

VM-22: Requirements for Principle-Based Reserves For Non-Variable Annuities

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Section 1: Background

A. Purpose

These requirements establish the minimum reserve valuation standard for non-variable annuity contracts as defined in Section II of the Valuation Manual, Subsection 2.C. For all contracts encompassed by the Scope, these requirements constitute the Commissioners Annuity Reserve Valuation Method (CARVM) and, for some contracts and certificates, the Commissioners Reserve Valuation Method (CRVM).

Guidance Note: CRVM requirements apply to some group pension contracts.

B. Principles

The projection methodology used to calculate the SR, and the DR where applicable, is based on the following set of principles. These principles should be followed when interpreting and applying the methodology in these requirements and analyzing the resulting reserves.

Guidance Note: The principles should be considered in their entirety, and it is required that companies meet these principles with respect to those contracts that fall within the scope of these requirements and are in force as of the valuation date to which these requirements are applied.

Principle 1: The objective of the approach used to determine the DR and SR is to quantify the amount of statutory reserves needed by the company to be able to meet contractual obligations in light of the risks to which the company is exposed with an element of conservatism consistent with statutory reporting objectives.

Principle 2: The calculation of the SR is based on the results derived from an analysis of asset and liability cash flows produced by the application of a stochastic cash-flow model to equity return and interest rate scenarios. For each scenario, the greatest present value of accumulated deficiency is calculated. The analysis, for the DR and SR, reflects prudent estimate assumptions for deterministic variables and is performed in aggregate (subject to limitations related to contractual provisions and prescribed guardrails) to allow the natural offset of risks within a given scenario. The methodology uses a projected total cash flow analysis by including all projected income, benefit, and expense items related to the business in the model and sets the SR at a degree of confidence using the CTE measure applied to the set of scenario specific greatest present values of accumulated deficiencies that is deemed to be reasonably conservative over the span of economic cycles.

Guidance Note: Examples where full aggregation between contracts may not be possible include experience rated group contracts and the operation of reinsurance treaties.

Principle 3: The implementation of a model involves decisions about the experience assumptions and the modeling techniques to be used in measuring the risks to which the company is exposed. Generally, assumptions are to be based on the conservative end of the confidence interval. The choice of a conservative estimate for each assumption may result in a distorted measure of the total risk. Conceptually, the choice of assumptions and the modeling decisions should be made so that the final result approximates what would be obtained for the SR at the required CTE level if it were possible to calculate results over the joint distribution of all future outcomes. In applying this concept to the actual calculation of the DR and SR, the company should be guided by evolving practice and expanding knowledge base in the measurement and management of risk.

Guidance Note: The intent of Principle 3 is to describe the conceptual framework for setting assumptions. Section 10 provides the requirements and guidance for setting contract holder behavior assumptions and includes alternatives to this framework if the company is unable to fully apply this principle. More guidance and requirements for setting assumptions in general are provided in Section 12.

Principle 4: While a stochastic cash-flow model attempts to include all real-world risks relevant to the objective of the stochastic cash-flow model and relationships among the risks, it will still contain limitations because it is only a model. The calculation of the SR is based on the results derived from the application of the stochastic cash-flow model to scenarios, while the actual statutory reserve needs of the company arise from the risks to which the company is (or will be) exposed in reality. Any disconnect between the model and reality should be reflected in setting prudent estimate assumptions to the extent not addressed by other means.

Principle 5: A cash-flow scenario model cannot completely quantify a company's exposure to risk. A model attempts to represent reality but will always remain an approximation thereto and, hence, uncertainty in future experience is an important consideration when determining the DR and SR. Therefore, the use of assumptions, methods, models, risk management strategies (e.g., hedging), derivative instruments, structured investments or any other risk transfer arrangements (such as reinsurance) that serve solely to reduce the calculated DR or SR without also reducing risk on scenarios similar to those used in the actual cash-flow modeling are inconsistent with these principles. The use of assumptions and risk management strategies should be appropriate to the business and not merely constructed to exploit "foreknowledge" of the components of the required methodology.

C. Risks Reflected and Risks Not Reflected

1. The risks reflected in the calculation of reserves under these requirements arise from actual or potential events or activities that are both:
 - a. Directly related to the contracts falling under the scope of these requirements or their supporting assets; and
 - b. Capable of materially affecting the reserve.
2. Categories and examples of risks reflected in the reserve calculations include, but are not necessarily limited to:
 - a. Asset risks
 - i. Credit risks (e.g., default or rating downgrades).
 - ii. Commercial mortgage loan roll-over rates (roll-over of bullet loans).
 - iii. Uncertainty in the timing or duration of asset cash flows (e.g., shortening (prepayment risk) and lengthening (extension risk)).
 - iv. Performance of equities, real estate, and Schedule BA assets.
 - v. Call risk on callable assets.
 - vi. Risk associated with hedge instrument (includes basis, gap, price, parameter estimation risks, and variation in assumptions).
 - vii. Currency risk.
 - b. Liability risks
 - i. Reinsurer default, impairment, or rating downgrade known to have occurred before or on the valuation date.
 - ii. Mortality/longevity, persistency/lapse, partial withdrawal, and premium/fee payment risks.
 - iii. Utilization risk associated with guaranteed living benefits.
 - iv. Anticipated mortality trends based on observed patterns of mortality improvement or deterioration, where permitted.
 - v. Annuitization risks.
 - vi. Additional premium dump-ins (high interest rate guarantees in low interest rate environments).
 - vii. Applicable expense risks, including fluctuation in maintenance expenses directly attributable to the business, future commission expenses, and expense inflation/growth.

- c. Combination risks
 - i. Risks modeled in the company's risk assessment processes that are related to the contracts, as described above.
 - ii. Disintermediation risk (including such risk related to payment of surrender or partial withdrawal benefits).
 - iii. Risks associated with revenue-sharing income.
- 3. Categories and examples of risks not reflected in the reserve calculations include, but are not necessarily limited to:
 - a. Asset risks
 - i. Liquidity risks associated with a "run on the bank."
 - b. Liability risks
 - i. Reinsurer default, impairment or rating downgrade occurring after the valuation date.
 - ii. Catastrophic events (e.g., epidemics or terrorist events).
 - iii. Major breakthroughs in life extension technology that have not yet altered recently observed mortality experience.
 - iv. Significant future reserve increases as an unfavorable scenario is realized.
 - c. General business risks
 - i. Deterioration of reputation.
 - ii. Future changes in anticipated experience (reparameterization in the case of stochastic processes), which would be triggered if and when adverse modeled outcomes were to actually occur.
 - iii. Poor management performance.
 - iv. The expense risks associated with fluctuating amounts of new business.
 - v. Risks associated with future economic viability of the company.
 - vi. Moral hazards.
 - vii. Fraud and theft.
 - viii. Operational.
 - ix. Litigation.

D. Materiality

The company shall establish a standard containing the criteria for determining whether an assumption, risk factor, or other element of the principle-based valuation has a material impact on the size of the reserve. This standard shall be applied when identifying material risks.

Section 2: Scope and Effective Date

A. Scope

Applicable non-variable annuity contracts specified in VM Section II, Subsection 2 “Annuity Products”, Paragraphs C and D and applicable contracts in VM Section II, Subsection 3 “Deposit-Type Contracts” are subject to VM-22 requirements.

B. Effective Date & Transition

Effective Date

These requirements apply for valuation dates on or after January 1, 2026.

Transition

A company may elect to establish minimum reserves pursuant to applicable requirements in VM-A, VM-C, VM-M, and VM-V for business otherwise subject to VM-22 PBR requirements and issued during the first three years following the effective date of VM-22. If a company during the three-year transition period elects to apply VM-22 PBR to a block of such business, then a company must continue to apply the requirements of VM-22 for future valuations of this business. Irrespective of the transition date, a company shall apply VM-22 PBR requirements to all applicable blocks of business on a prospective basis starting three years after the effective date.

Section 3: Reserve Methodology

A. Aggregate Reserve

The aggregate reserve for contracts falling within the scope of these requirements shall equal the SR (following the requirements of Section 4) plus the DR for contracts that pass the Single Scenario Test, plus the reserve for any contracts valued under applicable requirements in VM-A, VM-C, VM-M, and VM-V. Contracts valued under applicable requirements in VM-A, VM-C, VM-M, and VM-V are ones that pass the exclusion test and elect to not model DR or SR, per the requirements in Section 3.G.

B. Impact of Reinsurance Ceded

All components in the aggregate reserve shall be determined post-reinsurance ceded and pre-reinsurance ceded as outlined in Section 5.

C. The Additional Standard Projection Amount

The additional standard projection amount is determined by applying the standard projection method defined in Section 6. The additional standard projection amount is only required for disclosure purposes pursuant to VM-31.

Guidance Note: To further expand upon use of the Standard Projection Amount (SPA), the NAIC Life Actuarial (A) Task Force adopted a referral to the VM-22 (A) Subgroup on April 3, 2025 that states the following:

“LATF directs the VM-22 Subgroup to:

- 1. Require an attribution analysis, individually covering all material drivers and a residual impact, between the SR and SPA whenever an ASPA is indicated.*
- 2. Require an attribution analysis, individually covering all material drivers and a residual impact, between the SR and SPA for all companies at least every 3 years.*
- 3. Clarify that if an ASPA is indicated and the company is not strengthening their reserves in response to the SPA result, they need to provide support that the material drivers of the difference are due to company assumptions that can be supported based on reliable, relevant, and credible company data.*
- 4. Reiterate that the SPA is not a safe harbor.”*

Therefore, although not included in the NAIC Valuation Manual effective for 1/1/2026 due to time constraints, the VM-22 (A) Subgroup will develop language to address the above directive for the 1/1/2027 Valuation Manual. Upon such adoption by the Life Actuarial (A) Task Force, as feasible, companies are encouraged to incorporate such changes for 2026 reporting. The enhanced disclosures will ensure an effective SPA and enable the VM-22 (A) Subgroup and LATF to evaluate the SPA framework as adopted within three years.

D. The SR

1. The SR shall be determined based on asset and liability projections for the contracts falling within the scope of VM-22 requirements, excluding those contracts for which the company has determined a DR based on passing the Single Scenario Test in Section 7.E and those contracts valued using the methodology pursuant to applicable requirements in VM-A, VM-C, VM-M, and VM-V, over a broad range of stochastically generated projection scenarios described in Section 8 and using prudent estimate assumptions as required in Section 3.I herein.
2. The SR amount for any group of contracts shall be determined as CTE70 of the scenario reserves following the requirements of Section 4.

E. The DR

The DR for groups of contracts that have passed the Single Scenario Test in Section 7.E shall be determined following the requirements of Section 4 and using prudent estimate assumptions as required in Section 3.I herein.

F. Aggregation of Contracts for the DR and SR

1. Groups of contracts within different Reserving Categories may not be aggregated together in determining the SR or DR except as specified in Section 3.F.2. For the purposes of VM-22, Reserving Categories are classified as the following:
 - a. The “Payout Annuity Reserving Category” includes the following categories of contracts, certificates and contract features, whether group or individual, including both life contingent and term certain only contracts, directly written or assumed through reinsurance, with the exception of benefits provided by variable annuities:
 - i. Single Premium Immediate Annuity contracts;
 - ii. Deferred Income Annuity contracts;
 - iii. Structured Settlement Contracts in payout or deferred status;
 - iv. Fixed income payment streams resulting from the exercise of settlement options or annuitizations of host contracts issued;
 - v. Supplementary contracts, excluding contracts with no scheduled payments (such as retained asset accounts and settlements at interest);
 - vi. Certificates, emanating from non-variable group annuity contracts specified in Model #820, Section 5.C.2, purchased for the purpose of providing certificate holders fixed income payment streams upon their retirement; and
 - vii. Pension Risk Transfer Annuities.
 - b. The term “Longevity Reinsurance Reserving Category” includes all Longevity Reinsurance as defined under the definition provided in VM-01.

- c. The “Accumulation Reserving Category” includes all annuities within scope of VM-22 that are not in the “Payout Reserving Category” or “Longevity Reinsurance Reserving Category”.
 - i. Note this category shall include fixed income payment streams attributable to guaranteed living benefits associated with deferred annuity contracts, once the contract funds are exhausted
- 2. The Payout Annuity Reserving Category and Accumulation Reserving Category may be aggregated only if they meet the following criteria:
 - a. The company manages the risks of the contracts within both categories in an integrated risk management process.
 - b. The contracts within both categories are managed within a single portfolio, or portfolios with the same ALM strategy.

Guidance Note: For the purposes of aggregating payout and accumulation reserving categories, the Subgroup plans to revisit whether to include prerequisites to permit aggregation, as well as which criteria and disclosures to focus on for such aggregation.

- 3. For the purposes of calculating stochastic reserves, the stochastic exclusion test, and determining the final VM-22 reserves, groups of contracts for which the company calculates a DR, pursuant to the requirements in Section 7.E, shall not be aggregated with any groups of contracts that do not calculate a DR.
- 4. The reserve may be determined in aggregate across various groups of contracts within each Reserving Category, or within the combined Accumulation and Payout reserving categories following Section 3.F.2, as a single model segment when determining the SR or DR.
- 5. To the extent that aggregation results in more than one model segment, the aggregate reserve for each reserving category, or within the combined Accumulation and Payout reserving categories following Section 3.F.2, shall be calculated as follows:
 - a. If the company uses the NAER method described in Section 4.B.1.a:
 - i. Project the accumulated deficiencies as described in Section 4.A and take the present value using the NAER as described in Section 4.B.2 for each model segment.
 - ii. Combine the present values for each model segment and take the greatest present value in aggregate for each scenario. The aggregate scenario reserve shall equal the sum of the initial assets of each model segment and the greatest present value of the aggregated deficiencies, less the aggregate PIMR. The resulting aggregate scenario reserve for a given scenario shall not be less than the aggregate cash surrender value on the valuation date.
 - iii. Calculate the CTE (70) of the aggregate scenario reserves
 - b. If the company uses the direct iteration method described in Section 4.B.1.b:

- i. Calculate the starting amount of assets as described in Section 4.B.1.b for each scenario of each model segment.
 - ii. Add the starting amount of assets of each scenario for all model segments together and subtract the aggregate PIMR. The resulting aggregate scenario reserve for a given scenario shall not be less than the aggregate cash surrender value on the valuation date.
 - iii. Calculate the CTE (70) of the aggregate scenario reserves.
 - c. The benefit of aggregation and how it is allocated across multiple model segments within a reserving category and/or across reserving categories, pursuant to Section 3.F.2, shall be disclosed in VM-31.
6. The reserve for each longevity reinsurance contract within the “Longevity Reinsurance Reserving Category” shall be floored at 2% of the scheduled longevity benefits payable by the benefit provider within the next 12 months from the date of valuation. For the deals structured on a net basis, where the reinsurer covers only the benefits exceeding a predetermined reference benefit schedule, the floor will still be calculated based on the scheduled longevity benefits payable by the benefit provider within the next 12 months from the date of valuation.

