *CA*

Component *CA* provides for the amortization of the unamortized surrender charges using the actual surrender charge schedule applicable to the policy. Over time, the surrender charge is reduced and a portion of the charges in the policy are needed to fund the resulting increase in surrender value. This component can be interpreted as the “amount needed to amortize the unamortized surrender charge allowance for the *persisting* policies plus an implied borrowing cost”. By definition, the amortization for non-persisting lives in each time period is exactly offset by the collected surrender charge revenue (ignoring timing differences and any waiver upon death). The company must project the unamortized balance to the end of the surrender charge period and discount the year-by-year amortization under the following assumptions. All calculations should reflect the impact of income taxes.

- Net asset return (i.e., after fees) as shown in Table 1 below. These rates roughly equate to an annualized 5th percentile return over a 10-year horizon3. The 10-year horizon was selected as a reasonable compromise between the length of a typical surrender charge period and the longer testing period usually needed to capture all the costs on "more expensive" portfolios (i.e., lower available spread, lower AV/GV ratio, older ages, etc.). Note, however, that it may not be necessary to use these returns if surrender charges are a function of deposits/premiums.
- Income tax and discount rates (after-tax) as defined in Table 9 of this Appendix.
- The “Dynamic Lapse Multiplier” calculated at the valuation date (a function of Account Value (AV) –– Guaranteed Value (GV) ratio) is assumed to apply in each future year. This factor adjusts the lapse rate to reflect the antiselection present when the guarantee is in-the-money. Lapse rates may be lower when the guarantees have more value.
- Surrender charges and free partial withdrawal provisions should be reflected as per the contract specifications.
- “Prudent best estimate” lapse and withdrawal rates. Rates may vary according to the attributes of the business being valued, including, but not limited to, attained age, policy duration, etc.
- For simplicity, mortality may be ignored in the calculations.

Unlike the GC component, which requires the actuary to map the entire contract exposure to a single “equivalent” asset class, the *CA* calculation separately projects each fund (as mapped to the 8 prescribed categories) using the net asset returns in Table 2-1.

Table 2-1: Net Asset Returns for “CA” Component

Asset Class/Fund	Net Annualized Return
Fixed Account	Guaranteed Rate
Money Market and Fixed Income	0%
Balanced	–1%
Diversified Equity	–2%
Diversified International Equity	–3%
Intermediate Risk Equity	–5%
Aggressive or Exotic Equity	–8%

3 A 5th percentile return is consistent with the CTE90 risk measure adopted in the C3 Phase II RBC methodology.

Component *FE*

Component *FE* establishes a provision for fixed dollar costs (i.e., allocated costs, including overhead *and* those expenses defined on a "per policy" basis) less any fixed dollar revenue (e.g., annual administrative charges or policy fees). The company must project fixed expenses net of any "fixed revenue" to the earlier of contract maturity or 30 years and discount the year-by-year amounts under the following assumptions. All calculations should reflect the impact of income taxes.

- Income tax and discount rates (after-tax) as defined in Table 9 of this Appendix.
- The "Dynamic Lapse Multiplier" calculated at the valuation date (a function of MV−−GV ratio) is assumed to apply in each future year. This factor adjusts the lapse rate to reflect the antiselection present when the guarantee is in-the-money. Lapse rates may be lower when the guarantees have more value.
- Per policy expenses are assumed to grow with inflation starting in the second projection year. The ultimate inflation rate of 3% per annum is reached in the 8th year after the valuation date. The company must grade linearly from the current inflation rate ("CIR") to the ultimate rate. The CIR is the higher of 3% and the inflation rate assumed for expenses in the company's most recent asset adequacy analysis for similar business.
- "Prudent best estimate" for policy termination (i.e., total surrender). Rates may vary according to the attributes of the business being valued, including, but not limited to, attained age, policy duration, etc. Partial withdrawals should be ignored as they do not affect survivorship.
- For simplicity, mortality may be ignored in the calculations.

Component *GC*

The general format for *GC* may be written as: $GC = GV \times f(\tilde{\theta}) - AV \times \hat{g}(\tilde{\theta}) \times h(\hat{\theta})$ where *GV* = current guaranteed minimum death benefit, *AV* = current account value and $= \frac{\alpha}{\hat{\alpha}} \times g(\tilde{\theta})$. The functions $f(\circ)$, $g(\circ)$, and $h(\circ)$ depend on the risk attributes of the policy $\tilde{\theta}$and product portfolio $\hat{\theta}$. $h(\circ) = R$ was introduced in the "General" section as a "scaling factor". α is the company-determined net spread ("margin offset") available to fund the guaranteed benefits and $\hat{\alpha} = 100$ basis points is the margin offset assumed in the development of the "Base" tabular factors. The functions $f(\circ)$ $g(\circ)$ and $h(\circ)$are more fully described later in this section.

Rearranging terms for *GC*, we have $GC = f(\tilde{\theta}) \times [GV - AV \times z(\tilde{\theta})]$. Admittedly, $z(\tilde{\theta})$ is a complicated function that depends on the risk attribute sets $\tilde{\theta}$ and $\hat{\theta}$, but conceptually we can view $AV \times z(\tilde{\theta})$ as a shock to the current account value (in anticipation of the adverse investment return scenarios that typically comprise the CTE(90) risk measure for the AAR) so that the term in the square brackets is a "modified net amount at risk". Accordingly, $f(\tilde{\theta})$ can be loosely interpreted as a factor that adjusts for interest (i.e., discounting) and mortality (i.e., the probability of the annuitant dying).

In practice, $f(\circ)$, $g(\circ)$, and $h(\circ)$ are not functions in the typical sense, but values interpolated from the factor grid. The factor grid is a large pre-computed table developed from stochastic modeling for a wide array of combinations of the risk attribute set. The risk attribute set is defined by those policy and/or product portfolio characteristics that affect the risk profile (exposure) of the business: attained age, policy duration, AV/GV ratio, fund class, etc.

Fund Categorization

The following criteria should be used to select the appropriate factors, parameters and formulas for the exposure represented by a specified guaranteed benefit. When available, the volatility of the long-term annualized total return for the fund(s) – or an appropriate benchmark – should conform to the limits presented. This calculation should be made over a reasonably long period, such as 25 to 30 years.

Where data for the fund or benchmark are too sparse or unreliable, the fund exposure should be moved to the next higher volatility class than otherwise indicated. In reviewing the asset classifications, care should be taken to reflect any additional volatility of returns added by the presence of currency risk, liquidity (bid-ask) effects, short selling and speculative positions.

