AMERICAN ACADEMY of ACTUARIES

Recommended Approach for Setting Regulatory Risk-Based Capital Requirements for Variable Products with Guarantees (Excluding Index Guarantees)

Presented by the American Academy of Actuaries' Life Capital Adequacy Subcommittee to the National Association of Insurance Commissioners' Life Risk-Based Capital Working Group

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Background:

Several years ago, the NAIC Life Risk Based Capital Working Group asked the American Academy of Actuaries to take a fresh look at the C-3 component of the RBC formula to see if a practical method could be found to reflect the degree of asset/liability mismatch risk of a particular company.

We reviewed the request and agreed that more sensitivity to the specifics of product design and funding strategy is appropriate to advance the goal of differentiating weakly capitalized companies from the rest. We have defined C-3 risk to include Asset/Liability risk in general, not just interest rate risk.

Effective December 31, 2000, the NAIC implemented Phase 1 of this project. Phase 1 addressed interest rate risk for annuities and single premium life. For Phase 1, "annuities" means products with the characteristics of deferred and immediate annuities, structured settlements, guaranteed separate accounts, and GICs (including synthetic GICs, and funding agreements). Equity based variable products were not included in Phase I, but products that guarantee an interest rate index and variable annuities sold as fixed were, if they were cash flow tested. Phase 1 of the project implemented the determination of capital requirements for interest sensitive products by scenario testing (October 1999 report; available at: www.actuary.org).

The American Academy of Actuaries' Life Capital Adequacy Subcommittee recommends implementing Phase 2 to address both the interest rate and equity risk associated with variable products with guarantees (including living, death benefit and secondary guarantees), other than index guarantees.

Recommendation:

The recommended approach is to run stochastic scenarios using prudent best estimate assumptions (the more reliable the underlying data is, the closer the assumptions will be to experience and vice versa) and calibrated fund performance distribution functions on an aggregated basis. The measure of required capital for each scenario is consistent with the metric used in C-3 Phase I: under each scenario, starting with no statutory surplus, the year by year accumulated statutory surplus is calculated, reflecting estimated statutory reserves, Federal Income Tax, and expenses. As directed under Phase 1, these stochastic determinations of capital requirements also must be adjusted to avoid double counting of risks or revenue that are reflected elsewhere in the RBC calculations or their factor development. For each scenario, accumulated statutory surplus is determined for each calendar year-end and its present value calculated. The lowest of these present values is then tabulated. The scenarios are then sorted on this measure. Unlike the Phase I project, we are favoring the approach introduced in the Canadian Institute of Actuaries ("CIA") work and recommending the use of a modified Conditional Tail Expectation ("CTE") 90 percent to set RBC requirements. ("Segregated Fund Guarantees" is available at www.actuaries.ca.) Modified CTE 90 is the arithmetic average of the worst 10 percent of all scenarios, with no scenario being calculated as a positive value of accumulated surplus. The CTE 90 estimated surplus requirement less the reserves set up for these benefits establishes the RBC amount required.

It is also recommended that this RBC amount should be combined with the $C1_{CS}$ factor for covariance purposes .

The way grouping (of funds and of contracts), sampling, number of scenarios, and simplification methods are handled is the responsibility of the actuary. However, all these methods are subject to Actuarial Standards of Practice (ASOP), supporting documentation and justification. Actuarial certification will be required. A material change in model (or assumptions), from that used previously, will require regulatory disclosure and may be subject to regulatory review and approval.

Glossary:

Gross Wealth Ratio – The gross wealth ratio is the cumulative return for the indicated time period and percentile. (e.g., 1.0 indicates that the index is at its original level.)

Guaranteed Minimum Income Benefit (GMIB) – The GMIB is a VAGLB design for which the benefit is contingent on annuitization of a variable deferred annuity contract. The benefit is typically expressed as a contractholder option, on one or more option dates, to have a minimum amount applied to provide periodic income using a specified purchase basis.

Prudent Best Estimate - The assumptions to be used for modeling are to be the actuary's "prudent best estimate". This means that they are to be set at the conservative end of the

actuary's confidence interval as to the true underlying probabilities for the parameter(s) in question, based on the availability of relevant experience and its degree of credibility.

For non-scenario tested assumptions (those which do not vary over the stochastic scenarios), a "prudent best estimate" assumption would normally be defined by applying a margin for adverse deviation to the "best estimate" assumption. "Best estimate" would typically be the actuary's most reasonable estimate of future experience for a risk factor given all available, relevant information pertaining to the contingencies being valued. Recognizing that assumptions are simply assertions of future unknown experience, the margin for adverse deviation should be directly related to uncertainty in the underlying risk factor. The greater the uncertainty, the larger the margin. Each margin should serve to increase the liability or provision that would otherwise be held in its absence (i.e., using only the best estimate assumption).