G. Stochastic Exclusion Test

1. To the extent that certain groups of contracts pass the stochastic exclusion test in Section 7.B, these groups of contracts may be valued using the methodology and statutory maximum valuation rate pursuant to applicable requirements in VM-A, VM-C, VM-M, and VM-V.
2. For dividend-paying contracts that pass the Stochastic Exclusion Test, a dividend liability shall be established following requirements in VM-A and VM-C, as described above, for the base contract.
3. The company may not group together contract types with significantly different risk profiles when performing the exclusion test.

H. Allocation of the Aggregate Reserve to Contracts

The aggregate reserve shall be allocated to the contracts falling within the scope of these requirements using the method outlined in Section 13, with the exception of contracts valued under VM-A, VM-C, VM-M, and VM-V following Section 3.G which are to be calculated on a seriatim basis.

I. Prudent Estimate Assumptions

1. With respect to the SR in Section 3.D and DR in Section 3.E, the company shall establish the prudent estimate assumption for each risk factor in compliance with the requirements in Section 12 of Model #820 and must annually review and update the assumptions as appropriate in accordance with these requirements.
2. The qualified actuary, to whom responsibility for a given group of contracts is assigned, shall annually review relevant emerging experience for the purpose of assessing the appropriateness of the anticipated experience assumption. If the results of the review indicate that previously anticipated experience for a given factor is inadequate, then the company shall set a new, adequate, anticipated experience assumption for the factor.

3. To determine the prudent estimate assumptions, the DR and SR shall also follow the requirements in Sections 4 and general assumptions including Section 9 for hedging assumptions, Section 10 for contract holder behavior assumptions, Section 11 for mortality assumptions, and Section 12 for general guidance and expense assumptions.

J. Approximations, Simplifications, and Modeling Efficiency Techniques

A company may use simplifications, approximations, and modeling efficiency techniques to calculate the DR, SR and/or the additional standard projection amount required by this section if the company can demonstrate that the use of such techniques does not understate the reserve by a material amount, and the expected value of the reserve calculated using simplifications, approximations, and modeling efficiency techniques is not less than the expected value of the reserve calculated that does not use them.

Guidance Note:

Examples of modeling efficiency techniques include, but are not limited to:

1. Choosing a reduced set of scenarios from a larger set consistent with prescribed models and parameters.
2. Generating a smaller liability or asset model to represent the full seriatim model using grouping compression techniques or other similar simplifications.

There are multiple ways of providing the demonstration required by Section 3.J. The complexity of the demonstration depends upon the simplifications, approximations or modeling efficiency techniques used. Examples include, but are not limited to:

- Rounding at a transactional level in a direction that is clearly and consistently conservative or is clearly and consistently unbiased with an obviously immaterial impact on the result (e.g., rounding to the nearest dollar) would satisfy 3.J without needing a demonstration. However, rounding to too few significant digits relative to the quantity being rounded, even in an unbiased way, may be material and in that event, the company may need to provide a demonstration that the rounding would not produce a material understatement of the reserve.
- A brute force demonstration involves calculating the minimum reserve both with and without the simplification, approximation or modeling efficiency technique, and making a direct comparison between the resulting reserve. Regardless of the specific simplification, approximation or modeling efficiency technique used, brute force demonstrations always satisfy the requirements of Section 3.J.
- Choosing a reduced set of scenarios from a larger set consistent with prescribed models and parameters and providing a detailed demonstration of why it did not understate the reserve by a material amount and the expected value of the reserve would not be less than the expected value of the reserve that would otherwise be calculated. This demonstration may be a theoretical, statistical or mathematical argument establishing, to the satisfaction of the insurance commissioner, general bounds on the potential deviation in the reserve estimate rather than a brute force demonstration.

K. Prior Valuation Date

The company may calculate the DR, SR, and the additional standard projection amount as of a date no earlier than three months before the valuation date, using relevant company data, provided an appropriate method is used to adjust those amounts to the valuation date. Company data used for experience studies to determine prudent estimate assumptions are not subject to this three-month limitation.

Section 4: Determination of the DR and SR

A. Projection of Accumulated Deficiencies

1. General Description of Projection

The projection of accumulated deficiencies shall be made ignoring federal income tax in both cash flows and discount rates, and it shall reflect the dynamics of the expected cash flows for the entire group of contracts, reflecting all product features, including any guarantees provided under the contracts using prudent estimate liability assumptions defined in Sections 10, 11, and 12 and asset assumptions defined in Sections 4 and 9. The company shall project cash flows including the following:

- a. Gross premium received by the company from the contract holder or the ceding company in the case of reinsurance (including any due premiums as of the projected start date).

Guidance Note: If due premiums are modeled, the final reported reserve needs to be adjusted by adding the due premium asset.

- b. Other revenues, including contractual fees and charges, and revenue-sharing income received by the company (net of applicable expenses). For the Longevity Reinsurance Reserving Category, the scenario reserve for any given scenario shall not be less than 2% of the scheduled longevity benefits payable by the benefit provider within the next 12 months from the date of valuation in aggregate. For the deals structured on a net basis, where the reinsurer covers only the benefits exceeding a predetermined reference benefit schedule, the floor will still be calculated based on the scheduled longevity benefits payable by the benefit provider within the next 12 months from the date of valuation in aggregate.

Guidance Note: Calculate the minimum reserve by flooring the reserve amount at 2% of the scheduled longevity benefits payable by the benefit provider within next 12 months from the date of valuation. For the deals structured on a net basis, where the reinsurer covers only the benefits exceeding a predetermined reference benefit schedule, the floor will still be calculated based on the scheduled longevity benefits payable by the benefit provider within the next 12 months from the valuation date.

- c. All material benefits projected to be paid to contract holders—including, but not limited to, death claims, surrender benefits and withdrawal benefits—reflecting the impact of all guarantees and adjusted to take into account amounts projected to be charged to account values on general account business. Any guarantees, in addition to market value adjustments assessed on projected withdrawals or surrenders, shall be taken into account.
- d. Non-Guaranteed Elements (NGE) cash flows as described in Section 10.I.
- e. Insurance company expenses (including overhead and maintenance expense), commissions and other acquisition expenses associated with business inforce as of the valuation date.

- f. Cash flows associated with any reinsurance, to the extent not already covered above (for example, for longevity reinsurance).
- g. Cash flows from hedging instruments as described in Section 4 and Section 9.
- h. Cash receipts or disbursements associated with invested assets (other than policy loans) as described in Section 4.D.4, including investment income, realized capital gains and losses, principal repayments, asset default costs, investment expenses, asset prepayments, and asset sales.
- i. If modeled explicitly, cash flows related to policy loans as described in Section 10.H.2, including interest income, new loan payments and principal repayments.

Guidance Note: Future net policy loan cash flows include: policy loan interest paid in cash plus repayments of policy loan principal, including repayments occurring at death or surrender (note that the future benefits in Section 4.A.1.c are before consideration of policy loans), less additional policy loan principal (but excluding policy loan interest that is added to the policy loan principal balance).

2. Grouping of Index Crediting Strategies

Index crediting strategies for non-variable annuities may be grouped for modeling using an approach that recognizes the objectives of each index crediting strategy. In assigning each index crediting strategy to a grouping for projection purposes, the fundamental characteristics of the index crediting strategy shall be reflected, and the parameters shall have the appropriate relationship to the stochastically generated projection scenarios described in Section 8. The grouping shall reflect characteristics of the efficient frontier (i.e., returns generally cannot be increased without assuming additional risk).

Index accounts sharing similar index crediting strategies may also be grouped for modeling to an appropriately crafted proxy strategy normally expressed as a linear combination of recognized market indices, sub-indices or funds, in order to develop the investment return paths and associated interest crediting. Each index crediting strategy's specific risk characteristics, associated index parameters, and relationship to the stochastically generated scenarios in Section 8 should be considered before grouping or assigning to a proxy strategy. Grouping and/or development of a proxy strategy may not be done in a manner that intentionally understates the resulting reserve.

3. Model Cells

Projections may be performed for each contract in force on the date of valuation or by assigning contracts into representative cells of model plans using all characteristics and criteria having a material impact on the size of the reserve. Assigning contracts to model cells may not be done in a manner that intentionally understates the resulting reserve.

4. Modeling of Hedges

- a. For a company that does not have a future hedging strategy supporting the contracts:

- i. The company shall not consider the cash flows from any future hedge purchases or any rebalancing of existing hedge assets in its modeling, since they are not included in the company's investment strategy supporting the contracts.
 - ii. Existing hedging instruments that are currently held by the company in support of the contracts falling under the scope of these requirements shall be included in the starting assets.
- b. For a company that has one or more future hedging strategies supporting the contracts:
- i. For a future hedging strategy with hedge payoffs that offset index credits associated with index crediting strategies (index credits):
 - a) In modeling cash flows, the company shall include the cash flows from future hedge purchases or any rebalancing of existing hedge assets that are intended solely to offset index credits to contract holders.
 - b) Existing hedging instruments that are currently held by the company for offsetting the index credits in support of the contracts falling under the scope of these requirements shall be included in the starting assets.
 - c) An index credit hedge margin for these hedge instruments shall be reflected in both the "best efforts" and the "adjusted" runs, as applicable, by reducing index credit hedge payoffs by a margin multiple that shall be justified by sufficient and credible company experience and account for model error. It shall be no less than 1.5% multiplicatively of the portion of the index credit that is hedged. In the absence of sufficient and credible company experience, a margin of 20% shall be assumed. There is no cap on the index credit hedge margin if company experience indicates actual error is greater than these minimums.
 - ii. For a company with any future hedging strategies supporting the contracts that do not solely offset indexed interest credits, the detailed requirements for the modeling of hedges are defined in Section 9. The following requirements do not supersede the detailed requirements.
 - a) The appropriate costs and benefits of hedging instruments that are currently held by the company in support of the contracts falling under the scope of these requirements shall be included in the projections used in the determination of the DR and SR.
 - b) The projections shall take into account the appropriate costs and benefits of hedge positions expected to be held in the future through the execution of the future hedging strategies supporting the contracts. Because models do not always accurately portray the results of hedge programs, the company shall, through back-testing and other means, assess the accuracy of the hedge modeling. The company shall determine

a SR as the weighted average of two CTE values; first, a CTE70 (“best efforts”) representing the company’s projection of all of the hedge cash flows, including future hedge purchases, and a second CTE70 (“adjusted”) which shall use only hedge assets held by the company on the valuation date and only future hedge purchases associated solely with index credits. These are discussed in greater detail in Section 9. The SR shall be the weighted average of the two CTE70 values, where the weights reflect the error factor (E) determined following the guidance of Section 9.C.4.

- c) The company is responsible for verifying compliance with all requirements in Section 9 for all hedging instruments included in the projections.
 - d) The use of products not falling under the scope of VM-22 (e.g., variable annuities) as a hedge shall not be recognized in the determination of accumulated deficiencies.
- iii. If a company has a more comprehensive hedge strategy combining index credits with guaranteed benefits and/or other risks (e.g., full fair value or economic hedging), no portion of this hedge strategy is eligible for the treatment described in section 4.A.4.b.i.

5. Revenue Sharing

If applicable, projections of accumulated deficiencies may include income from projected future revenue sharing, net of applicable projected expenses (net revenue-sharing income) by following the requirements set forth in VM-21 Sections 4.A.5.a through 4.a.5.f.

6. Length of Projections

Projections of accumulated deficiencies shall be run for as many future years as needed so that no obligations remain at the end of the projection periods.

7. Interest Maintenance Reserve (IMR)

The IMR shall be handled consistently with the treatment in the company’s cash flow testing, and the amounts should be adjusted to a pre-tax basis.

B. Determination of Scenario Reserve

1. For a given scenario, the scenario reserve shall be determined using one of two methods described below:
 - a. The starting asset amount, less the allocated amount of PIMR, plus the greatest present value, as of the projection start date, of the projected accumulated deficiencies; or

Guidance Note: The greatest present value of accumulated deficiencies can be negative.

- b. The direct iteration method, where the scenario reserve is determined by solving for the amount of starting assets which, when projected along with all contract cash flows, result in the defeasement of all projected future benefits and expenses at the end of the projection horizon with no positive accumulated deficiencies at the end of any projection year during the projection period, less the allocated amount of PIMR.

The scenario reserve for any given scenario shall not be less than the cash surrender value in aggregate on the valuation date for the group of contracts modeled in the projection. In the case where all assets supporting the liability are held at market value, the market value adjustment shall also be applied to the cash surrender value.

Guidance Note: Refer to NAIC Model #200 “Separate Accounts Funding Guaranteed Minimum Benefits under Group Contracts Model Regulation” and Model #255 “Modified Guaranteed Annuity Model Regulation” for assets held in separate accounts.

2. Discount Rates

In determining the scenario reserve, unless using the direct iteration method pursuant to Section 4.B.1.b, the accumulated deficiencies shall be discounted at the NAER on additional assets, as defined in Section 4.B.3.

3. Determination of NAER on Additional Invested Asset Portfolio

- a. The additional invested asset portfolio for a scenario is a portfolio of general account assets as of the valuation date, outside of the starting asset portfolio, that is required in that projection scenario so that the projection would not have a positive accumulated deficiency at the end of any projection year. This portfolio may include only (i) General Account assets available to the company on the valuation date that do not constitute part of the starting asset portfolio; and (ii) cash assets.

Additional invested assets should be selected in a manner such that if the starting asset portfolio were revised to include the additional invested assets, the projection would not be expected to experience any positive accumulated deficiencies at the end of any projection year. The additional invested asset portfolio can be comprised of one or more of the following:

- (i) Pro-rata slice of the starting asset portfolio
- (ii) Cash that is immediately reinvested
- (iii) A combination of assets that would be transferred to the portfolio from the general account to cover a potential shortfall

It is assumed that the accumulated deficiencies for this scenario projection are known. Assets selected for the additional invested asset portfolio should be based on the same allocation methodology for all scenarios.