All exposures/funds must be categorized into one of the following eight (8) asset classes:

1. Fixed Account
2. Money Market
3. Fixed Income
4. Balanced
5. Diversified Equity
6. Diversified International Equity
7. Intermediate Risk Equity
8. Aggressive or Exotic Equity

Fixed Account. The fund is credited interest at guaranteed rates for a specified term or according to a 'portfolio rate' or 'benchmark' index. The funds offer a minimum positive guaranteed rate that is periodically adjusted according to company policy and market conditions.

Money Market/Short-Term. The fund is invested in money market instruments with an average remaining term-to-maturity of less than 365 days.

Fixed Income. The fund is invested primarily in investment grade fixed income securities. Up to 25% of the fund within this class may be invested in diversified equities or high- yield bonds. The expected volatility of the fund returns will be lower than the Balanced fund class.

Balanced. This class is a combination of fixed income securities with a larger equity component. The fixed income component should exceed 25% of the portfolio and may include high yield bonds as long as the total long-term volatility of the fund does not exceed the limits noted below. Additionally, any aggressive or 'specialized' equity component should not exceed one-third (33.3%) of the total equities held. Should the fund violate either of these constraints, it should be categorized as an equity fund. These funds usually have a long- term volatility in the range of 8% – 13%.

Diversified Equity. The fund is invested in a broad-based mix of U.S. and foreign equities. The foreign equity component (maximum 25% of total holdings) must be comprised of liquid securities in well-developed markets. Funds in this category would exhibit long-term volatility comparable to that of the S&P500. These funds should usually have a long-term volatility in the range of 13% – 18%.

Diversified International Equity. The fund is similar to the Diversified Equity class, except that the majority of fund holdings are in foreign securities. These funds should usually have a long-term volatility in the range of 14% – 19%.

Intermediate Risk Equity. The fund has a mix of characteristics from both the Diversified and Aggressive Equity Classes. These funds have a long-term volatility in the range of 19% – 25%.

Aggressive or Exotic Equity. This class comprises more volatile funds where risk can arise from: (a) underdeveloped markets, (b) uncertain markets, (c) high volatility of returns, (d) narrow focus (e.g., specific market sector), etc. The fund (or market benchmark) either does not have sufficient history to allow for the calculation of a long-term expected volatility, or the volatility is very high. This class would be used whenever the long-term expected annualized volatility is indeterminable or exceeds 25%.

THE SELECTION OF AN APPROPRIATE INVESTMENT TYPE SHOULD BE DONE AT THE LEVEL FOR WHICH THE GUARANTEE APPLIES. FOR GUARANTEES APPLYING ON A DEPOSIT-BY-DEPOSIT BASIS, THE FUND SELECTION IS STRAIGHTFORWARD. HOWEVER, WHERE THE GUARANTEE APPLIES ACROSS DEPOSITS OR FOR AN ENTIRE CONTRACT, THE APPROACH CAN BE MORE COMPLICATED. IN SUCH INSTANCES, THE APPROACH IS TO IDENTIFY FOR EACH POLICY WHERE THE "GROUPED FUND HOLDINGS" FIT WITHIN THE CATEGORIES LISTED AND TO CLASSIFY THE ASSOCIATED ASSETS ON THIS BASIS.

A seriatim process is used to identify the "grouped fund holdings", to assess the risk profile of the current fund holdings (possibly calculating the expected long-term volatility of the funds held with reference to the indicated market proxies), and to classify the entire "asset exposure" into one of the specified choices. Here, "asset exposure" refers to the underlying assets (separate and/or general account investment options) on which the guarantee will be determined. For example, if the guarantee applies separately for each deposit year within the contract, then the classification process would be applied separately for the exposure of each deposit year.

In summary, mapping the benefit exposure (i.e., the asset exposure that applies to the calculation of the guaranteed minimum death benefits) to one of the prescribed asset classes is a multi-step process:

1. Map each separate and/or general account investment option to one of the prescribed asset classes. For some funds, this mapping will be obvious, but for others it will involve a review of the fund's investment policy, performance benchmarks, composition and expected long-term volatility.
2. Combine the mapped exposure to determine the expected long-term "volatility of current fund holdings". This will require a calculation based on the expected long-term volatilities for each fund and the correlations between the prescribed asset classes as given in Table 2-2.
3. Evaluate the asset composition and expected volatility (as calculated in step 2) of current holdings to determine the single asset class that best represents the exposure, with due consideration to the constraints and guidelines presented earlier in this section.

In step 1., the company should use the fund's actual experience (i.e., historical performance, inclusive of reinvestment) only as a guide in determining the expected long-term volatility. Due to limited data and changes in investment objectives, style and/or management (e.g., fund mergers, revised investment policy, different fund managers, etc.), the company may need to give more weight to the expected long-term volatility of the fund's benchmarks. In general, the company should exercise caution and not be overly optimistic in assuming that future returns will consistently be less volatile than the underlying markets.

In step 2., the company should calculate the "volatility of current fund holdings" (σ for the exposure being categorized) by the following formula using the volatilities and correlations in Table 2.

$$\sigma = \sqrt{\sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j \rho_{ij} \sigma_i \sigma_j}$$

where $w_i = \frac{AV_i}{\sum_k AV_k}$ is the relative value of fund *i* expressed as a proportion of total contract value, ρ_{ij} is the correlation between asset classes *i* and *j* and σ_i is the volatility of asset class *i* (see Table 2). An example is provided at the end of this section.

Table 2-2: Volatilities and Correlations for Prescribed Asset Classes

ANNUAL VOLATILITY		FIXED ACCOUNT	MONEY MARKET	FIXED INCOME	BALANCED	DIVERSE EQUITY	INTL EQUITY	INTERM EQUITY	AGGR EQUITY
1.0%	FIXED ACCOUNT	**1**	0.50	0.15	0	0	0	0	0
1.5%	MONEY MARKET	0.50	**1**	0.20	0	0	0	0	0
5.0%	FIXED INCOME	0.15	0.20	**1**	0.30	0.10	0.10	0.10	0.05
10.0%	BALANCED	0	0	0.30	**1**	0.95	0.60	0.75	0.60
15.5%	DIVERSE EQUITY	0	0	0.10	0.95	**1**	0.60	0.80	0.70
17.5%	INTL EQUITY	0	0	0.10	0.60	0.60	**1**	0.50	0.60
21.5%	INTERM EQUITY	0	0	0.10	0.75	0.80	0.50	**1**	0.70
26.0%	AGGR EQUITY	0	0	0.05	0.60	0.70	0.60	0.70	**1**

As an example, suppose three funds (Fixed Income, diversified U.S. Equity and Aggressive Equity) are offered to clients on a product with a contract level guarantee (i.e., across all funds held within the policy). The current fund holdings (in dollars) for five sample contracts are shown in Table 2-3.