For example, assumptions for circumstances that have never been observed require more margin for error than those for which abundant and relevant experience data are available. Furthermore, larger margins are typically required for contingencies related to policyholder behavior when a given policyholder action results in the surrender or exercise of a valuable option.

Variable Annuity Guaranteed Living Benefit (VAGLB) – VAGLB is a guaranteed benefit included in a variable deferred or immediate annuity providing that:

a. One or more guaranteed benefit amounts payable to a living contractholder or living annuitant, under contractually specified conditions (e.g., upon annuitization), if any, will be enhanced should the Projected Contract Value fall below a given level or fail to achieve certain performance levels; and

b. Only such guarantees having the potential to provide benefits whose present value as of the benefit commencement date that exceed the Projected Contract Value are included in this definition.

Scope:

All variable annuities that contain any guaranteed death or living benefit and variable life insurance with secondary guarantees, whether written directly or assumed through reinsurance, must utilize scenario testing to establish capital requirements. (Equity indexed products are excluded from this requirement. Separate account products that guarantee an index are covered in another recommendation from the Academy and being considered for adoption by the NAIC.)

Scenarios:

Scenarios will consist of a sufficient number of interest rate and equity scenarios, adequate for the purpose, created by the company. The interest rate and equity scenarios will need to meet the calibration methodology and requirements outlined in Appendix 2.

Methodology:

Asset/Liability models should be run that reflect the dynamics of the guarantees provided and the statutory accounting framework currently in place.

Assets:

The statement value of assets included in the model should be set equal to the statement value of reserves modeled. The reserves should be net of amounts accrued for expense allowances reported in page 3, line 13A of the annual statement (i.e., CARVM/CRVM allowance). The mix of assets between separate account and general account assets should be consistent with that used for cash flow testing.

Interim Reserves:

Interim reserves need to be reasonably estimated throughout the projection period. For further guidance see Methodology Note C3-02.

Fund categorization:

The funds offered on the product may be grouped for modeling. In Methodology Note C3-01, various current practices are provided. Regardless of method chosen, fundamental characteristics of the fund should be made in relation to the required calibration points of the S&P 500 and Ibbotson Small Cap Index. The modeling should reflect characteristics of the efficient frontier (i.e., returns generally cannot be increased without assuming additional risk.).

Modeling of Hedges:

If the insurer is following a clearly defined hedging strategy, the stochastic model should take into account the impact of hedge positions currently held and expected to be held in the future. (To the degree the hedge position includes basis, gap or price risk, some reduction for effectiveness of hedges may be made.)

Capital Determination:

A conditional tail expectation approach will be used to determine required capital. The CTE at the 90th percentile will be the standard. This reflects the results in the worst 10 percent of all scenarios. However, for capital determination, we will cap the results of any one scenario at 0 (i.e., no gains are allowed to offset the losses in the tail).

C1 Expense Allowance Elimination for Modeled Products

The current RBC formula has a charge for the expense allowance in reserves of 2.4 percent (pre-tax) if the surrender charges are based on fund contributions and the fund balance exceeds the sum of premium less withdrawals; otherwise the charge is 11 percent. This amount provides for the possible non-recovery of the full "CARVM Allowance" if the stock market performs poorly. Since this impact will be captured directly in the Phase 2 modeling, this separate requirement is no longer necessary for products covered by C3, Phase 2.

Alternative Method:

[This section is illustrative of the sort of "safe harbor" we are trying to find. It is not a part of the recommendation at this time.]

As an alternative to stochastic scenario testing, a company may choose to use the "Alternative Method" for some or all of its eligible products. Under this method, capital requirements are calculated for three scenarios. These scenarios are consistent with the Determination of Keel Method Scenarios for reserve requirements under Actuarial Guideline MMMM. However, N, will be based on the percentile of the cumulative distribution at 1 percent, 5 percent and 10 percent, and equal -2.326, -1.645 and -1.281, respectively. (For reserves, N is set equal to -0.9674 for the 16.67 percentile.) The arithmetic average of these three results is the total capital requirement for these products. In doing these calculations, no lapses are to be assumed and no interim surplus strains to be considered. The risk based capital requirement is the excess of any of the initial assets needed to mature the obligation above the reserve, but not less than zero. Eligible products are minimum death benefit guarantee products and living benefit products eligible for the "keel method" under Actuarial Guideline MMMM. "Enhanced death benefit" products and path dependent living benefits are not eligible for the alternative method.