The company should be able to support that these additional assets are not double counted across various PBR calculations. For example, it would be inappropriate to

assume the same asset was “transferred to the portfolio from the general account” for the same economic scenario for both VM-21 and VM-22.

- b. To determine the NAER on additional invested assets for a given scenario:
 - i. Project the additional invested asset portfolio as of the valuation date to the end of the projection period,
 - a) Investing any cash in the portfolio and reinvesting all investment proceeds using the company’s investment policy, subject to the alternative investment strategy described in Section 4.D.3.b.
 - b) Excluding any liability cash flows.
 - c) Incorporating the appropriate returns, defaults and investment expenses for the given scenario.
 - ii. If the value of the projected additional invested asset portfolio does not equal or exceed the accumulated deficiencies at the end of each projection year for the scenario, increase the size of the initial additional invested asset portfolio as of the valuation date, and repeat the preceding step.
 - iii. Determine a vector of annual earned rates that replicates the growth in the additional invested asset portfolio from the valuation date to the end of the projection period for the scenario. This vector will be the NAER for the given scenario.

Guidance Note: There are multiple ways to select the additional invested asset portfolio at the valuation date. Similarly, there are multiple ways to determine the earned rate vector. The company shall be consistent in its choice of methods, from one valuation to the next.

C. Projection Scenarios

1. Number of Scenarios

The number of scenarios for which the scenario reserve shall be computed shall be the responsibility of the company, following Section 8.F.

2. Economic Scenario Generation

Treasury Department interest rate curves, as well as investment return paths for index funds, equities, and fixed income assets shall be determined on a stochastic basis using the methodology described in Section 8. If the company uses a proprietary generator to develop scenarios, the company shall demonstrate that the resulting scenarios meet the requirements described in Section 8.

3. The DR Scenario

The DR, for the group of contracts under the Single Scenario Test, is determined as the scenario

reserve for a single economic scenario (scenario 12 found in Appendix 1 of VM-20). As with the SR, cash flows are projected in compliance with the applicable requirements in Section 4, Section 5, Section 10, and Section 11 of VM-22.

D. Projection of Assets

1. Starting Asset Amount
 - a. For the projections of accumulated deficiencies, at the start of the projection, the amount of assets valued consistently with their annual statement values shall be set equal to:
 - i. Any hedge instruments held in support of the contracts being valued; and
 - ii. An amount of assets held in the general account equal to the approximate value of statutory reserves as of the start of the projections less the amount in (i).
 - iii. The allocated amount of PIMR attributable to the assets selected.
 - b. If the amount of initial general account assets is negative, the model should reflect a projected interest expense. General account assets chosen for use as described above shall be selected on a consistent basis from one reserve valuation hereunder to the next.

2. Valuation of Projected Assets

For purposes of determining the projected accumulated deficiencies, the value of projected assets shall be determined in a manner consistent with their value at the start of the projection. For assets assumed to be purchased during a projection, the value shall be determined in a manner consistent with the value of assets at the start of the projection that have similar investment characteristics. However, for derivative instruments that are used in hedging and are not assumed to be sold during a particular projection interval, the company may account for them at an amortized cost in an appropriate manner elected by the company.

Guidance Note: Accounting for hedge assets should recognize any methodology prescribed by a company's state of domicile.

3. General Account Assets
 - a. General account assets shall be projected, net of projected defaults, using assumed investment returns consistent with their book value and expected to be realized in future periods as of the date of valuation. Initial assets that mature during the projection and positive cash flows projected for future periods shall be invested in a manner that is representative of and consistent with the company's investment policy, subject to the following requirements:

- i. The final maturities and cash flow structures of assets purchased in the model, such as the patterns of gross investment income and principal repayments or a fixed or floating rate interest basis, shall be determined by the company as part of the model representation;
 - ii. The combination of price and structure for fixed income investments and derivative instruments associated with fixed income investments shall appropriately reflect the projected Treasury Department curve along the relevant scenario and the requirements for gross asset spread assumptions stated below;
 - iii. For purchases of public non-callable corporate bonds, follow the requirements defined in VM-20 Sections 7.E, 7.F and 9.F. The prescribed spreads reflect current market conditions as of the model start date and grade to long-term conditions based on historical data at the start of projection year four;
 - iv. For transactions of derivative instruments associated with fixed income investments, reflect the prescribed assumptions in VM-20 Section 9.F for interest rate swap spreads;
 - v. For purchases of other fixed income investments, if included in modeled company investment strategy, set assumed gross asset spreads over U.S. Treasuries in a manner that is consistent with, and results in reasonable relationships to, the prescribed spreads for public non-callable corporate bonds and interest rate swaps.
- b. Notwithstanding the above requirements, the aggregate reserve shall be the higher of that produced by the modeled company investment strategy and that produced by substituting an alternative investment strategy in which the fixed income reinvestment assets have the same weighted average life (WAL) as the reinvestment assets in the modeled company investment strategy and are all public non-callable corporate bonds with gross asset spreads, asset default costs, and investment expenses by projection year that are consistent with a credit quality blend of at least:
- i. 5% Treasury
 - ii. 15% PBR credit rating 3 (Aa2/AA)
 - iii. 80% PBR credit rating 6 (A2/A)
- c. Any disinvestment shall be modeled in a manner that is consistent with the company's investment policy and that reflects the company's cost of borrowing where applicable, provided that the assumed cost of borrowing is not lower than the rate at which positive cash flows are reinvested in the same time period, taking into account duration, ratings, and other attributes of the borrowing mechanism. Gross asset spreads used in computing market values of assets sold in the model shall be consistent with, but not necessarily the same as, the gross asset spreads in Section 4.D.3.a.iii and Section 4.D.3.a.v, recognizing that initial assets that mature during the projection may have different characteristics than modeled reinvestment assets.

Guidance Note: The simple language above "provided that the assumed cost of borrowing is not lower than the

rate at which positive cash flows are reinvested in the same time period” is intended to prevent excessively optimistic borrowing assumptions. If in any case, the assumed cost of borrowing restriction cannot be fully applied or followed precisely, then as with all other simplifications/approximations, the company shall not allow borrowing assumptions to materially reduce the reserve.

4. Cash Flows from Invested Assets

- a. Cash flows from general account fixed income assets, including starting and reinvestment assets, shall be reflected in the projection as follows:
 - i. Model gross investment income and principal repayments in accordance with the contractual provisions of each asset and in a manner consistent with each scenario.
 - ii. Reflect asset default costs as prescribed in VM-20 Section 9.F and anticipated investment expenses through deductions to the gross investment income.
 - iii. Model the proceeds arising from modeled asset sales and determine the portion representing any realized capital gains and losses.
 - iv. Reflect any uncertainty in the timing and amounts of asset cash flows related to the paths of interest rates, equity returns or other economic values directly in the projection of asset cash flows. Asset defaults are not subject to this requirement, since asset default assumptions must be determined by the prescribed method as noted in Section 4.D.4.a.ii above.
- b. Cash flows from index funds and general account equity assets—i.e., non-fixed income assets having substantial volatility of returns, such as common stocks and real estate—including starting and reinvestment assets, shall be reflected in the projection as follows:
 - i. Determine the grouping for asset categories and the allocation of specific assets to each category in a manner that is consistent with that used for index crediting strategies, as discussed in Section 4.A.2.
 - ii. Project the gross investment return including realized and unrealized capital gains in a manner that is consistent with the stochastically generated scenarios.
 - iii. Model the timing of an asset sale in a manner that is consistent with the investment policy of the company for that type of asset. Reflect expenses through a deduction to the gross investment return using prudent estimate assumptions.
- c. Cash flows for each projection interval for policy loan assets shall follow the requirements in Section 10.H.

E. Projection of Annuitization Benefits

1. Assumed Annuitization Purchase Rates
 - a. For payouts specified at issue (such as single premium immediate annuities, deferred income annuities, and some structured settlements), such purchase rates shall reflect the payout rate specified in the contract.
 - b. For purposes of projecting future elective annuitization benefits (including annuitizations stemming from the election of a GMIB) and withdrawal amounts from GMWBs, the projected annuitization purchase rates shall be determined assuming that market interest rates available at the time of election are the interest rates used to project general account assets, as determined in Section 4.D.3.
2. Projected Election of GMIBs, GMWBs and Other Annuitization Options
 - a. For contracts projected to elect future annuitization options (including annuitizations stemming from the election of a GMIB) or for projections of GMWB benefits once the account value has been depleted, the projections shall assume the contract will stay in force, the projected periodic payments are paid, and the associated maintenance expenses are incurred.

F. Frequency of Projection

1. Use of an annual cash-flow frequency (“timestep”) is generally acceptable for benefits/features that are not sensitive to projection frequency. The lack of sensitivity to projection frequency should be validated by testing wherein the company should determine that the use of a more frequent—i.e., shorter—time step does not materially increase reserves. A more frequent time increment should always be used when the product features are sensitive to projection period frequency.

G. Compliance with ASOPs

When determining a DR or SR, the analysis shall conform to the ASOPs as promulgated from time to time by the ASB.

Under these requirements, an actuary will make various determinations, verifications and certifications. The company shall provide the actuary with the necessary information sufficient to permit the actuary to fulfill the responsibilities set forth in these requirements and responsibilities arising from each applicable ASOP.

Section 5: Reinsurance

A. Treatment of Reinsurance in the Aggregate Reserve

1. Aggregate Reserve Pre- and Post-Reinsurance Ceded

As noted in Section 3.B, the aggregate reserve is determined both pre-reinsurance ceded and post-reinsurance ceded. Therefore, it is necessary to determine the components needed to determine the aggregate reserve—i.e., the SR, DR, and/or the reserve amount valued using requirements in VM-A, VM-C, VM-M, and VM-V, as applicable—on both bases. Note that for the reserve amount valued using requirements in VM-A, VM-C, VM-M, and VM-V, the post-reinsurance ceded reserve is determined by subtracting the reinsurance reserve credit. Sections 5.A.2 and 5.A.3 discuss adjustments to inputs necessary to determine the DR and/or SR on both a post-reinsurance ceded and a pre-reinsurance ceded basis.

2. Reflection of Reinsurance Cash Flows in the DR and/or SR

- a. In order to determine the aggregate reserve post-reinsurance ceded, accumulated deficiencies, scenario reserves, and the resulting DR and/or SR shall be determined reflecting the effects of reinsurance treaties that meet the statutory requirements that would allow the treaty to be accounted for as reinsurance within statutory accounting. This involves including, where appropriate, all projected reinsurance premiums or other costs and all reinsurance recoveries, where the reinsurance cash flows reflect all the provisions in the reinsurance agreement, using prudent estimate assumptions.
 - i. In this section, reinsurance includes retrocession, and assuming company includes retrocessionnaire.
 - ii. All significant terms and provisions within reinsurance treaties shall be reflected. In addition, it shall be assumed that each party is knowledgeable about the treaty provisions and will exercise them to their advantage.

Guidance Note: Renegotiation of the treaty upon the expiration of an experience refund provision or at any other time shall not be assumed if such would be beneficial to the company and not beneficial to the counterparty. This is applicable to both the ceding party and assuming party within a reinsurance arrangement.

- iii. If the company has knowledge that a counterparty is financially impaired, the company shall establish a margin for the risk of default by the counterparty. In the absence of knowledge that the counterparty is financially impaired, the company is not required to establish a margin for the risk of default by the counterparty.
 - iv. A company shall include the cash flows from a reinsurance agreement or amendment in calculating the DR and/or SR if such qualifies for credit in compliance with Appendix A-791 of the Accounting Practices and Procedures Manual. If a reinsurance agreement or amendment does not qualify for credit for reinsurance but treating the reinsurance agreement or amendment as if it did so qualify would result in a reduction to the company's surplus, then the company shall increase the aggregate reserve by the absolute value of such reductions in surplus.
- b. In order to determine the DR and/or SR on a pre-reinsurance ceded basis, accumulated deficiencies, scenario reserves, and the resulting DR and/or SR shall be determined ignoring the effects of reinsurance

ceded within the projections. Different approaches may be used to determine the starting assets on the ceded portion of the contracts, dependent upon the characteristics of a given treaty:

- i. For a standard coinsurance treaty, where the assets supporting the ceded liabilities were transferred to the assuming reinsurer, one acceptable approach involves a projection based on using starting assets on the ceded portion of the policies that are similar to those supporting the retained portion of the ceded policies or supporting similar types of policies. Scaling up each asset supporting the retained portion of the contract is also an acceptable method.

Guidance Note: For standard pro rata insurance treaties that do not include experience refunds, where allocated expenses are similar to the renewal expense allowance, a possible approach may be multiplying the quota share by the present value of future reinsurance cash flows pertaining to the reinsured block of business.

- ii. Alternatively, a treaty may contain an identifiable portfolio of assets associated with the ceded liabilities. This could be the case for several forms of reinsurance: funds withheld coinsurance; modified coinsurance; coinsurance with a trust. To the extent these assets would be available to the cedant, an acceptable approach could involve modeling this portfolio of assets. To the extent that these assets were insufficient to defease the ceded liabilities, the modeling would partially default to the approach discussed for a standard coinsurance treaty. To the extent these assets exceeded what might be needed to defease the ceded liabilities (perhaps an over collateralization requirement in a trust), the inclusion of such assets shall be limited.

Guidance Note: Section 3.5.2 in ASOP No. 52, *Principle-Based Reserves for Life Products under the NAIC Valuation Manual*, provides possible methods for constructing a hypothetical pre-reinsurance asset portfolio, if necessary, for purposes of the pre-reinsurance reserve calculation.

- c. An assuming company shall use assumptions to project cash flows to and from ceding companies that reflect the assuming company's experience for the business segment to which the reinsured policies belong and reflect the terms of the reinsurance agreement.
- d. The company shall assume that the counterparties to a reinsurance agreement are knowledgeable about the contingencies involved in the agreement and likely to exercise the terms of the agreement to their respective advantage, taking into account the context of the agreement in the entire economic relationship between the parties. In setting assumptions for the NGE in reinsurance cash flows, the company shall include, but not be limited to, the following:
 - i. The usual and customary practices associated with such agreements.
 - ii. Past practices by the parties concerning the changing of terms, in an economic environment similar to that projected.
 - iii. Any limits placed upon either party's ability to exercise contractual options in the reinsurance agreement.
 - iv. The ability of the direct-writing company to modify the terms of its policies in response to changes in reinsurance terms.
 - v. Actions that might be taken by a party if the counterparty is in financial difficulty.