TABLE 2-3: FUND CATEGORIZATION EXAMPLE

	1	2	3	4	5
MV Fund X (Fixed Income):	5,000	4,000	8,000	-	5,000
MV Fund Y (Diversified Equity):	9,000	7,000	2,000	5,000	-
MV Fund Z (Aggressive Equity):	1,000	4,000	-	5,000	5,000
Total Market Value:	15,000	15,000	10,000	10,000	10,000
Total Equity Market Value:	10,000	11,000	2,000	10,000	5,000
Fixed Income % (*A*):	33%	27%	80%	0%	50%
Fixed Income Test (*A*>75%):	No	No	Yes	No	No
Aggressive % of Equity (B):	10%	36%	n/a	50%	100%
Balanced Test (*A*>25% & *B*<33.3%):	Yes	No	n/a	No	No
Volatility of Current Fund Holdings:	10.9%	13.2%	5.3%	19.2%	13.4%
Fund Classification:	**Balanced**	**Diversified***	**Fixed Income**	**Intermediate**	**Diversified**

* Although the volatility suggests "Balanced Fund", the Balanced Fund criteria were not met. Therefore, this 'exposure' is moved "up" to Diversified Equity. For those funds classified as Diversified Equity, additional analysis would be required to assess whether they should be instead designated as "Diversified International Equity".

As an example, the "Volatility of Current Fund Holdings" for policy #1 is calculated as $\sqrt{A+B}$ where:

$$A = \left(\frac{5}{15}\times 0.05\right)^2 + \left(\frac{9}{15}\times 0.155\right)^2 + \left(\frac{1}{15}\times 0.26\right)^2$$

$$B = 2\cdot\left(\frac{5}{15}\cdot\frac{9}{15}\right)(0.1\times 0.05\times 0.155) + 2\cdot\left(\frac{5}{15}\cdot\frac{1}{15}\right)(0.05\times 0.05\times 0.26) + 2\cdot\left(\frac{9}{15}\cdot\frac{1}{15}\right)(0.7\times 0.155\times 0.26)$$

So, the volatility for contract #1 = $\sqrt{0.0092 + 0.0026}$ = 0.109 or 10.9%.

Derivation of Total Equivalent Account Charges (MER) and Margin Offset (α)

The total equivalent account charge ("MER") is meant to capture *all* amounts that are deducted from policyholder funds, not only those that are commonly expressed as spread-based fees. The MER, expressed as an equivalent annual basis point charge against account value, should include (but not be limited to) the following: investment management fees, mortality & expense charges, administrative loads, policy fees and risk premiums. In light of the foregoing, it may be necessary to estimate the "equivalent MER" if there are fees withdrawn from policyholder accounts that are not expressed as basis point charges against account value.

The margin offset, α, represents the total amount available to fund the guaranteed benefit claims and amortization of the unamortized surrender charge allowance after considering most other policy expenses (including overhead). The margin offset, expressed as an equivalent annual basis point charge against account value, may include the effect of Revenue Sharing in the same manner as would be done for modeling as described in section 6 of the Modeling Methodology, except as may be thereby permitted, should be deemed "permanently available" in all future scenarios. However, the margin offset should not include per policy charges (e.g., annual policy fees) since these are included in *FE*. It is often helpful to interpret the margin offset as $\alpha = MER - X + RS$, where *X* is the sum of:

- Investment management expenses and advisory fees;
- Commissions, bonuses (dividends) and overrides;
- Maintenance expenses, other than those included in *FE*; and
- Unamortized acquisition costs not reflected in *CA*.

And *RS* is the Revenue Sharing to the extent permitted as described above.

Product Attributes and Factor Tables

The tabular approach for the *GC* component creates a multi-dimensional grid (array) by testing a very large number of combinations for the policy attributes. The results are expressed as factors. Given the seven (7) attributes for a policy (i.e., *P*, *A*, *F*, *X*, *D*, ϕ, *MER*), two factors are returned for $f(\circ)$ and $g(\circ)$. The factors are determined by looking up (based on a "key") into the large, pre-computed multi-dimensional tables and using multi-dimensional linear interpolation.

The policy attributes for constructing the test cases and the lookup keys are given in Table 2-4.

As can be seen, there are 6 ξ 2 ξ 8 ξ 8 ξ 5 ξ 7 ξ 3 = 80,640 "nodes" in the factor grid. Interpolation is only permitted across the last four (4) dimensions: Attained Age (*X*), Policy Duration (*D*), AV––GV Ratio (ϕ) and MER. The "MER Delta" is calculated based on the difference between the actual MER and that assumed in the factor testing (see Table 10), subject to a cap (floor) of 100 bps (–100 bps).

Functions are available to assist the company in applying the Alternative Method for GMDB risks. These functions perform the factor table lookups and associated multi-dimensional linear interpolations. Their use is not mandatory. Based on the information in this document, the company should be able to write its own lookup and retrieval routines. Interpolation in the factor tables is described further later in this section.

Table 2-4: Nodes of the Factor Grid

Policy Attribute	Key: Possible Values & Description
Product Definition, *P*.	0 : 0 Return-of-premium. 1 : 1 Roll-up (3% per annum). 2 : 2 Roll-up (5% per annum). 3 : 3 Maximum Anniversary Value (MAV). 4 : 4 High of MAV and 5% Roll-up. 5 : 5 Enhanced Death Benefit (excl. GMDB)
GV Adjustment Upon Partial Withdrawal, *A*.	0 : 0 Pro-rata by market value. 1 : 1 Dollar-for-dollar.
Fund Class, *F*.	0 : 0 Fixed Account. 1 : 1 Money Market. 2 : 2 Fixed Income (Bond). 3 : 3 Balanced Asset Allocation. 4 : 4 Diversified Equity. 5 : 5 International Equity. 6 : 6 Intermediate Risk Equity. 7 : 7 Aggressive / Exotic Equity.
Attained Age (Last Birthday), *X*.	0 : 35 4 : 65 1 : 45 5 : 70 2 : 55 6 : 75 3 : 60 7 : 80
Policy Duration (years-since-issue), *D*.	0 : 0.5 1 : 3.5 2 : 6.5 3 : 9.5 4 : 12.5
Account Value-to-Guaranteed Value Ratio, ζ.	0 : 0.25 4 : 1.25 1 : 0.50 5 : 1.50 2 : 0.75 6 : 2.00 3 : 1.00
Annualized Account Charge Differential from Table 2-10 Assumptions ("MER Delta")	0 : –100 bps 1 : +0 2 : +100

A test case (i.e., a node on the multi-dimensional matrix of factors) can be uniquely identified by its key, which is the concatenation of the individual 'policy attribute' keys, prefixed by a leading '1'. For example, the key '12034121' indicates the factor for a 5% roll-up GMDB, where the GV is adjusted pro-rata upon partial withdrawal, balanced asset allocation, attained age 65, policy duration 3.5, 75% AV/GV ratio and "equivalent" annualized fund based charges equal to the 'base' assumption (i.e., 250 bps p.a.).