Actuarial Memorandum:

An actuarial memorandum should be constructed documenting the methodology and assumptions upon which the required capital is determined. The memorandum should also include sensitivity tests that the actuary feels appropriate given the composition of their block of business (i.e. identifying the key assumptions, that is those that contribute most to the RBC amount and if changed have the largest effect on RBC for the product). This memorandum will be confidential and available to regulators upon request.

Regulatory Communication:

If there is a material change in results due to a change in assumptions from the previous year, an executive summary should be sent to the state of domicile communicating such change and quantifying the impact it has on the results. Such communication shall remain confidential.

Appendix 1 – General Methodology

For "Guaranteed Minimum Income Benefits", the risk to expected margins in the purchase rate from uncertain future interest rates will be reflected in the modeling. An equity fund's degree of volatility will be reflected in the modeling. Reinsurance and hedging will also be reflected. For hedging, an adjustment to the modeled result may be made (reflecting basis risk, gap risk, and cost risk, if any).

For each scenario, the C3 measure is the most negative of the series of present values S(t)*pv(t), where S(t) is statutory assets less statutory liabilities for the products in question at the end of year t and pv(t) is the accumulated discount factor for t years using 105 percent of the after-tax one-year Treasury rates for that scenario. {This needs more discussion and confirmation what rate should be used for discounting.}

Appendix 2 - Model Calibration

Interest rate scenarios generated must have a distribution of value that meet or exceed the following calibration criteria such that the number of scenarios generated produce rates less than or greater than the rates in the tail.

1 Year Treasury Rates

Accumulation Period	2.5%-ile	5%-ile	10%-ile	90%-ile	95%-ile	97.5%ile
One-year						
Five-year						
Ten-year						

10 Year Treasury Rates

Accumulation Period	2.5%-ile	5%-ile	10%-ile	90%-ile	95%-ile	97.5%ile
One-year						
Five-year						
Ten-year						

Equity scenarios need to be generated for model calibration. These scenarios should be generated for the S&P 500 and Ibbotson Small Cap indexes. This ensures that the equity generator used produces results comparable to what has been historically observed. These generated scenarios may or may not be used in the projection. [The values shown here are still under review]

S&P 500 Gross Wealth Ratios

Accumulation Period	2.5%-ile	5%-ile	10%-ile	90%-ile	95%-ile	97.5%ile
One-year	0.86	0.89	0.94	1.35	1.39	1.44
Five-year	1.02	1.10	1.23	2.72	2.96	3.20
Ten-year	1.36	1.43	1.57	5.04	5.36	5.58

Ibbotson Small Cap Gross Wealth Ratios

Accumulation Period	2.5%-ile	5%-ile	10%-ile	90%-ile	95%-ile	97.5%ile
One-year	0.73	0.80	0.89	1.45	1.57	1.69

Five-year	0.65	1.03	1.20	3.50	3.97	4.28
Ten-year	1.65	1.80	2.05	8.51	10.29	11.38

Methodology Note C3-01 – Equity Fund Categorization

In many instances, it is not practical to run scenarios based on each individual fund. Therefore some grouping of funds may be made. Examples of classification groups used in the industry include:

- Portfolio Objective
- Morningstar classification
- Fund Concentration (e.g. Industry Funds)
- Historical Returns
- Performance Benchmark
- Beta
- AG 34 Classifications

Methodology Note C3-02 – Interim Reserves

As in all modeling, significant assumptions are frequently used. However, it is the responsibility of the actuary to ensure that the model reasonably reflect anticipated experience. Because of the importance of statutory reserves in the determination of the lowest future present value, care should be used. It is generally unrealistic to perform stochastic projection for reserves within a stochastic projection for capital determination. Therefore, reasonable estimates may need to be made. One such example is for guaranteed minimum income benefits ("GMIB's"). Reserves for GMIB's may be highly dependent on product design, the relationship of the account value and the notional GMIB value, and the duration of the contract. One approach to reflect this is to adjust the calculated reserve based on a table that summarizes the relationship between these characteristics.

Methodology Note C3-03 – Model Building for In Force Liabilities

In Force Liabilities need to be constructed utilizing a method that adequately represents the risks of the underlying contracts. If liabilities are summarized, the risk characteristics of the group should be representative of the individual policies and properly represent the different fund characteristics and strategies of the individual contract. For Variable contracts some examples include:

- Fund concentrations
- Average Beta of policy
- Average Risk & Return expected

- Morningstar Categories

Methodology Note C3-04 – Allocations of Funding and Other Behavioral Characteristics
[Content to Follow]

Future Issues to be Resolved:

- Calibration requirements for interest rates and equity returns;
- Testing Alternative Method
- Details of Regulatory review and approval
- Does scope include VUL
- What credit should be allowed for hedging
- Testing methodology and results
- Discount rates for accumulated negative surplus