- e. To the extent that a single deterministic valuation assumption for risk factors associated with certain provisions of reinsurance agreements will not adequately capture the risk, the company shall do one of the following:
 - i. Stochastically model the risk factors directly in the cash-flow model when calculating the SR.
 - ii. Perform a separate stochastic analysis outside the cash-flow model to quantify the impact on reinsurance cash flows to and from the company. The company shall use the results of this analysis to adjust prudent estimate assumptions or to determine an amount to adjust the SR to adequately make provision for the risks of the reinsurance features.

3. Reserve Determined Upon Passing the Exclusion Test

If a company passes the stochastic exclusion test and elects to use a methodology pursuant to applicable Sections VM-A, VM-C, VM-M, and VM-V, as allowed in Section 3.G, it is important to note that the methodology produces reserves on a pre-reinsurance ceded basis. Therefore, the reserve must be adjusted for any reinsurance ceded accordingly.

It should be noted that the pre-reinsurance-ceDED and post-reinsurance-ceDED reserves may result in different outcomes for the stochastic exclusion test or single scenario test. In particular, it is possible that the pre-reinsurance-ceDED reserves would pass the relevant exclusion test (and allow the use of VM-A, VM-C, VM-M, and VM-V or a DR, respectively) while the post-reinsurance-ceDED reserves might not, or vice versa.

4. Additional Standard Projection Amount

Where reinsurance is ceded, the additional standard projection amount shall be calculated as described in Section 6 to reflect the reinsurance costs and reinsurance recoveries under the reinsurance treaties. The additional standard projection amount shall also be calculated pre-reinsurance ceded using the methods described in Section 6 but ignoring the effects of the reinsurance ceded.

Section 6: Requirements for the Standard Projection Amount

A. Overview

1. Determining the Additional Standard Projection Amount
 - a. The additional standard projection amount shall be the larger of zero and an amount determined in aggregate for all contracts within each reserving category falling under the scope of these requirements, excluding those contracts that pass the exclusion tests in Section 7.A and to which VM-A, VM-C, VM-M and VM-V are applied, by calculating the Prescribed Projections Amount under the CTE with Prescribed Assumptions (CTEPA) method. The company shall assess the impact of aggregation on the additional standard projection amount. For groups of contracts that calculate a DR pursuant to the requirements in Section 7.E, an additional standard projection amount shall also be calculated.

Guidance Note: The following outlines one method that may be used to assess the impact of aggregation. If a company plans to use a different method, they should discuss that method with their domiciliary commissioner.

The benefit of aggregation is determined using the following steps, using the same scenario used for the cumulative decrement analysis, and using prescribed assumptions and discount rates:

1. Calculate the present value of each contract's accumulated deficiency up through the duration of the aggregate GPVAD. When determining the contract accumulated deficiency: (a) contract starting assets equal CSV; (b) contract level starting assets include both separate account and general account assets, and exclude any hedge assets; (c) discount rate for the PVAD is the NAER; and (d) for a contract that terminates prior to the duration of the GPVAD, there will no longer be liability cash flows, but assets (positive or negative) continue to accumulate.
2. The impact of aggregation is the sum of the absolute value of the negative amounts from step 1 above.

Apply steps 1 and 2 above to each model point.

- b. The additional standard projection amount shall be calculated based on the scenario reserves, as discussed in Section 4.B, with certain prescribed assumptions replacing the company prudent estimate assumptions. As is the case in the projection of a scenario in the calculation of the DR and/or SR, the scenario reserves used to calculate the additional standard projection amount are based on an analysis of asset and liability cash flows produced along certain equity and interest rate scenario paths.

B. Additional Standard Projection Amount

1. General

Where not inconsistent with the guidance given here, the process and methods used to determine the additional standard projection amount under the CTEPA method shall be the same as required in the calculation of the DR and SR as described in Section 3.D and Section 3.E of these requirements. Regarding groups of contracts for which a DR is calculated, any references to CTE in this section (e.g., CTE70 (adjusted) and CTE70 (best efforts)) shall instead follow a scenario reserve calculation, pursuant to the requirements in Section 7.E.2. Any additional

assumptions needed to determine the additional standard projection amount shall be explicitly documented.

2. The company shall determine the Prescribed Projections Amount by following the CTEPA Method below.
3. For determining the CTE70 (adjusted), the assumptions for hedging programs with hedge payoffs that offset interest credits associated with indexed interest strategies (indexed interest credits) shall be the same as those used for the CTE70 (best efforts), following the requirements in Section 4.A.4.b.
4. Calculation Methodology
 - a. CTEPA Method:
 - i. If the company used a model office to calculate the CTE Amount (or single scenario reserve for the DR), then the company may continue to use the same model office, or one that is no less granular than the model office that was used to determine the CTE Amount (or single scenario reserve for the DR), provided that the company shall maintain consistency in the grouping method used from one valuation to the next.
 - ii. Calculate the Prescribed Projections Amount as the CTE70 (adjusted) using the same method as that outlined in Section 9.C (which is the same as the SR following Section 4.A.4.b for a company that does not have a future hedging strategy supporting the contracts other than those supporting index interest credits) but substituting the assumptions prescribed by Section 6.C. For the DR, the single scenario reserve following Section 7.E shall be calculated instead of the CTE70, but substituting with the assumptions prescribed by Section 6.C. The calculation of this Prescribed Projections Amount also requires that the scenario reserve for any given scenario be equal to or in excess of the cash surrender value in aggregate on the valuation date for the group of contracts modeled in the projection.
 - b. Once the Prescribed Projections Amount is determined by the method above, then the company shall reduce the Prescribed Projections Amount by the CTE70 (adjusted). For a group of contracts that calculate a DR pursuant to the requirements in Section 7.E, the Prescribed Projections Amount shall be reduced by the DR. The difference shall be referred to as the Unbuffered Additional Standard Projection Amount.
 - c. For the SR, reduce the Unbuffered Additional Standard Projection Amount by an amount equal to the difference between (i) and (ii), where (i) and (ii) are calculated in the following manner:
 - i. For the SR, calculate the Unfloored CTE70 (adjusted), using the same procedure as CTE70 (adjusted) but without requiring that the scenario reserve for any scenario be no less than the cash surrender value in aggregate on the valuation date.
 - ii. For the SR, calculate the Unfloored CTE65 (adjusted), which is calculated in the same way as Unfloored CTE70 (adjusted) but

averaging the 35% (instead of 30%) largest values.

- d. For the DR, a company can elect to have no reduction to the value calculated in section 6.B.4.b, or can elect to calculate a reduction to the unbuffered amount as described in section 6.B.4.c with the following adjustments:
 - i. The reduction to the unbuffered additional standard projection amount is calculated as a % equal to the difference of 6.B.4.c.i and 6.B.4.c.ii divided by the unfloored CTE70 (adjusted).
 - ii. The calculation must be on a valuation date no earlier than December 31 on the prior calendar year
 - iii. The unbuffered additional standard projection amount shall be reduced by the value calculated in i) multiplied by the DR.
- e. The additional standard projection amount shall subsequently be the larger of the quantity calculated in Section 6.B.4.c and zero for contracts that calculate the SR. The additional standard projection amount for contracts that calculate a DR shall subsequently be the larger of the quantity calculated in Section 6.B.4.d and zero.

5. Modeled Reinsurance

Cash flows associated with reinsurance shall be projected in the same manner as that used in the calculation of the DR and SR as described in Section 3.

6. Modeled Hedges

Cash flows associated with hedging shall be projected in the same manner as that used in the calculation of the CTE70 (adjusted) as discussed in Section 9.C or Section 4.A.4.b for a company without a future hedging strategy supporting the contracts other than a future hedging strategy with hedge payoffs that offset interest credits associated with indexed interest strategies.

C. Prescribed Assumptions

- 1. Assignment of Guaranteed Benefit Type
 - a. Assumptions shall be set for each contract in accordance with the contract's guaranteed benefit type, where a number of common benefit types are specifically defined in VM-01 (e.g., GMDB, GMWB, etc.).
 - b. Certain guaranteed living benefit products have features that can be described by multiple types of guaranteed benefits. If the guaranteed living benefit can be described by more than one of the definitions in VM-01 for the purpose of determining the additional standard projection amount, the company shall select the guaranteed benefit type that it deems best applicable and shall be consistent in its selection from one valuation to the next. For instance, if a guaranteed living benefit has both lifetime GMWB and non-lifetime GMWB features and the company determines that the lifetime GMWB is the most prominent component; assumptions for all contracts with such a guaranteed living benefit shall be set as if the guaranteed living benefit were only a lifetime GMWB and did not contain any of the non-lifetime GMWB features. If the

company determines that the non-lifetime GMWB is the most prominent component; assumptions for all contracts with such a guaranteed living benefit shall be set as if the guaranteed living benefit were only a non-lifetime GMWB and did not contain any of the lifetime GMWB features.

- c. Certain Group Annuity or Pension Risk Transfer contracts may contain multiple types of guaranteed benefits. For example, a Pension Risk Transfer contract may provide guaranteed benefits comprised of a combination of payout annuities, account value-based benefits, life-contingent lump sum payouts, and/or death benefits if the original pension plan that purchased the contract provided a range of benefit types to its participants. For such contracts, the company shall use the corresponding prescribed Group Annuity or Pension Risk Transfer assumptions consistently for all guaranteed benefits valued under the contract regardless of the nature of the benefits. For Group Annuity or Pension Risk Transfer contracts containing multiple types of guaranteed benefits, a description of the various guaranteed benefits included within the contracts and their prevalence and materiality should be disclosed in the PBR Actuarial Report.
- d. If a contract cannot be classified into any categories within a given assumption, the company shall determine the defined benefit type with the most similar benefits and risk profile as the company's benefit and utilize the assumption prescribed for this benefit.

2. Maintenance Expenses

Maintenance expense assumptions shall be determined as the sum of (a) plus (b) if the company is responsible for the administration or (c) if the company is not responsible for the administration of the contract:

- a. Each contract for which the company is responsible for administration incurs an annual expense equal to the Base Maintenance Expense Assumption shown in the table below for each product type multiplied by $[1.025]^{(valuation year - 2015)}$ in the first projection year, and increased by an assumed annual inflation rate of [2.5%] for subsequent projection years.

Table 6.1: Base Maintenance Expense Assumptions

Contract Type	Base Maintenance Expense Assumption
Individual contracts or certificates in a group contract in the Payout Annuity Reserving Category	\$50
Fixed Indexed Annuities and other contracts in the Accumulation Reserving Category with guaranteed living benefits	\$100
All other individual contracts or certificates in a group contract, including contracts in the Accumulation Reserving Category with no guaranteed living benefits	\$75

- b. Seven basis points of the projected account value for each year in the projection. For contracts without an account value (such as those within the Payout Annuity Reserving Category), the seven basis points shall be applied to the present value of benefits using the mortality assumption in Section 6.C.8 and the discount rate in Section 13.B.

- c. Each contract for which the company is not responsible for administration (e.g., if the contract were assumed by the company in a reinsurance transaction in which only the risks associated with a guaranteed benefit rider were transferred) incurs an annual expense equal to \$35 multiplied by $[1.025]^{(valuation\ year - 2015)}$ in the first projection year, increased by an assumed annual inflation rate of [2.5%] for subsequent projection years.
3. Guarantee Actuarial Present Value

The Guarantee Actuarial Present Value (GAPV) is used in the determination of the full surrender rates (Section 6.C.5) and other voluntary contract terminations (Section 6.C.10). The GAPV represents the integrated actuarial present value of the lump sum or income payments associated with all guaranteed living benefits, including account value, within the contract, as well as death benefits associated with GMDBs. For the purpose of calculating the GAPV, such payments shall include the portion that is paid out of the contract holder's Account Value. Regarding contracts for which there is no account value or surrender benefit, such as some contracts within the Payout Annuity Reserving Category and Longevity Reinsurance Reserving Category, the GAPV requirements are not applicable.

The calculation of an integrated benefit, for a future projection period can be expressed as:

$$\text{t}p_{x+t} * \text{Living Benefit (survival to receive benefit at time t and associated amount)} + \text{t}p_{x+t} * \text{t}q_{x+t} * \text{Death Benefit (then current probability of death multiplied by any death benefit)}$$

The GAPV shall be calculated in the following manner:

- a. The GAPV shall be determined by setting the guaranteed benefit exercise timing in a prudent matter, such that the policyholder realizes the value and broader efficiency of the product (i.e., elect immediate, defer until a significant deferral credit or attained age band break, etc.). Note that it is generally prudent to assume immediate election, unless there are other product feature considerations that make immediate election unavailable or significantly less valuable than waiting for a preset period of time
- b. Once a GMWB is exercised, the contract holder shall be assumed to withdraw in each subsequent contract year an amount equal to no less than the initial percentage taken of the GMWB's guaranteed maximum annual withdrawal amount in that contract year (and 100% when the account value is depleted).
- c. If account value growth is required to determine projected benefits or product features, then the account value growth shall either be assumed to be the current fixed index credited interest rate or the current option budget, by strategy, reduced by fees chargeable to the account value.
- d. For a GMDB that terminates at a certain age or in a certain contract year, the GAPV shall be calculated as if the GMDB does not terminate. Benefit features such as guaranteed growth in the GMDB benefit basis may be calculated so that no additional benefit basis growth occurs after the GMDB termination age or date defined in the contract.
- e. The mortality assumption shall follow the mortality assumption in Section 6.C.8. The discount rate used shall be the 10-year Treasury Department bond rate on the valuation date of the financial report that is being developed, unless otherwise specified in a subsequent subsection of Section 6.C.3.