The factors are contained in the file "C3-II GMDB Factors 100%Mort CTE(90) (2005-03-29).csv", a comma-separated value text file. Each "row" represents the factors/parameters for a test policy as identified by the lookup keys shown in Table 2-4. Rows are terminated by new line and line feed characters.

Each row consists of 5 entries, described further below.

1	2	3	4	5
Test Case Identifier (Key)	Base GMDB Cost Factor	Base Margin Offset Factor	Scaling Adjustment (Intercept)	Scaling Adjustment (Slope)

GMDB Cost Factor. This is the term $f(\tilde{\theta})$ in the formula for *GC*. The parameter set $\tilde{\theta}$is defined by $(P, A, F, X, D, \varphi, MER)$. Here, φ is the AV/GV ratio for the benefit exposure (e.g., policy) under consideration. The values in the factor grid represent CTE(90) of the sample distribution[4] for the present value of guaranteed benefit cash flows (in excess of account value) in all future years (i.e., to the earlier of contract maturity and 30 years), normalized by guaranteed value.

Base Margin Offset Factor. This is the term $g(\tilde{\theta})$ in the formula for *GC*. The parameter set $\tilde{\theta}$ is defined by $(P, A, F, X, D, \varphi, MER)$. Here, φ is the AV/GV ratio for the benefit exposure (e.g., policy) under consideration. The values in the factor grid represent CTE(90) of the sample distribution for the present value of margin offset cash flows in all future years (i.e., to the earlier of contract maturity and 30 years), normalized by account value. Note that the Base Margin Offset Factors assume $\hat{\alpha} = 100$ basis points of "margin offset" (net spread available to fund the guaranteed benefits).
All else being equal, the margin offset α has a profound effect on the resulting AAR. In comparing the Alternative Method against models for a variety of GMDB portfolios, it became clear that some adjustment factor would be required to "scale" the results to account for the diversification effects[5] of attained age, policy duration and AV/GV ratio. The testing examined $W_1 = \frac{\alpha}{MER} = 0.20$ and $W_2 = \frac{\alpha}{MER} = 0.60$, where α = available margin offset and *MER* = total "equivalent" account based charges, in order to understand the interaction between the margin ratio ("*W*") and AAR.

Based on this analysis, the *Scaling Factor* is defined as:

$$h(\hat{\theta}) = R = \beta_0 + \beta_1 \times W$$

β_0 and β_1 are respectively the intercept and slope for the linear relationship, defined by the parameter set $\hat{\theta} = (P, F, \hat{\varphi})$. Here, $\hat{\varphi}$ is 90% of the aggregate AV/GV for the *product form* (i.e., not for the individual policy or cell) under consideration. In calculating the *Scaling Factor* directly from this linear function, the margin ratio "*W*" must be constrained[6] to the range $[0.2, 0.6]$.

It is important to remember that $\hat{\varphi} = 0.90 \times \frac{\sum AV}{\sum GV}$ for the product form being evaluated (e.g., all 5% Roll-up policies). The 90% factor is meant to reflect the fact that the cost (payoff structure) for a basket of otherwise identical put options (e.g., GMDB) with varying degrees of in-the-moneyness (i.e., AV/GV ratios) is more left-skewed than the cost for a

4 Technically, the sample distribution for "present value of net cost" = PV[GMDB claims] – PV[Margin Offset] was used to determine the scenario results that comprise the CTE90 risk measure. Hence, the "GMDB Cost Factors" and "Base Margin Offset Factors" are calculated from the same scenarios.

5 By design, the Alternative Methodology does not directly capture the diversification benefits due to a varied asset profile and product mix. This is not a flaw of the methodology, but a consequence of the structure. Specific assumptions would be required to capture such diversification effects. Unfortunately, such assumptions might not be applicable to a given company and could grossly over-estimate the ensuing reduction in required capital.

6 The scaling factors were developed by testing "margin ratios" $W_1 = 0.2$ and $W_2 = 0.6$. Using values outside this range could give anomalous results.

single put option at the "weighted average" asset-to-strike ratio.

To appreciate the foregoing comment, consider a basket of two 10-year European put options as shown in Table 2-5. These options are otherwise identical except for their "market-to-strike price" ratios. The option values are calculated assuming a 5% continuous risk-free rate and 16% annualized volatility. The combined option value of the portfolio is $9.00, equivalent to a single put option with $S = \$180.92$ and $X = \$200$. The market-to-strike (i.e., AV/GV) ratio is 0.905, which is less than the average $AV/GV = 1 = \frac{\$75+\$125}{\$100+\$100}$.

Table 2-5: Equivalent Single European Put Option

	Equivalent Single Put Option	**Put Option A ("in-the-money")**	**Put Option B ("out-of-the-money")**
Market value (*AV*)	$180.92	$75	$125
Strike price (*GV*)	$200.00	$100	$100
Option Value	$9.00	$7.52	$1.48

<u>Scaling Adjustment (Intercept)</u>. The scaling factor $h(\hat{\theta}) = R$ is a linear function of *W*, the ratio of margin offset to MER. This is the intercept β_0 that defines the line.

<u>Scaling Adjustment (Slope)</u>. The scaling factor $h(\hat{\theta}) = R$ is a linear function of *W*, the ratio of margin offset to MER. This is the slope β_1 that defines the line.

Table 2-6 shows the "Base Cost" and "Base Margin Offset" values from the factor grid for some sample policies. As mentioned earlier, the Base Margin Offset factors assume 100 basis points of "available spread". The "Margin Factors" are therefore scaled by the ratio $\frac{\alpha}{100}$, where α = the actual margin offset (in basis points per annum) for the policy being valued. Hence, the margin factor for the 7th sample policy is exactly half the factor for node 12044121 (the 4th sample policy in Table 6). That is, 0.02160 = 0.5 × 0.04319.