4. Partial Withdrawals

Partial withdrawals required contractually or previously elected (e.g., a contract operating under an automatic withdrawal provision, or that has voluntarily enrolled in an automatic withdrawal program, on the valuation date) are to be deducted from the Account Value in each projection interval consistent with the projection frequency used, as described in Section 4.F, and according to the terms of the contract. However, if a GMWB contract's automatic withdrawals results in partial withdrawal amounts in excess of the GMWB's guaranteed maximum annual withdrawal amount, such automatic withdrawals shall be revised such that they equal the GMWB's guaranteed maximum annual withdrawal amount. However, for tax qualified contracts with ages greater than or equal to the federal required minimum distribution (RMD) age, if the prescribed withdrawal amount is below the RMD amount, the withdrawal amount may be reset to the RMD amount.

Guidance Note: Companies are expected to model withdrawal amounts consistent with the RMD amount where applicable and where practically feasible; however, it is understood that this level of modeling sophistication may not be available for all companies.

For any contract not on an automatic withdrawal provision as described in the preceding paragraph, depending on the guaranteed benefit type, other partial withdrawals shall be projected as follows but shall not exceed the free partial withdrawal amount above which surrender charges are incurred and may be floored at the RMD amount for tax qualified contracts with ages greater than or equal to the federal RMD age:

- a. For contracts in the Accumulation Reserving Category, the partial withdrawal amount each year shall equal the following percentages of account value, based on the contract holder's attained age:

Table 6.2: Partial Withdrawals for Accumulation Reserving Category Contracts – Qualified

Attained Age	Contracts without GLBs	Contracts with GLBs prior to exercising
59 and under	1.65%	0.95%
60 – 64	2.10%	1.15%
65 – 69	2.35%	1.40%
70 – 74	3.95%	2.70%
75 – 79	4.80%	4.30%
80 and over	6.30%	5.80%

Table 6.3: Partial Withdrawals for Accumulation Reserving Category Contracts – Non-Qualified

Attained Age	Contracts without GLBs	Contracts with GLBs prior to exercising
59 and under	1.60%	1.15%
60 – 64	1.60%	1.15%
65 – 69	1.60%	1.15%
70 – 74	1.60%	1.65%
75 – 79	1.60%	1.65%
80 and over	1.60%	1.65%

- b. For contracts in the Accumulation Reserving Category with a guaranteed living benefit and an account value of zero, the partial withdrawal amount shall be the guaranteed maximum annual withdrawal amount.
- c. For contracts in the Accumulation Reserving Category with a guaranteed living benefit, partial withdrawals shall be projected to commence pursuant to the prudent estimate assumption of the company, with additional requirements as defined in subsections i and ii below. Once guaranteed living benefit withdrawals are projected to commence, the partial withdrawal amount shall be, for a lifetime guarantee, 100% of the guaranteed maximum annual withdrawal amount each year until the contract account value reaches zero, or for a non-lifetime guarantee, 70% of the guaranteed maximum annual withdrawal amount each year until the contract account value reaches zero.
 - i. 100% of qualified contracts must begin withdrawals at the earlier of attained age 80 or contract year 15, and
 - ii. At least 95% of non-qualified contracts must begin withdrawals at the earlier of attained age 85 or contract year 20.

Guidance Note: This requirement applies at the contract level and is a floor for total utilization. For example, say the company prudent estimate assumption for utilization is 50% at contract year 10 and 50% at contract year 15, for both qualified and non-qualified contracts. Assume the company has 3 groups of contracts:

- 1) a group of qualified contracts with issue age of 60,
- 2) a group of qualified contracts with issue age of 70, and
- 3) a group of non-qualified contracts with issue age of 75.

For purposes of the additional standard projection amount calculation, the first group would begin withdrawals at the prudent estimate (i.e., 50% at age 70, 50% at age 75), the second group would have 100% begin withdrawals at age 80 instead of the prudent estimate (i.e., 50% at age 80, 50% at age 85), and the third group would have 95% begin withdrawals at age 85 and 5% begin withdrawals at age 90 instead of the prudent estimate (i.e., 50% at age 85, 50% at age 90).

- d. For contracts in the Accumulation Reserving Category with a guaranteed living benefit and, in the contract year immediately preceding the valuation date, withdrew a non-zero amount not in excess of the guaranteed living benefit's guaranteed maximum annual withdrawal amount, the partial withdrawal amount shall be:
 - i. for a lifetime guarantee, 100% of the guaranteed maximum annual withdrawal amount each year until the contract account value reaches zero, or
 - ii. for a non-lifetime guarantee, 70% of the guaranteed maximum annual withdrawal amount each year until the contract account value reaches zero.
- e. There may be instances where the company has certain data limitations, for example, with respect to contracts that are not enrolled in an automatic withdrawal program but have exercised a non-excess withdrawal in the contract year immediately preceding the valuation date. The company may employ an appropriate proxy method if it does not result in a material understatement of the reserve.
- f. For contracts that do not offer withdrawal benefits, such as some contracts within the Payout Annuity Reserving Category and Longevity Reinsurance Reserving Category, this section is not applicable.

5. Full Surrenders

For contracts that offer surrender benefits, base lapse and full surrender rates shall be dynamically adjusted upward (or downward) when the actual credited rate is below (or above) the competitor rate. For contracts with a guaranteed living benefit, base lapse and full surrender rates shall be further adjusted based on the ITM of the rider value. The following formula shall be used:

$$\text{Total Lapse} = (\text{Base Lapse} \times \text{GMIR Factor} + \text{Rate Factor} \times \text{MVA Factor}) \times \text{ITM Factor}$$

where:

ITM Factor

$\text{ITM Factor} = (0.75 \div \text{ITM})^2$	if $\text{ITM} < 0.75$ and $\text{AV} \neq 0$
$\text{ITM Factor} = 1$	if $0.75 \leq \text{ITM} \leq 1.25$ and $\text{AV} \neq 0$
$\text{ITM Factor} = (1.25 \div \text{ITM})^2$	if $\text{ITM} > 1.25$ and $\text{AV} \neq 0$
$\text{ITM Factor} = 0$	if $\text{AV} = 0$
$\text{ITM} = \text{GAPV} \div \text{Account Value}$	

Guidance Note: $\text{ITM} = 1$ for contracts in the Accumulation Reserving Category with no guaranteed living benefits or guaranteed death benefits.

Rate Factor

$$\text{Rate Factor} = \text{Market Factor} \times \text{Max}(0, 1 - 5 \times (I\text{-CSV}/AV))$$
MVA Factor

MVA Factor = 0 when MVA is in effect; 1 when MVA is not in effect

GMIR Factor

For indexed annuities:

GMIR Factor = 1.00

For fixed annuities:

<i>GMIR Factor</i> = 1.25	if GMIR \leq 1.0%
<i>GMIR Factor</i> = 1.00	if 1.0% $<$ GMIR \leq 2.5%
<i>GMIR Factor</i> = 0.70	if GMIR $>$ 2.5%

Market Factor

$$\text{Market Factor} = -1.25 \times (CR - MR)^X \quad \text{if } CR \geq MR$$

$$\text{Market Factor} = 0 \quad \text{if } MR > CR \geq (MR - BF)$$

$$\text{Market Factor} = 1.25 \times (MR - BF - CR)^X \quad \text{if } CR < (MR - BF)$$

X = 2.0 during Surrender Charge Period, 2.5 at Shock, and 2.5 thereafter

Minimum and Maximum Lapse (not applicable if AV = 0)

Minimum Lapse = 0.5%

Maximum Lapse = 90%

Crediting Rate (CR)

For indexed annuities:

CR = the options budget (or value of the options supporting the index crediting strategy, as appropriate), at the time of the projection

For fixed annuities:

CR = the crediting rate, at the time of the projection

Market Rate (MR)

MR = the market competitor rate at the time of the projection

For indexed annuities and fixed annuities with Interest Guarantee Period $<$ 2 Years:

MR = Max (3-month Treasury rate, 5-year Treasury rate plus 50% A / 50% AA spread) minus Pricing Spread

For fixed annuities with Interest Guarantee Period \geq 2 Years:

MR = N-year Treasury rate plus 50% A / 50% AA spread minus Pricing Spread

N = 5-year Treasury rate for 2 years \leq Interest Guarantee Period $<$ 5 years

N = 7-year Treasury rate for 5 years \leq Interest Guarantee Period $<$ 7 years

N = 10-year Treasury rate for Interest Guarantee Period \geq 7 years

Pricing Spread = 0% (since already reflected in selection of credit spread)

Buffer Factor (BF)

BF = a buffer factor where dynamic lapses do not occur, 50bps

Base Lapse

Base Lapse = Determined using the following tables:

Table 6.4: Base Lapse Rates for Indexed Annuities with no Guaranteed Living Benefits

Years Before or After Surrender Charge Expiration	Attained Age			
	Before 60	60 to 69	70 to 79	80 and above
5 yrs or more after expiry	6.5%	7.0%	6.0%	5.0%
4 yrs after expiry	8.0%	8.5%	6.5%	5.0%
3 yrs after expiry	8.5%	9.5%	7.0%	5.5%
2 yrs after expiry	11.0%	12.0%	9.0%	7.0%
1 yr after expiry	15.0%	17.5%	13.5%	9.0%
Upon expiry	33.5%	41.5%	37.0%	23.5%
1 yr to expiry	4.5%	3.5%	4.0%	4.0%
2 yrs to expiry	4.0%	3.5%	3.0%	3.0%
3 yrs to expiry	2.5%	2.0%	2.0%	2.0%
4 yrs to expiry	3.0%	2.5%	2.5%	2.5%
5 yrs or more to expiry	2.0%	2.5%	2.0%	1.5%

Table 6.5: Base Lapse Rates for Fixed Annuities with no Guaranteed Living Benefits

Years Before or After Surrender Charge (SC) Expiration	Interest Guarantee Period (IGP)		
	In Years where IGP <= 1 Year*	In Years where IGP > 1 Year, and not in Year of IGP Expiry	In Year of an IGP Expiry after IGP > 1 Year
3 yrs or more after expiry	3.0%	2.0%	55.0%
2 yrs after expiry	7.5%	2.0%	65.0%
1 yr after expiry	10.0%	2.0%	75.0%
Upon expiry	25.0%	6.0%	75.0%
1 yr to expiry	2.5%	1.0%	70.0%
2 yrs to expiry	2.5%	1.0%	70.0%
3 yrs or more to expiry	2.5%	1.0%	70.0%

* includes floating rate structures

Guidance Note: Examples of how to apply the table above:

Example 1: For a contract with an initial 3-year IGP and 3-year SC period, then renewing into 1-year IGP with no SC, the base lapse rates in contract years 1 to 7 would be 1%, 1%, 1%, 75%, 10%, 7.5%, 3%.

Example 2: For a contract with an initial 3-year IGP and 3-year SC period, then renewing into another 3-year IGP with 3-year SC period, the base lapse rates in contract years 1 to 7 would be 1%, 1%, 1%, 75%, 1%, 1%, 75%.

Example 3: For a contract with an initial 1-year IGP and 3-year SC period, then renewing into a 2-year IGP with no SC, the base lapse rates in contract years 1 to 6 would be 2.5%, 2.5%, 2.5%, 25%, 1%, 65%.

Table 6.6: Base Lapse Rates for Indexed Annuities and Fixed Annuities with Guaranteed Living Benefits

Years Before or After Surrender Charge Expiration	Attained Age			
	Before 60	60 to 69	70 to 79	80 and above
5 yrs or more after expiry	11.5%	6.5%	4.5%	4.0%
4 yrs after expiry	11.5%	6.5%	4.5%	4.0%
3 yrs after expiry	11.5%	6.5%	4.5%	4.0%
2 yrs after expiry	11.5%	6.5%	4.5%	4.0%
1 yr after expiry	11.5%	6.5%	4.5%	4.0%
Upon expiry	18.5%	14.0%	11.0%	8.5%
1 yr to expiry	7.0%	4.5%	4.5%	3.5%
2 yrs to expiry	3.0%	2.5%	2.0%	2.5%
3 yrs to expiry	2.5%	1.5%	2.0%	2.5%
4 yrs to expiry	2.0%	1.5%	1.5%	2.0%
5 yrs or more to expiry	2.0%	1.5%	1.5%	1.5%

Any lapse skew applied should be consistent with the company's best estimate.

For contracts in which there is no account value or surrender benefit, such as some contracts within the Payout Annuity Reserving Category and Longevity Reinsurance Reserving Category, this section is not applicable.

6. Annuitizations

- a. The annuitization rate for contracts shall be 0% at all projection intervals.

7. Index Transfers and Future Deposits

- a. No transfers between fixed and index strategies or accounts shall be assumed in the projection unless required by the contract (e.g., contractual rights given to the insurer to implement a contractually specified portfolio insurance management strategy). When transfers must be modeled, to the extent not inconsistent with contract language, the allocation of transfers to indices, accounts, or funds must be in proportion to the contract's current allocation to funds.
- b. No future deposits to account value shall be assumed unless required by the terms of the contract, in which case they must be modeled. When future deposits must be modeled, to the extent not inconsistent with contract language, the allocation of the deposit to funds must be in proportion to the contract's current allocation to such funds.

8. Mortality

The following mortality rates shall be used:

Guidance Note: The mortality rates provided are based on Age Nearest Birthday. If a company uses Age Last Birthday, the following formula should be used on the base mortality rate after the factor has been applied:

$$q_{(x)ALB} = [q_{(x)ANB} + (1 - q_{(x)ANB}) * q_{(x+1)ANB}] / (2 - q_{(x)ANB})$$

Fx factors represent adjustments to the 2012 IAM Basic Mortality Table brought up to the current period using Projection Scale G2, as defined in VM-M Section 1.J.1.c. Such

adjustments reflect emerging experience, including the impact of how historical mortality improvement has differed from the G2 scale. The G2 scale for use in projecting mortality improvement on a going forward basis has not changed.

- i. For Individual Annuity contracts within the Accumulation Reserving Category, the mortality rate for a contract holder with age x in year $(2012 + n)$ shall be calculated using the following formula, where q_x denotes mortality from the 2012 IAM Basic Mortality Table, as defined in VM-M Section 2.C, multiplied by the appropriate factor (F_x) from Table 6.7 and $G2_x$ denotes mortality improvement from Projection Scale G2, as defined in VM-M Section 1.J.1.c:

$$q_x^{2012+n} = q_x^{2012}(1 - G2_x)^n * F_x$$

Table 6.7: F_x for Individual Annuities in Accumulation Reserving Category

Attained Age (x)	For Contracts Without Guaranteed Living Benefits		For Contracts With Guaranteed Living Benefits	
	Female	Male	Female	Male
<=50	150.0%	120.0%	125.0%	105.0%
51	150.0%	120.0%	125.0%	105.0%
52	150.0%	120.0%	125.0%	105.0%
53	150.0%	118.0%	125.0%	101.6%
54	150.0%	116.0%	125.0%	98.2%
55	150.0%	114.0%	125.0%	94.8%
56	150.0%	112.0%	125.0%	91.4%
57	150.0%	110.0%	125.0%	88.0%
58	144.0%	107.0%	119.0%	86.0%
59	138.0%	104.0%	113.0%	84.0%
60	132.0%	101.0%	107.0%	82.0%
61	126.0%	98.0%	101.0%	80.0%
62	120.0%	95.0%	95.0%	78.0%
63	117.6%	97.0%	94.0%	80.0%
64	115.2%	99.0%	93.0%	82.0%
65	112.8%	101.0%	92.0%	84.0%
66	110.4%	103.0%	91.0%	86.0%
67	108.0%	105.0%	90.0%	88.0%
68	110.0%	105.6%	92.6%	89.0%
69	112.0%	106.2%	95.2%	90.0%

Attained Age (x)	For Contracts Without Guaranteed Living Benefits		For Contracts With Guaranteed Living Benefits	
	Female	Male	Female	Male
70	114.0%	106.8%	97.8%	91.0%
71	116.0%	107.4%	100.4%	92.0%
72	118.0%	108.0%	103.0%	93.0%
73	119.4%	108.0%	104.4%	94.0%
74	120.8%	108.0%	105.8%	95.0%
75	122.2%	108.0%	107.2%	96.0%
76	123.6%	108.0%	108.6%	97.0%
77	125.0%	108.0%	110.0%	98.0%
78	123.6%	108.0%	110.0%	99.0%
79	122.2%	108.0%	110.0%	100.0%
80	120.8%	108.0%	110.0%	101.0%
81	119.4%	108.0%	110.0%	102.0%
82	118.0%	108.0%	110.0%	103.0%
83	116.4%	108.4%	110.0%	104.4%
84	114.8%	108.8%	110.0%	105.8%
85	113.2%	109.2%	110.0%	107.2%
86	111.6%	109.6%	110.0%	108.6%
87	110.0%	110.0%	110.0%	110.0%
88	109.6%	110.0%	109.6%	110.0%
89	109.2%	110.0%	109.2%	110.0%
90	108.8%	110.0%	108.8%	110.0%
91	108.4%	110.0%	108.4%	110.0%
92	108.0%	110.0%	108.0%	110.0%
93	107.8%	110.0%	107.8%	110.0%
94	107.6%	110.0%	107.6%	110.0%
95	107.4%	110.0%	107.4%	110.0%
96	107.2%	110.0%	107.2%	110.0%
97	107.0%	110.0%	107.0%	110.0%
98	106.2%	109.0%	106.2%	109.0%
99	105.4%	108.0%	105.4%	108.0%

Attained Age (x)	For Contracts Without Guaranteed Living Benefits		For Contracts With Guaranteed Living Benefits	
	Female	Male	Female	Male
100	104.6%	107.0%	104.6%	107.0%
101	103.8%	106.0%	103.8%	106.0%
102	103.0%	105.0%	103.0%	105.0%
103	102.0%	103.3%	102.0%	103.3%
104	101.0%	101.7%	101.0%	101.7%
>=105	100.0%	100.0%	100.0%	100.0%

- ii. For Individual Annuity contracts within the Payout Annuity Reserving Category other than Structured Settlement Contracts, the mortality rate for a contract holder age x in year (2012 + n) shall be calculated using the following formula, where q_x denotes mortality from the 2012 IAM Basic Mortality Table, as defined in VM-M Section 2.C, multiplied by the appropriate factor (F_x) from Table 6.8 and $G2_x$ denotes mortality improvement from Projection Scale G2, as defined in VM-M Section 1.J.1.c:

$$q_x^{2012+n} = q_x^{2012} (1 - G2_x)^n * F_x$$

Table 6.8: Fx for Individual Annuities in Payout Annuity Reserving Category

Attained Age (x)	Female	Male
<=50	125.0%	100.0%
51	125.0%	100.0%
52	125.0%	100.0%
53	125.0%	100.0%
54	125.0%	100.0%
55	125.0%	100.0%
56	125.0%	100.0%
57	125.0%	100.0%
58	120.6%	99.0%
59	116.2%	98.0%
60	111.8%	97.0%
61	107.4%	96.0%
62	103.0%	95.0%
63	101.0%	95.4%
64	99.0%	95.8%
65	97.0%	96.2%
66	95.0%	96.6%
67	93.0%	97.0%
68	94.4%	98.6%
69	95.8%	100.2%
70	97.2%	101.8%
71	98.6%	103.4%
72	100.0%	105.0%
73	101.6%	107.0%
74	103.2%	109.0%
75	104.8%	111.0%
76	106.4%	113.0%
77	108.0%	115.0%
78	108.0%	116.0%
79	108.0%	117.0%

Attained Age (x)	Female	Male
80	108.0%	118.0%
81	108.0%	119.0%
82	108.0%	120.0%
83	108.0%	120.0%
84	108.0%	120.0%
85	108.0%	120.0%
86	108.0%	120.0%
87	108.0%	120.0%
88	109.0%	119.0%
89	110.0%	118.0%
90	111.0%	117.0%
91	112.0%	116.0%
92	113.0%	115.0%
93	113.0%	115.0%
94	113.0%	115.0%
95	113.0%	115.0%
96	113.0%	115.0%
97	113.0%	115.0%
98	111.4%	113.0%
99	109.8%	111.0%
100	108.2%	109.0%
101	106.6%	107.0%
102	105.0%	105.0%
103	103.3%	103.3%
104	101.7%	101.7%
>=105	100.0%	100.0%

- iii. For Structured Settlement contracts for Standard lives, the mortality rate for an annuitant age x in year $(2011 + n)$ shall be calculated using the following formula, where q_x denotes mortality from the 1983 IAM Table ‘a’, as defined in VM-M Section 1.M, multiplied by the appropriate factor (F_x) from Table 6.9 and $G2_x$ denotes mortality improvement from Projection Scale G2, as defined in VM-M Section 1.J.1.c:

$$q_x^{2011+n} = q_x^{2011}(1 - G2_x)^n * F_x$$

Table 6.9: Fx for Structured Settlement Contracts with Standard lives

Attained Age	Structured Settlements – Standard Lives					
	Contract Years 1 to 5		Contract Years 6 to 10		Contract Years ≥11	
	Female	Male	Female	Male	Female	Male
≤2	300.0%	300.0%	300.0%	300.0%	365.0%	375.0%
3	306.0%	306.0%	307.0%	306.0%	374.0%	381.0%
4	312.0%	312.0%	314.0%	312.0%	383.0%	387.0%
5	318.0%	318.0%	321.0%	318.0%	392.0%	393.0%
6	324.0%	324.0%	328.0%	324.0%	401.0%	399.0%
7	330.0%	330.0%	335.0%	330.0%	410.0%	405.0%
8	335.0%	330.0%	339.0%	330.0%	415.0%	405.0%
9	340.0%	330.0%	343.0%	330.0%	420.0%	405.0%
10	345.0%	330.0%	347.0%	330.0%	425.0%	405.0%
11	350.0%	330.0%	351.0%	330.0%	430.0%	405.0%
12	355.0%	330.0%	355.0%	330.0%	435.0%	405.0%
13	355.0%	331.0%	355.0%	331.0%	435.0%	407.0%
14	355.0%	332.0%	355.0%	332.0%	435.0%	409.0%
15	355.0%	333.0%	355.0%	333.0%	435.0%	411.0%
16	355.0%	334.0%	355.0%	334.0%	435.0%	413.0%
17	355.0%	335.0%	355.0%	335.0%	435.0%	415.0%
18	354.0%	335.0%	354.0%	335.0%	434.0%	414.0%
19	353.0%	335.0%	353.0%	335.0%	433.0%	413.0%
20	352.0%	335.0%	352.0%	335.0%	432.0%	412.0%
21	351.0%	335.0%	351.0%	335.0%	431.0%	411.0%
22	350.0%	335.0%	350.0%	335.0%	430.0%	410.0%
23	350.0%	338.0%	350.0%	338.0%	429.0%	414.0%
24	350.0%	341.0%	350.0%	341.0%	428.0%	418.0%
25	350.0%	344.0%	350.0%	344.0%	427.0%	422.0%
26	350.0%	347.0%	350.0%	347.0%	426.0%	426.0%

Attained Age	Structured Settlements – Standard Lives					
	Contract Years 1 to 5		Contract Years 6 to 10		Contract Years ≥11	
	Female	Male	Female	Male	Female	Male
27	350.0%	350.0%	350.0%	350.0%	425.0%	430.0%
28	355.0%	358.0%	355.0%	358.0%	432.0%	440.0%
29	360.0%	366.0%	360.0%	366.0%	439.0%	450.0%
30	365.0%	374.0%	365.0%	374.0%	446.0%	460.0%
31	370.0%	382.0%	370.0%	382.0%	453.0%	470.0%
32	375.0%	390.0%	375.0%	390.0%	460.0%	480.0%
33	375.0%	392.0%	375.0%	392.0%	460.0%	482.0%
34	375.0%	394.0%	375.0%	394.0%	460.0%	484.0%
35	375.0%	396.0%	375.0%	396.0%	460.0%	486.0%
36	375.0%	398.0%	375.0%	398.0%	460.0%	488.0%
37	375.0%	400.0%	375.0%	400.0%	460.0%	490.0%
38	359.0%	387.0%	359.0%	387.0%	444.0%	478.0%
39	343.0%	374.0%	343.0%	374.0%	428.0%	466.0%
40	327.0%	361.0%	327.0%	361.0%	412.0%	454.0%
41	311.0%	348.0%	311.0%	348.0%	396.0%	442.0%
42	295.0%	335.0%	295.0%	335.0%	380.0%	430.0%
43	278.0%	312.0%	279.0%	312.0%	363.0%	404.0%
44	261.0%	289.0%	263.0%	289.0%	346.0%	378.0%
45	244.0%	266.0%	247.0%	266.0%	329.0%	352.0%
46	227.0%	243.0%	231.0%	243.0%	312.0%	326.0%
47	210.0%	220.0%	215.0%	220.0%	295.0%	300.0%
48	206.0%	213.0%	210.0%	213.0%	288.0%	291.0%
49	202.0%	206.0%	205.0%	206.0%	281.0%	282.0%
50	198.0%	199.0%	200.0%	199.0%	274.0%	273.0%
51	194.0%	192.0%	195.0%	192.0%	267.0%	264.0%
52	190.0%	185.0%	190.0%	185.0%	260.0%	255.0%
53	189.0%	185.0%	189.0%	185.0%	258.0%	254.0%
54	188.0%	185.0%	188.0%	185.0%	256.0%	253.0%
55	187.0%	185.0%	187.0%	185.0%	254.0%	252.0%
56	186.0%	185.0%	186.0%	185.0%	252.0%	251.0%
57	185.0%	185.0%	185.0%	185.0%	250.0%	250.0%
58	179.0%	180.0%	182.0%	183.0%	245.0%	246.0%
59	173.0%	175.0%	179.0%	181.0%	240.0%	242.0%
60	167.0%	170.0%	176.0%	179.0%	235.0%	238.0%
61	161.0%	165.0%	173.0%	177.0%	230.0%	234.0%

Attained Age	Structured Settlements – Standard Lives					
	Contract Years 1 to 5		Contract Years 6 to 10		Contract Years ≥11	
	Female	Male	Female	Male	Female	Male
62	155.0%	160.0%	170.0%	175.0%	225.0%	230.0%
63	149.0%	154.0%	166.0%	172.0%	218.0%	224.0%
64	143.0%	148.0%	162.0%	169.0%	211.0%	218.0%
65	137.0%	142.0%	158.0%	166.0%	204.0%	212.0%
66	131.0%	136.0%	154.0%	163.0%	197.0%	206.0%
67	125.0%	130.0%	150.0%	160.0%	190.0%	200.0%
68	123.0%	128.0%	149.0%	158.0%	184.0%	193.0%
69	121.0%	126.0%	148.0%	156.0%	178.0%	186.0%
70	119.0%	124.0%	147.0%	154.0%	172.0%	179.0%
71	117.0%	122.0%	146.0%	152.0%	166.0%	172.0%
72	115.0%	120.0%	145.0%	150.0%	160.0%	165.0%
73	114.0%	118.0%	143.0%	148.0%	156.0%	161.0%
74	113.0%	116.0%	141.0%	146.0%	152.0%	157.0%
75	112.0%	114.0%	139.0%	144.0%	148.0%	153.0%
76	111.0%	112.0%	137.0%	142.0%	144.0%	149.0%
77	110.0%	110.0%	135.0%	140.0%	140.0%	145.0%
78	110.0%	110.0%	133.0%	137.0%	137.0%	141.0%
79	110.0%	110.0%	131.0%	134.0%	134.0%	137.0%
80	110.0%	110.0%	129.0%	131.0%	131.0%	133.0%
81	110.0%	110.0%	127.0%	128.0%	128.0%	129.0%
82	110.0%	110.0%	125.0%	125.0%	125.0%	125.0%
83	110.0%	110.0%	123.0%	123.0%	123.0%	123.0%
84	110.0%	110.0%	121.0%	121.0%	121.0%	121.0%
85	110.0%	110.0%	119.0%	119.0%	119.0%	119.0%
86	110.0%	110.0%	117.0%	117.0%	117.0%	117.0%
87	110.0%	110.0%	115.0%	115.0%	115.0%	115.0%
88	110.0%	110.0%	114.0%	114.0%	114.0%	114.0%
89	110.0%	110.0%	113.0%	113.0%	113.0%	113.0%
90	110.0%	110.0%	112.0%	112.0%	112.0%	112.0%
91	110.0%	110.0%	111.0%	111.0%	111.0%	111.0%
92	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%
93	109.0%	109.0%	109.0%	109.0%	109.0%	109.0%
94	108.0%	108.0%	108.0%	108.0%	108.0%	108.0%
95	107.0%	107.0%	107.0%	107.0%	107.0%	107.0%
96	106.0%	106.0%	106.0%	106.0%	106.0%	106.0%