Table 2-6: Sample Nodes on the Factor Grid

KEY	GMDB TYPE	GV ADJUST	FUND CLASS	AGE	POLICY DUR	AV/GV	MER (bps)	OFFSET	COST FACTOR	MARGIN FACTOR
10132031	ROP	$-for-$	Balanced Allocation	55	0.5	1.00	250	100	0.01073	0.04172
10133031	ROP	$-for-$	Balanced Allocation	60	0.5	1.00	250	100	0.01619	0.03940
10134031	ROP	$-for-$	Balanced Allocation	65	0.5	1.00	250	100	0.02286	0.03634
12044121	5% Rollup	Pro-rata	Diverse Equity	65	3.5	0.75	250	100	0.18484	0.04319
12044131	5% Rollup	Pro-rata	Diverse Equity	65	3.5	1.00	250	100	0.12931	0.03944
12044141	5% Rollup	Pro-rata	Diverse Equity	65	3.5	1.25	250	100	0.08757	0.03707
12044121	5% Rollup	Pro-rata	Diverse Equity	65	3.5	0.75	250	50	0.18484	0.02160

Interpolation in the Factor Tables

Interpolation is only permitted across the last four (4) dimensions of the risk parameter set $\tilde{\theta}$: Attained Age (*X*), Policy Duration (*D*), AV—GV Ratio (ϕ) and MER. The “MER Delta” is calculated based on the difference between the actual MER and that assumed in the factor testing (see Table 2-10), subject to a cap (floor) of 100 bps (–100 bps). In general, the calculation for a single policy will require *three* applications of multi-dimensional linear interpolation between the 16 = 2^4 factors/values in the grid:

(1) To obtain the *Base Factors* $f(\tilde{\theta})$ and $g(\tilde{\theta})$.

(2) To obtain the *Scaling Factor* $h(\hat{\theta}) = R$.

Based on the input parameters, the supplied functions (see Appendix 9) will automatically perform the required lookups, interpolations and calculations for $h(\hat{\theta}) = R$., including the constraints imposed on the margin ratio *W*. Use of the tools noted in Appendix 9 is not mandatory.

Multi-dimensional interpolation is an iterative extension of the familiar two-dimensional linear interpolation for a discrete function $V(x)$:

$$\tilde{V}(x_k + \delta) = (1 - \xi) \times V(x_k) + \xi \times V(x_{k+1})$$

$$and$$

$$\xi = \frac{\delta}{x_{k+1} - x_x}$$

In the above formulation, $\tilde{V}(x)$ is assumed continuous and x_k and x_{k+1} are defined values ("nodes") for $V(x)$. By definition, $x_k \leq (x_k + \delta) \leq x_{k+1}$ so that $0 \leq \xi \leq 1$. In effect, multi-dimensional interpolation repeatedly applies simple linear interpolation one dimension at a time until a single value is obtained.
Multi-dimensional interpolation across all four dimensions is not required. However, simple linear interpolation for *AV—GV* Ratio (ϑ) is mandatory. In this case, the company must choose nodes for the other three (3) dimensions according to the following rules:

Risk Attribute (Dimension)	**Node Determination**
Attained Age	Use next higher attained age.
Policy Duration	Use nearest.
MER Delta	Use nearest (capped at +100 & floored at –100 bps.

For example, if the actual policy/cell is attained age 62, policy duration 4.25 and MER Delta = +55 bps, the company should use the nodes defined by attained age 65, policy duration 3.5 and MER Delta = +100.

Table 2-7 provides an example of the fully interpolated results for a 5% Roll-up "Pro Rata" policy mapped to the Diversified Equity class (first row). While Table 2-7 does not demonstrate how to perform the multi-dimensional interpolation, it does show the required 16 nodes from the *Base Factors*. The margin offset is assumed to be 100 basis points.

Table 2-7: Base Factors for a 5% Rollup GMDB Policy, Diversified Equity

Key	Age	Policy Dur	Policy Av/Gv	Mer (Bps)	Base Cost Factor	Base Margin Factor
INTERPOLATED	62	4.25	0.80	265	0.15010	0.04491
12043121	60	3.5	0.75	250	0.14634	0.04815
12043122	60	3.5	0.75	350	0.15914	0.04511
12043131	60	3.5	1.00	250	0.10263	0.04365
12043132	60	3.5	1.00	350	0.11859	0.04139
12043221	60	6.5	0.75	250	0.12946	0.04807
12043222	60	6.5	0.75	350	0.14206	0.04511
12043231	60	6.5	1.00	250	0.08825	0.04349
12043232	60	6.5	1.00	350	0.10331	0.04129
12044121	65	3.5	0.75	250	0.18484	0.04319
12044122	65	3.5	0.75	350	0.19940	0.04074
12044131	65	3.5	1.00	250	0.12931	0.03944
12044132	65	3.5	1.00	350	0.14747	0.03757
12044221	65	6.5	0.75	250	0.16829	0.04313
12044222	65	6.5	0.75	350	0.18263	0.04072
12044231	65	6.5	1.00	250	0.11509	0.03934
12044232	65	6.5	1.00	350	0.13245	0.03751

The interpolations required to compute the *Scaling Factor* are slightly different from those needed for the *Base Factors*. Specifically, the user should *not* interpolate the intercept and slope terms for each surrounding node, but rather interpolate the *Scaling Factors* applicable to each of the nodes.

Table 2-8 provides an example of the *Scaling Factor* for the sample policy given earlier in Table 2-7 (i.e., a 5% Roll-up "Pro Rata" policy mapped to the Diversified Equity class) as well as the nodes used in the interpolation. The aggregate AV/GV for the product portfolio (i.e., all 5% Roll-up policies combined) is 0.75; hence, 90% of this value is 0.675 as shown under "Adjusted Product AV/GV". As before, the margin offset is 100 basis points per annum.

Table 2-8: Interpolated Scaling Factors for a 5% Rollup GMDB Policy, Diversified Equity

Key	Age	Policy Dur	Adjusted Product Av/Gv	Mer (Bps)	Intercept	Slope	Scaling Factor
INTERPOLATED	62	4.25	0.675	265	n/a	n/a	0.871996
12043111	60	3.5	0.50	250	0.855724	0.092887	0.892879
12043112	60	3.5	0.50	350	0.855724	0.092887	0.882263
12043121	60	3.5	0.75	250	0.834207	0.078812	0.865732
12043122	60	3.5	0.75	350	0.834207	0.078812	0.856725
12043211	60	6.5	0.50	250	0.855724	0.092887	0.892879
12043212	60	6.5	0.50	350	0.855724	0.092887	0.882263
12043221	60	6.5	0.75	250	0.834207	0.078812	0.865732
12043222	60	6.5	0.75	350	0.834207	0.078812	0.856725
12044111	65	3.5	0.50	250	0.855724	0.092887	0.892879
12044112	65	3.5	0.50	350	0.855724	0.092887	0.882263
12044121	65	3.5	0.75	250	0.834207	0.078812	0.865732
12044122	65	3.5	0.75	350	0.834207	0.078812	0.856725
12044211	65	6.5	0.50	250	0.855724	0.092887	0.892879
12044212	65	6.5	0.50	350	0.855724	0.092887	0.882263
12044221	65	6.5	0.75	250	0.834207	0.078812	0.865732
12044222	65	6.5	0.75	350	0.834207	0.078812	0.856725

Adjustments to GC for Product Variations & Risk Mitigation/Transfer

In some cases, it may be necessary for the company to make adjustments to the published factors due to:

1. A variation in product form wherein the definition of the guaranteed benefit is materially different from those for which factors are available (see Table 2-9); and/or
2. A risk mitigation / management strategy that cannot be accommodated through a straight-forward and direct adjustment to the published values.

Any adjustments to the published factors must be fully documented and supported through stochastic modeling. Such modeling may require stochastic simulations but would not ordinarily be based on full inforce projections. Instead, a representative "model office" should be sufficient. In the absence of material changes to the product design, risk management program and Alternative Method (including the published factors), the company would not be expected to redo this modeling each year.

Note that minor variations in product design do not necessarily require additional effort. In some cases, it may be reasonable to use the factors/formulas for a different product form (e.g., for a "roll-up" GMDB policy near or beyond the maximum reset age or amount, the company should use the "return-of-premium" GMDB factors/formulas, possibly adjusting the guaranteed value to reflect further resets, if any). In other cases, the company might determine the RBC based on two different guarantee definitions and interpolate the results to obtain an appropriate value for the given policy/cell. Likewise, it may be possible to adjust the Alternative Method results for certain risk transfer arrangements without significant additional work (e.g., quota-share reinsurance without caps, floors or sliding scales would normally be reflected by a simple pro-rata adjustment to the "gross" *GC* results).

However, if the policy design is sufficiently different from those provided and/or the risk mitigation strategy is non-linear in its impact on the AAR, and there is no practical or obvious way to obtain a good result from the prescribed factors/formulas, the company must justify any adjustments or approximations by stochastic modeling. Notably this modeling need not be performed on the whole portfolio but can be undertaken on an appropriate set of representative policies.

The remainder of this section suggests a process for adjusting the published "Cost" and "Margin Offset" factors due to a variation in product design (e.g., a "step-up" option at every 7^{th} anniversary whereby the guaranteed value is reset to the account value, if higher). Note that the "Scaling Factors" (as determined by the slope and intercept terms in the factor table) would not be adjusted.

The steps for adjusting the published *Cost* and *Margin Offset* factors for product design variations are:

1. Select a policy design in the published tables that is similar to the product being valued. Execute cashflow projections using the documented assumptions (see Tables 2-9 and 2-10) and the scenarios from the prescribed generators for a set of representative cells (combinations of attained age, policy duration, asset class, AV/GV ratio and MER). These cells should correspond to nodes in the factor grid. Rank (order) the sample distribution of results for the present value of net cost[7]. Determine those scenarios which comprise CTE(90).

2. Using the results from step 1., average the present value of cost for the CTE(90) scenarios and divide by the current guaranteed value. For a the J^{th} cell, denote this value by F_J. Similarly, average the present value of margin offset revenue for the same subset of scenarios and divide by account value. For the J^{th} cell, denote this value by G_J.

[7] Present value of net cost = PV[guaranteed benefit claims in excess of account value] – PV[margin offset]. The discounting includes cashflows in all future years (i.e., to the earlier of contract maturity and the end of the horizon).

3. Extract the corresponding factors from the published grid. For each cell, calibrate to the published tables by defining a "model adjustment factor" (denoted by asterisk) separately for the "cost" and "margin offset" components:

$$F_J^* = \frac{f(\tilde{\theta})}{F_J} \text{ and } G_J^* = \frac{\hat{g}(\tilde{\theta})}{G_J}$$

4. Execute "product specific" cashflow projections using the documented assumptions and scenarios from the prescribed generators for the same set of representative cells. Here, the company should model the actual product design. Rank (order) the sample distribution of results for the present value of net cost. Determine those scenarios which comprise CTE(90).

5. Using the results from step 4., average the present value of cost for the CTE(90) scenarios and divide by the current guaranteed value. For a the J^{th} cell, denote this value by $\bar{F}_J$. Similarly, average the present value of margin offset revenue for the same subset of scenarios and divide by account value. For a the J^{th} cell, denote this value by $\bar{G}_J$.

6. To calculate the AAR for the specific product in question, the company should implement the Alternative Method as documented, but use $\bar{F}_J \times F_J^*$ in place of $f(\tilde{\theta})$ and $\bar{G}_J \times G_J^*$ instead of $\hat{g}(\tilde{\theta})$. The company must use the "Scaling Factors" for the product evaluated in step 1. (i.e., the product used to calibrate the company's cashflow model).

Assumptions for the Alternative Method Published GMDB Factors

This subsection reviews the model assumptions used to develop the Alternative Method factors. Each node in the factor grid is effectively the modeled result for a given "cell".

Table 2-9: Model Assumptions & Product Characteristics

Account Charges (MER)	Vary by fund class. See Table 2-10 later in this section.
Base Margin Offset	100 basis points per annum
GMDB Description	1. ROP = return of premium ROP. 2. ROLL = 5% roll-up, capped at 2.5 ξ premium, frozen at age 80. 3. MAV = annual ratchet (maximum anniversary value), frozen at age 80. 4. HIGH = Higher of 5% roll-up and annual ratchet frozen at age 80. 5. EDB = ROP + 40% Enhanced Death Benefit (capped at 40% of deposit).
Adjustment to GMDB Upon Partial Withdrawal	"Pro-Rata by Market Value" and "Dollar-for-Dollar" are tested separately.
Surrender Charges	Ignored (i.e., zero). Reflected in the "CA" component of the AAR.
Single Premium/Deposit	$100,000. No future deposits; no intra-policy fund rebalancing.
Base Policy Lapse Rate	• Pro-rata by MV: 10% p.a. at all policy durations (before dynamics) • Dollar-for-dollar: 2% p.a. at all policy durations (no dynamics)
Partial Withdrawals	• Pro-rata by MV: None (i.e., zero) • Dollar-for-dollar: Flat 8% p.a. at all policy durations (as a % of AV).