Attained Age	Structured Settlements – Standard Lives					
	Contract Years 1 to 5		Contract Years 6 to 10		Contract Years ≥11	
	Female	Male	Female	Male	Female	Male
97	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%
98	104.0%	104.0%	104.0%	104.0%	104.0%	104.0%
99	103.0%	103.0%	103.0%	103.0%	103.0%	103.0%
100	102.0%	102.0%	102.0%	102.0%	102.0%	102.0%
101	101.0%	101.0%	101.0%	101.0%	101.0%	101.0%
102	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
103	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
104	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
>=105	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Substandard lives shall use the mortality formula and terms described above for Standard lives, with such mortality reflecting the inclusion of the “Constant Extra Death” (CED) methodology described in Actuarial Guideline IX-A. The CED shall be applied prior to the application of multiplicative Fx factor. The factors for Substandard lives differ by the extent of the age rate-up, and are as follows in Tables 6.10 and 6.11:

Table 6.10: Fx for Structured Settlement Contracts for Substandard lives with age rate-ups of 1-20 years

Attained Age	Structured Settlements – Substandard Lives, Rate-Ups 1-20 Years							
	Contract Years 1 to 10		Contract Years 11 to 20		Contract Years 21 to 30		Contract Years ≥31	
	Female	Male	Female	Male	Female	Male	Female	Male
≤2	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%
3	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%
4	59.0%	59.0%	59.0%	59.0%	59.0%	59.0%	59.0%	59.0%
5	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%
6	63.0%	63.0%	63.0%	63.0%	63.0%	63.0%	63.0%	63.0%
7	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
8	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
9	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
10	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
11	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
12	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
13	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%

Attained Age	Structured Settlements – Substandard Lives, Rate-Ups 1-20 Years							
	Contract Years 1 to 10		Contract Years 11 to 20		Contract Years 21 to 30		Contract Years ≥31	
	Female	Male	Female	Male	Female	Male	Female	Male
14	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
15	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
16	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
17	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
18	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
19	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
20	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
21	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
22	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
23	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
24	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
25	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
26	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
27	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
28	66.0%	67.0%	66.0%	67.0%	66.0%	67.0%	66.0%	67.0%
29	67.0%	69.0%	67.0%	69.0%	67.0%	69.0%	67.0%	69.0%
30	68.0%	71.0%	68.0%	71.0%	68.0%	71.0%	68.0%	71.0%
31	69.0%	73.0%	69.0%	73.0%	69.0%	73.0%	69.0%	73.0%
32	70.0%	75.0%	70.0%	75.0%	70.0%	75.0%	70.0%	75.0%
33	71.0%	75.0%	71.0%	76.0%	72.0%	77.0%	72.0%	77.0%
34	72.0%	75.0%	72.0%	77.0%	74.0%	79.0%	74.0%	79.0%
35	73.0%	75.0%	73.0%	78.0%	76.0%	81.0%	76.0%	81.0%
36	74.0%	75.0%	74.0%	79.0%	78.0%	83.0%	78.0%	83.0%
37	75.0%	75.0%	75.0%	80.0%	80.0%	85.0%	80.0%	85.0%
38	75.0%	77.0%	81.0%	88.0%	90.0%	98.0%	93.0%	101.0%
39	75.0%	79.0%	87.0%	96.0%	100.0%	111.0%	106.0%	117.0%
40	75.0%	81.0%	93.0%	104.0%	110.0%	124.0%	119.0%	133.0%
41	75.0%	83.0%	99.0%	112.0%	120.0%	137.0%	132.0%	149.0%
42	75.0%	85.0%	105.0%	120.0%	130.0%	150.0%	145.0%	165.0%
43	75.0%	84.0%	107.0%	119.0%	134.0%	150.0%	149.0%	165.0%
44	75.0%	83.0%	109.0%	118.0%	138.0%	150.0%	153.0%	165.0%
45	75.0%	82.0%	111.0%	117.0%	142.0%	150.0%	157.0%	165.0%
46	75.0%	81.0%	113.0%	116.0%	146.0%	150.0%	161.0%	165.0%
47	75.0%	80.0%	115.0%	115.0%	150.0%	150.0%	165.0%	165.0%
48	76.0%	80.0%	116.0%	115.0%	150.0%	150.0%	166.0%	165.0%

Attained Age	Structured Settlements – Substandard Lives, Rate-Ups 1-20 Years							
	Contract Years 1 to 10		Contract Years 11 to 20		Contract Years 21 to 30		Contract Years ≥31	
	Female	Male	Female	Male	Female	Male	Female	Male
49	77.0%	80.0%	117.0%	115.0%	150.0%	150.0%	167.0%	165.0%
50	78.0%	80.0%	118.0%	115.0%	150.0%	150.0%	168.0%	165.0%
51	79.0%	80.0%	119.0%	115.0%	150.0%	150.0%	169.0%	165.0%
52	80.0%	80.0%	120.0%	115.0%	150.0%	150.0%	170.0%	165.0%
53	82.0%	82.0%	123.0%	119.0%	155.0%	154.0%	174.0%	170.0%
54	84.0%	84.0%	126.0%	123.0%	160.0%	158.0%	178.0%	175.0%
55	86.0%	86.0%	129.0%	127.0%	165.0%	162.0%	182.0%	180.0%
56	88.0%	88.0%	132.0%	131.0%	170.0%	166.0%	186.0%	185.0%
57	90.0%	90.0%	135.0%	135.0%	175.0%	170.0%	190.0%	190.0%
58	90.0%	91.0%	135.0%	136.0%	175.0%	172.0%	191.0%	192.0%
59	90.0%	92.0%	135.0%	137.0%	175.0%	174.0%	192.0%	194.0%
60	90.0%	93.0%	135.0%	138.0%	175.0%	176.0%	193.0%	196.0%
61	90.0%	94.0%	135.0%	139.0%	175.0%	178.0%	194.0%	198.0%
62	90.0%	95.0%	135.0%	140.0%	175.0%	180.0%	195.0%	200.0%
63	89.0%	94.0%	133.0%	138.0%	172.0%	178.0%	192.0%	198.0%
64	88.0%	93.0%	131.0%	136.0%	169.0%	176.0%	189.0%	196.0%
65	87.0%	92.0%	129.0%	134.0%	166.0%	174.0%	186.0%	194.0%
66	86.0%	91.0%	127.0%	132.0%	163.0%	172.0%	183.0%	192.0%
67	85.0%	90.0%	125.0%	130.0%	160.0%	170.0%	180.0%	190.0%
68	84.0%	89.0%	124.0%	129.0%	159.0%	168.0%	178.0%	188.0%
69	83.0%	88.0%	123.0%	128.0%	158.0%	166.0%	176.0%	186.0%
70	82.0%	87.0%	122.0%	127.0%	157.0%	164.0%	174.0%	184.0%
71	81.0%	86.0%	121.0%	126.0%	156.0%	162.0%	172.0%	182.0%
72	80.0%	85.0%	120.0%	125.0%	155.0%	160.0%	170.0%	180.0%
73	80.0%	85.0%	119.0%	124.0%	153.0%	158.0%	168.0%	177.0%
74	80.0%	85.0%	118.0%	123.0%	151.0%	156.0%	166.0%	174.0%
75	80.0%	85.0%	117.0%	122.0%	149.0%	154.0%	164.0%	171.0%
76	80.0%	85.0%	116.0%	121.0%	147.0%	152.0%	162.0%	168.0%
77	80.0%	85.0%	115.0%	120.0%	145.0%	150.0%	160.0%	165.0%
78	84.0%	88.0%	114.0%	118.0%	140.0%	144.0%	153.0%	157.0%
79	88.0%	91.0%	113.0%	116.0%	135.0%	138.0%	146.0%	149.0%
80	92.0%	94.0%	112.0%	114.0%	130.0%	132.0%	139.0%	141.0%
81	96.0%	97.0%	111.0%	112.0%	125.0%	126.0%	132.0%	133.0%
82	100.0%	100.0%	110.0%	110.0%	120.0%	120.0%	125.0%	125.0%
83	102.0%	102.0%	110.0%	110.0%	118.0%	118.0%	122.0%	122.0%

Attained Age	Structured Settlements – Substandard Lives, Rate-Ups 1-20 Years							
	Contract Years 1 to 10		Contract Years 11 to 20		Contract Years 21 to 30		Contract Years ≥31	
	Female	Male	Female	Male	Female	Male	Female	Male
84	104.0%	104.0%	110.0%	110.0%	116.0%	116.0%	119.0%	119.0%
85	106.0%	106.0%	110.0%	110.0%	114.0%	114.0%	116.0%	116.0%
86	108.0%	108.0%	110.0%	110.0%	112.0%	112.0%	113.0%	113.0%
87	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%
88	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%
89	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%
90	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%
91	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%
92	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%	110.0%
93	109.0%	109.0%	109.0%	109.0%	109.0%	109.0%	109.0%	109.0%
94	108.0%	108.0%	108.0%	108.0%	108.0%	108.0%	108.0%	108.0%
95	107.0%	107.0%	107.0%	107.0%	107.0%	107.0%	107.0%	107.0%
96	106.0%	106.0%	106.0%	106.0%	106.0%	106.0%	106.0%	106.0%
97	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%
98	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%
99	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%
100	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%
101	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%
102	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%	105.0%
103	103.3%	103.3%	103.3%	103.3%	103.3%	103.3%	103.3%	103.3%
104	101.7%	101.7%	101.7%	101.7%	101.7%	101.7%	101.7%	101.7%
>=105	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.11: Fx for Structured Settlement Contracts for Substandard lives with age rate-ups of ≥21 years

Attained Age	Structured Settlements – Substandard Lives, Rate-Ups ≥21 Years							
	Contract Years 1 to 10		Contract Years 11 to 20		Contract Years 21 to 30		Contract Years ≥31	
	Female	Male	Female	Male	Female	Male	Female	Male
≤2	55.0%	55.0%	55.0%	55.0%	70.0%	75.0%	70.0%	70.0%
3	57.0%	57.0%	57.0%	57.0%	72.0%	76.0%	72.0%	72.0%
4	59.0%	59.0%	59.0%	59.0%	74.0%	77.0%	74.0%	74.0%
5	61.0%	61.0%	61.0%	61.0%	76.0%	78.0%	76.0%	76.0%

Attained Age	Structured Settlements – Substandard Lives, Rate-Ups ≥21 Years							
	Contract Years 1 to 10		Contract Years 11 to 20		Contract Years 21 to 30		Contract Years ≥31	
	Female	Male	Female	Male	Female	Male	Female	Male
6	63.0%	63.0%	63.0%	63.0%	78.0%	79.0%	78.0%	78.0%
7	65.0%	65.0%	65.0%	65.0%	80.0%	80.0%	80.0%	80.0%
8	65.0%	65.0%	65.0%	65.0%	81.0%	80.0%	81.0%	80.0%
9	65.0%	65.0%	65.0%	65.0%	82.0%	80.0%	82.0%	80.0%
10	65.0%	65.0%	65.0%	65.0%	83.0%	80.0%	83.0%	80.0%
11	65.0%	65.0%	65.0%	65.0%	84.0%	80.0%	84.0%	80.0%
12	65.0%	65.0%	65.0%	65.0%	85.0%	80.0%	85.0%	80.0%
13	65.0%	65.0%	65.0%	65.0%	85.0%	80.0%	85.0%	80.0%
14	65.0%	65.0%	65.0%	65.0%	85.0%	80.0%	85.0%	80.0%
15	65.0%	65.0%	65.0%	65.0%	85.0%	80.0%	85.0%	80.0%
16	65.0%	65.0%	65.0%	65.0%	85.0%	80.0%	85.0%	80.0%
17	65.0%	65.0%	65.0%	65.0%	85.0%	80.0%	85.0%	80.0%
18	65.0%	65.0%	65.0%	65.0%	85.0%	80.0%	85.0%	80.0%
19	65.0%	65.0%	65.0%	65.0%	85.0%	80.0%	85.0%	80.0%
20	65.0%	65.0%	65.0%	65.0%	85.0%	80.0%	85.0%	80.0%
21	65.0%	65.0%	65.0%	65.0%	85.0%	80.0%	85.0%	80.0%
22	65.0%	65.0%	65.0%	65.0%	85.0%	80.0%	85.0%	80.0%
23	65.0%	65.0%	65.0%	65.0%	85.0%	81.0%	85.0%	81.0%
24	65.0%	65.0%	65.0%	65.0%	85.0%	82.0%	85.0%	82.0%
25	65.0%	65.0%	65.0%	65.0%	85.0%	83.0%	85.0%	83.0%
26	65.0%	65.0%	65.0%	65.0%	85.0%	84.0%	85.0%	84.0%
27	65.0%	65.0%	65.0%	65.0%	85.0%	85.0%	85.0%	85.0%
28	66.0%	67.0%	66.0%	67.0%	86.0%	87.0%	86.0%	87.0%
29	67.0%	69.0%	67.0%	69.0%	87.0%	89.0%	87.0%	89.0%
30	68.0%	71.0%	68.0%	71.0%	88.0%	91.0%	88.0%	91.0%
31	69.0%	73.0%	69.0%	73.0%	89.0%	93.0%	89.0%	93.0%
32	70.0%	75.0%	70.0%	75.0%	90.0%	95.0%	90.0%	95.0%
33	71.0%	76.0%	71.0%	76.0%	91.0%	96.0%	92.0%	97.0%
34	72.0%	77.0%	72.0%	77.0%	92.0%	97.0%	94.0%	99.0%
35	73.0%	78.0%	73.0%	78.0%	93.0%	98.0%	96.0%	101.0%
36	74.0%	79.0%	74.0%	79.0%	94.0%	99.0%	98.0%	103.0%
37	75.0%	80.0%	75.0%	80.0%	95.0%	100.0%	100.0%	105.0%
38	77.0%	83.0%	79.0%	85.0%	98.0%	105.0%	107.0%	115.0%
39	79.0%	86.0%	83.0%	90.0%	101.0%	110.0%	114.0%	125.0%
40	81.0%	89.0%	87.0%	95.0%	104.0%	115.0%	121.0%	135.0%