	No dynamics or anti-selective behavior.
Mortality	100% of MGDB 94 ALB.
Gender/Age Distribution	100% male. Methodology accommodates different attained ages and policy durations. A 5-year age setback will be used for female annuitants.
Max. Annuitization Age	All policies terminate at age 95.
Fixed Expenses, Annual Fees	Ignored (i.e., zero). Reflected in the "FE" component of the AAR.
Income Tax Rate	21%
Discount Rate	4.54% (after-tax) effective = 5.75% pre-tax.
Dynamic Lapse Multiplier (Applies only to policies where GMDB is adjusted "pro-rata by MV" upon withdrawal)	*U*=1, *L*=0.5, *M*=1.25, *D*=1.1 ■ Applied to the 'Base Policy Lapse Rate' (not withdrawals).

Notes on GMDB Factor Development

- The roll-up is continuous (not simple interest, not stepped at each anniversary) and is applied to the previous roll-up guaranteed value (i.e., not the contract guaranteed value under HIGH).
- The Enhanced Death Benefit ("EDB") is floored at zero. It pays out 40% of the gain in the policy upon death at time t: $B_t = MIN[0.40 \times Deposit, 0.40 \times MAX(0, AV_t - Deposit)]$. The test policy also has a 100% return-of-premium GMDB, but the EDB Alternative Factors will be net of the GMDB component. That is, the EDB factors are 'stand-alone' and applied *in addition to* the GMDB factors.
- The "Base Policy Lapse Rate" is the rate of policy termination (total surrenders). Policy terminations (surrenders) are assumed to occur throughout the policy year (not only on anniversaries).
- Partial withdrawals (if applicable) are assumed to occur at the end of each time period (quarterly).
- Account charges ("MER") represent the total amount (annualized, in basis points) assessed against policyholder funds (e.g., sum of investment management fees, mortality and expense charges, risk premiums, policy/administrative fees, etc.). They are assumed to occur throughout the policy year (not only on anniversaries).

Table 2-10: Account-Based Fund Charges (bps per annum)

Asset Class / Fund	Account Value Charges (MER)
Fixed Account	0
Money Market	110
Fixed Income (Bond)	200
Balanced	250
Diversified Equity	250
Diversified International Equity	250
Intermediate Risk Equity	265
Aggressive or Exotic Equity	275

Calculation Example

Continuing the previous example (see Tables 2-7 and 2-8) for a 5% Roll-up GMDB policy mapped to Diversified Equity, suppose we have the policy/product parameters as specified in Table 2-11.

Table 2-11: Sample Policy Results for 5% Roll-up GMDB, Diversified Equity

Parameter	Value	Description
Deposit Value	$100.00	Total deposits adjusted for partial withdrawals.
Account Value	$98.43	Total account value at valuation date, in dollars.
GMDB	$123.04	Current guaranteed minimum death benefit, in dollars.
Attained Age	62	Attained age at the valuation date (in years).
Policy Duration	4.25	Policy duration at the valuation date (in years).
GV Adjustment	Pro-Rata	GMDB adjusted pro-rata by MV upon partial withdrawal.
Fund Class	Diversified Equity	Contract exposure mapped to Diversified Equity as per the Fund Categorization instructions in the section of this Appendix on Component GC.
MER	265	Total charge against policyholder funds (bps).
ProductCode	2	Product Definition code as per lookup key in Table 4.
GVAdjust	0	GV Adjustment Upon Partial Withdrawal as per key in Table 2-4.

FundCode	4	Fund Class code as per lookup key in Table 2-4.
PolicyMVGV	0.800	Contract account value divided by GMDB.
AdjProductMVGV	0.675	90% of the aggregate AV/GV for the Product portfolio.
RC	150	Margin offset (basis points per annum).

Using the usual notation, $GC = GV \times f(\tilde{\theta}) - AV \times \hat{g}(\tilde{\theta}) \times h(\tilde{\theta})$.

$f(\tilde{\theta})$ = 0.150099 = GetCostFactor(2, 0, 4, 62, 4.25, 0.8, 265)

$\hat{g}(\tilde{\theta})$ = 0.067361 = GetMarginFactor(2, 0, 4, 62, 4.25, 0.8, 265, 150)

$h(\tilde{\theta})$ = 0.887663 = GetScalingFactor(2, 0, 4, 62, 4.25, 0.675, 265, 150)

Hence, *GC* = $12.58 = (123.04 × 0.150099) – (98.43 × 0.067361 × 0.887663). As a normalized value, this quantity is 12.78% of account value, 10.23% of guaranteed value and 51.1% of the current net amount at risk (Net amount at risk = GV – AV).

Note that $\hat{g}(\tilde{\theta}) = \frac{\alpha}{\hat{\alpha}} \times g(\tilde{\theta}) = \frac{150}{100} \times 0.044907$ where $g(\tilde{\theta})$ is "per 100 basis points" of available margin offset.

$g(\tilde{\theta})$ = 0.044907 = GetMarginFactor(2, 0, 4, 62, 4.25, 0.8, 265, 100)

Appendix 1a – Cash Flow Modeling for C-3 RBC Methodology

General Approach

1. The underlying asset and liability model(s) are those used for year-end Asset Adequacy Analysis cash flow testing, or a consistent model.

2. Run the 200 scenarios (12 or 50) subset selected from the 10,000 scenarios produced from the interest-rateNAIC economic scenario generator, using significance values based on the 20-year U.S. treasury rates.

3. The statutory capital and surplus position, S(t), should be captured for every scenario for each calendar year-end of the testing horizon. The capital and surplus position is equal to statutory assets less statutory liabilities for the portfolio, excluding voluntary reserves and asset adequacy reserves from the calculation.

4. For each scenario, the C-3 measure is the most negative of the series of present values S(t)*pv(t), where pv(t) is the accumulated discount factor for t years using 105 percent of the after-tax one-year U.S. Treasury rates for that scenario. In other words:

$$pv(t) \quad \prod_{1}^{t} 1/(1+i_t)$$

5. Rank the scenario-specific C-3 measures in descending order, with scenario number 1's measure being the positive capital amount needed to equal the very worst present value measure.

6. Taking the weighted average of a subset of the scenario specific C-3 scores derives the final C-3 after-tax factor. The C-3 scores are multiplied by the following series of weights:

For the 50 scenario set, the C-3 scores are multiplied by the following series of weights:

-- Weighting Table ----------------------------

Scenario Rank:	17	16	15	14	13	12	11	10	9	8	7	6	5
Weight:	0.02	0.04	0.06	0.08	0.10	0.12	0.16	0.12	0.10	0.08	0.06	0.04	0.02

The sum of these products is the C-3 charge for the product.

(a) For the 12 scenario set, the charge is calculated as the average of the C-3 scores ranked 2 and 3, but cannot be less than half the worst scenario score.

7. If multiple asset/liability portfolios are tested and aggregated, an aggregate C-3 charge can be derived by first summing the S(t)'s from all the portfolios (by scenario) and then following Steps 2 through 6 above. An alternative method is to calculate the C-3 score by scenario for each product, sum them by scenario, then order them by rank and apply the above weights.

Single Scenario C-3 Measurement Considerations

1. GENERAL METHOD - This approach incorporates interim values, consistent with the approach used for bond, mortgage and mortality RBC factor quantification. The approach establishes the risk measure in terms of an absolute level of risk (e.g., solvency) rather than volatility around an expected level of risk. It also recognizes reserve conservatism, to the degree that such conservatism has not been used elsewhere.

2. INITIAL ASSETS = RESERVES - Consistent with appointed actuary practice, the cash flow models are run with initial assets equal to reserves; that is, no surplus assets are used.

3. AVR - Existing AVR-related assets should not be included in the initial assets used in the C-3 modeling. These assets are available for future credit loss deviations over and above expected credit losses. These deviations are covered by C-1 risk capital. Similarly, future AVR contributions should not be modeled. However, the expected credit losses should be in the cash flow modeling. (Deviations from expected are covered by both the AVR and the C-1 risk capital.)

4. IMR - IMR assets should be used for C-3 modeling. (Also see #9 – Disinvestment Strategy.)

5. INTERIM MEASURE - Retained statutory surplus (i.e., statutory assets less statutory liabilities) is used as the year-to-year interim measure.

6. TESTING HORIZONS - Surplus adequacy should be tested over a period that extends to a point at which contributions to surplus on a closed block are immaterial in relationship to the analysis. If some products are being cash flow tested for Asset Adequacy Analysis over a longer period than the ~~3~~100 years generated by the ~~interest-rate~~economic scenario generator, the scenario rates should be held constant at the year ~~3~~100 level for all future years. A consistent testing horizon is important for all lines if the C-3 results from different lines of business are aggregated.

7. TAX TREATMENT - The tax treatment should be consistent with that used in Asset Adequacy Analysis. Appropriate disclosure of tax assumptions may be required.

8. REINVESTMENT STRATEGY - The reinvestment strategy should be that used in Asset Adequacy Analysis modeling.

9. DISINVESTMENT STRATEGY - In general, negative cash flows should be handled just as they are in the Asset Adequacy Analysis. The one caveat is, since the RBC scenarios are more severe, models that depend on borrowing need to be reviewed to be confident that loans in the necessary volume are likely to be available under these circumstances at a rate consistent with the model's assumptions. If not, adjustments need to be made.

   If negative cash flows are handled by selling assets, then appropriate modeling of contributions and withdrawals to the IMR need to be reflected in the modeling.

10. STATUTORY PROFITS RETAINED - The measure is based on a profits retained model, anticipating that statutory net income earned one period is retained to support capital requirements in future periods. In other words, no stockholder dividends are withdrawn, but policyholder dividends, excess interest, declared rates, etc., are modeled realistically and assumed, paid or credited.

11. LIABILITY and ASSET ASSUMPTIONS - The liability and asset assumptions should be those used in Asset Adequacy Analysis modeling. Disclosure of these assumptions may be required.

12. SENSITIVITY TESTING - Key assumptions shall be stress tested (e.g., lapses increased by 50 percent) to evaluate sensitivity of the resulting C-3 requirement to the various assumptions made by the actuary. Disclosure of these results may be required.

Appendix 1b - Frequently Asked Questions for Cash Flow Modeling for C-3 RBC

1. Where can the scenario generator be found? ~~What is needed to run it?~~

   The scenario generator is the Conning GEMS Economic Scenario Generator. Outputs may be found at the following website: https://naic.conning.com/scenariofiles ~~a Microsoft Excel spreadsheet. By entering the Treasury yield curve at the date for which the testing is done, it will generate the sets of 50 or 12 scenarios. It requires Windows 95 or higher. This spreadsheet and instructions are available on the NAIC Web site at (http://www.naic.org/cmte_e_lrbc.htm). It is also available on diskette from the American Academy of Actuaries~~.

2. The results may include sensitive information in some instances. How can it be kept confidential?

   As provided for in Section 8 of the Risk-Based Capital (RBC) For Insurers Model Act, all information in support of and provided in the RBC reports (to the extent the information therein is not required to be set forth in a publicly available annual statement schedule), with respect to any domestic or foreign insurer, which is filed with the commissioner constitute information that might be damaging to the insurer if made available to its competitors, and therefore shall be kept confidential by the commissioner. This information shall not be made public or be subject to subpoena, other than by the commissioner and then only for the purpose of enforcement actions taken by the commissioner under the Risk-Based Capital (RBC) For Insurers Model Act or any other provision of the insurance laws of the state.

3. The definition of the annuities category talks about "debt incurred for funding an investment account…" Could you give a specific description of what is intended?

   One example is a situation where an insurer is borrowing under an advance agreement with a federal home loan bank, under which agreement collateral, on a current fair value basis, is required to be maintained with the bank. This arrangement has many of the characteristics of a GIC, but is classified as debt.

4. The instructions specify that assumptions consistent with those used for Asset Adequacy Analysis testing be used for C-3 RBC, but my company cash flow tests a combination of universal life and annuities for that analysis and using the same assumptions will produce incorrect results. What was intended in this situation?

   Where this situation exists, assumptions should be used for the risk-based capital work that are consistent with those used for the Asset Adequacy Cash Flow Testing. In other words, the assumptions used should be appropriate to the annuity component being evaluated for RBC and consistent with the overall assumption set used for Asset Adequacy Analysis.