Attained Age	Structured Settlements – Substandard Lives, Rate-Ups ≥21 Years							
	Contract Years 1 to 10		Contract Years 11 to 20		Contract Years 21 to 30		Contract Years ≥31	
	Female	Male	Female	Male	Female	Male	Female	Male
41	83.0%	92.0%	91.0%	100.0%	107.0%	120.0%	128.0%	145.0%
42	85.0%	95.0%	95.0%	105.0%	110.0%	125.0%	135.0%	155.0%
43	85.0%	94.0%	96.0%	104.0%	111.0%	123.0%	137.0%	154.0%
44	85.0%	93.0%	97.0%	103.0%	112.0%	121.0%	139.0%	153.0%
45	85.0%	92.0%	98.0%	102.0%	113.0%	119.0%	141.0%	152.0%
46	85.0%	91.0%	99.0%	101.0%	114.0%	117.0%	143.0%	151.0%
47	85.0%	90.0%	100.0%	100.0%	115.0%	115.0%	145.0%	150.0%
48	86.0%	90.0%	100.0%	100.0%	116.0%	115.0%	146.0%	150.0%
49	87.0%	90.0%	100.0%	100.0%	117.0%	115.0%	147.0%	150.0%
50	88.0%	90.0%	100.0%	100.0%	118.0%	115.0%	148.0%	150.0%
51	89.0%	90.0%	100.0%	100.0%	119.0%	115.0%	149.0%	150.0%
52	90.0%	90.0%	100.0%	100.0%	120.0%	115.0%	150.0%	150.0%
53	92.0%	92.0%	103.0%	103.0%	123.0%	119.0%	155.0%	154.0%
54	94.0%	94.0%	106.0%	106.0%	126.0%	123.0%	160.0%	158.0%
55	96.0%	96.0%	109.0%	109.0%	129.0%	127.0%	165.0%	162.0%
56	98.0%	98.0%	112.0%	112.0%	132.0%	131.0%	170.0%	166.0%
57	100.0%	100.0%	115.0%	115.0%	135.0%	135.0%	175.0%	170.0%
58	101.0%	101.0%	115.0%	116.0%	135.0%	136.0%	175.0%	172.0%
59	102.0%	102.0%	115.0%	117.0%	135.0%	137.0%	175.0%	174.0%
60	103.0%	103.0%	115.0%	118.0%	135.0%	138.0%	175.0%	176.0%
61	104.0%	104.0%	115.0%	119.0%	135.0%	139.0%	175.0%	178.0%
62	105.0%	105.0%	115.0%	120.0%	135.0%	140.0%	175.0%	180.0%
63	103.0%	104.0%	114.0%	118.0%	133.0%	138.0%	172.0%	178.0%
64	101.0%	103.0%	113.0%	116.0%	131.0%	136.0%	169.0%	176.0%
65	99.0%	102.0%	112.0%	114.0%	129.0%	134.0%	166.0%	174.0%
66	97.0%	101.0%	111.0%	112.0%	127.0%	132.0%	163.0%	172.0%
67	95.0%	100.0%	110.0%	110.0%	125.0%	130.0%	160.0%	170.0%
68	94.0%	99.0%	109.0%	109.0%	124.0%	129.0%	159.0%	168.0%
69	93.0%	98.0%	108.0%	108.0%	123.0%	128.0%	158.0%	166.0%
70	92.0%	97.0%	107.0%	107.0%	122.0%	127.0%	157.0%	164.0%
71	91.0%	96.0%	106.0%	106.0%	121.0%	126.0%	156.0%	162.0%
72	90.0%	95.0%	105.0%	105.0%	120.0%	125.0%	155.0%	160.0%
73	90.0%	94.0%	104.0%	104.0%	119.0%	124.0%	153.0%	158.0%
74	90.0%	93.0%	103.0%	103.0%	118.0%	123.0%	151.0%	156.0%
75	90.0%	92.0%	102.0%	102.0%	117.0%	122.0%	149.0%	154.0%

Attained Age	Structured Settlements – Substandard Lives, Rate-Ups ≥21 Years							
	Contract Years 1 to 10		Contract Years 11 to 20		Contract Years 21 to 30		Contract Years ≥31	
	Female	Male	Female	Male	Female	Male	Female	Male
76	90.0%	91.0%	101.0%	101.0%	116.0%	121.0%	147.0%	152.0%
77	90.0%	90.0%	100.0%	100.0%	115.0%	120.0%	145.0%	150.0%
78	90.0%	90.0%	99.0%	99.0%	112.0%	116.0%	138.0%	142.0%
79	90.0%	90.0%	98.0%	98.0%	109.0%	112.0%	131.0%	134.0%
80	90.0%	90.0%	97.0%	97.0%	106.0%	108.0%	124.0%	126.0%
81	90.0%	90.0%	96.0%	96.0%	103.0%	104.0%	117.0%	118.0%
82	90.0%	90.0%	95.0%	95.0%	100.0%	100.0%	110.0%	110.0%
83	91.0%	91.0%	95.0%	95.0%	99.0%	99.0%	107.0%	107.0%
84	92.0%	92.0%	95.0%	95.0%	98.0%	98.0%	104.0%	104.0%
85	93.0%	93.0%	95.0%	95.0%	97.0%	97.0%	101.0%	101.0%
86	94.0%	94.0%	95.0%	95.0%	96.0%	96.0%	98.0%	98.0%
87	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
88	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%
89	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
90	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%
91	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%
92	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
93	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
94	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
95	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
96	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
97	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
98	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
99	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
100	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
101	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
102	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
103	93.3%	93.3%	93.3%	93.3%	93.3%	93.3%	93.3%	93.3%
104	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%
>=105	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Group annuities (except for those contracts owned or purchased by retirement plans, which are covered immediately below), international business, and contracts within the Longevity Reinsurance Reserving Category shall use the 1994 GAM Table, as defined in VM-M Section 2.D, with Projection Scale AA applied to the valuation date. The company prudent estimate assumptions for group annuities, international business, and contracts within the Longevity Reinsurance Reserving Category shall be developed separately from each other as appropriate.

Guidance Note: For certain Group Annuity and Longevity Reinsurance contracts, a single contract may contain annuitants drawn from multiple underlying sub-populations with materially different mortality characteristics (e.g., due to differences in geography, plan composition, industry collar, socioeconomic profile, etc.). For contracts containing multiple underlying sub-populations, both i.) the determination of prudent estimate assumptions and ii.) the comparison between the mortality rates under the company's prudent estimate assumptions and under the prescribed table should be performed at a level of granularity that recognizes these material differences and that is at least as granular as the company uses for its own internal assumption development purposes (e.g., the level of granularity used when pricing the business or when periodically re-determining the company's internal mortality assumptions).

For example, if a Longevity Reinsurance contract contains annuitants drawn from two underlying pension plans, one of which is predominantly blue collar and lower income and the other of which is predominantly white collar and higher income, the prudent estimate assumptions should be determined separately for each of the two plans (or at a greater level of granularity if consistent with company practice), and the comparison between the company's prudent estimate assumptions and the prescribed table should be performed at either the individual annuitant level or at the plan level as opposed to the contract level.

- iv. Group Annuities owned or purchased by retirement plans (as defined in the NAIC Model 820 – Standard Valuation Law) use the following mortality tables:

PRI-2012 Private Retirement Plans Amount-Weighted Mortality Rates Table excluding the Upper and Lower Quartile Tables with the latest MP Scale (MP-2021 as of Jan 2023)

PRI-2012 for Blue Collar, White Collar, or Total* (mix of blue and white collar) Mortality Table can be used. Justification for the selection of the mortality table should be provided.

*PRI-2012 Total Tables may not be appropriate for a company's given group of annuitants if the assumed mix of blue/white collar annuitants is not consistent with the company's annuitants.

Guidance Note: Each company should use the most granular data available to it when assigning annuitants to the appropriate collar tables. In some cases, information on the annuitant collar, union status, hourly vs. salaries status, etc. may be available (e.g., from the contract pricing process) at the individual annuitant level. In other cases, information may be available only at the plan-level. Acknowledging that each company will face unique data availability,

quality, and storage challenges unique to both their mix of business and system capabilities, companies should use reasonable efforts to acquire, store, and utilize available information in the collar assignment process.

Annuitants classified as either “hourly waged earners” or “belonging to a union” can be considered “blue collar”; annuitants classified as either “salaried wage earner” or “no union affiliation” can be considered “white collar”. All participants in a given plan may be classified as blue or white collar if at least 70% of the annuitants with the plan meet the criteria for either “blue collar” or “white collar”.

If the company cannot determine the collar for a group of annuitants (e.g., because such information was never supplied to the company or because the company did not store such information or cannot use it in its valuation process), then the company should use the Total table.

Retirement tables should be used for in-pay annuities (retired annuitants) and Employee tables should be used for deferred annuities (active or term-vested annuitants).

Contingent survivor tables should be used for beneficiaries to the extent that beneficiaries can be identified, or the base tables should be weighted based on Company expectation of proportion of benefits associated with beneficiaries. Group Structured Settlement contracts use the mortality table consistent with the Individual Structured Settlement Mortality Assumptions.

v. Other Group Annuities

Use the corresponding individual annuity mortality assumption provided in this section.

9. Account Value Depletions

The following assumptions shall be used when a contract’s Account Value reaches zero:

- a. If the contract has a guaranteed living benefit, the contract shall take benefits that are equal in amount each year to the guaranteed maximum annual withdrawal amount.
- b. If the contract has any other guaranteed benefits, including a GMDB, the contract shall remain in-force. If the guaranteed benefits contractually terminate upon account value depletion, such termination provisions are assumed to be voided in order to approximate the contract holder’s retaining adequate Account Value to maintain the guaranteed benefits in-force. At the option of the company, fees associated with the contract and guaranteed benefits may continue to be charged and modeled as collected even if the account value has reached zero. While the contract must remain in-force, benefit features may still be terminated according to contractual terms other than account value depletion provisions.
- c. If the contract has no minimum guaranteed benefits, the contract should be terminated according to contractual terms.

10. Other Voluntary Contract Terminations

For contracts that have other elective provisions that allow a contract holder to terminate the contract voluntarily, the termination rate shall be calculated as detailed above in Section 6.C.5 with the following adjustments:

- a. If the contract holder is not yet eligible to terminate the contract under the elective provisions, the termination rate shall be zero.
- b. After the contract holder becomes eligible to terminate the contract under the elective provisions, the termination rate shall be determined using assumptions in Section 6.C.5.
- c. In Section 6.C.5, the ITM of a contract's guaranteed benefit shall be calculated based on the ratio of the guaranteed benefit's GAPV to the termination value of the contract. The termination value of the contract shall be calculated as the GAPV of the payment stream that the contract holder is entitled to receive upon termination of the contract; if the contract holder has multiple options for the payment stream, the termination value shall be the highest GAPV of these options.
- d. For contracts with guaranteed living benefits, for all contract years in which a withdrawal is projected, the termination rate obtained from Section 6.C.5 shall be additionally multiplied by 60%.

11. Crediting Rates and Investment Spread

- a. This section applies to all contracts that provide crediting rates after initial issuance.
- b. For Fixed Index Annuities, the option budget is the assumed crediting rate for quantifying the investment spread between the net portfolio earned rate and the crediting rate.
- c. With respect to setting a limit on the annual spread between the net portfolio earned rate and the crediting rate:
 - i. The maximum annual spread is 2.25% for policies without an initial bonus.
 - ii. For policies with an initial bonus of 0.5%, the maximum annual spread is 2.25% + 0.5%/SCP during the surrender charge period (SCP). The maximum annual spread is reduced back to 2.25% after the SCP.
 - iii. The extra maximum annual spread 0.5%/SCP allows the insurer to recapture the initial bonus via higher spread during the SCP.

Section 7: Stochastic Exclusion and Single Scenario Testing

A. Stochastic Exclusion Test Requirement Overview

1. The company may elect to exclude one or more groups of contracts from the SR calculation if the stochastic exclusion test (SET) is satisfied for each of the groups of contracts. The company has the option to calculate or not calculate the SET.
 - a. If the company does not elect to calculate the SET for one or more groups of contracts, or the company calculates the SET and fails the test for such groups of contracts, the reserve methodology described in Section 4 shall be used for calculating the aggregate reserve for those groups of contracts.
 - b. If the company elects to calculate the SET for one or more groups of contracts, and passes the test for such groups of contracts, then for each group of contracts that passes the SET, the company shall choose whether or not to use the reserve methodology described in Section 4 for that group of contracts. If the reserve methodology described in Section 4 is not used for one or more groups of contracts, then the company shall use the reserve methodology pursuant to applicable requirements in VM-A, VM-C, VM-M and VM-V for those groups of contracts.
 - c. A company may not exclude a group of contracts from the SR requirements if there are one or more future hedging strategies supporting the contracts, with the exception of hedging programs solely supporting index credits as described in Section 4.A.4 or future hedging strategies supporting the contracts are solely associated with product features that are determined to not be material under VM-22 Section 4.A due to low utilization.

B. Requirements to Pass the Stochastic Exclusion Tests

Groups of contracts pass the SET if one of the following is met:

1. Stochastic Exclusion Ratio Test (SERT)—Annually within 12 months before the valuation date the company demonstrates that the groups of contracts pass the SERT defined in Section 7.C.
2. Stochastic Exclusion Demonstration Test—In the first year and at least once every three calendar years thereafter, the company provides a demonstration in the PBR Actuarial Report as specified in Section 7.D.
3. SET Certification Method – For any groups of contracts within the scope of VM-22, the qualified actuary may document that the groups of contracts have passed the exclusion test through an approach other than the SET Certification Method within the past three years and that there have not been material changes in the interest rate risk, mortality and/or longevity risk, or asset return volatility risk inherent in the liabilities and supporting assets. Alternatively, for groups of contracts that do not have guaranteed living benefits, future hedging strategies, or pension risk transfer business, in the first year and at least every third calendar year thereafter, the company provides a certification by a qualified actuary that the group of contracts is not subject to material interest rate risk, mortality and/or longevity risk, or asset return volatility risk (i.e., the risk on non-fixed-income investments having substantial volatility of returns, such as common stocks and real estate investments).

Guidance Note: The qualified actuary should develop documentation to support the actuarial certification that presents his or her analysis clearly and in detail sufficient for another actuary to understand the analysis and reasons for the actuary's conclusion that the group of contracts is not subject to material interest rate risk, mortality and/or longevity risk, or asset return volatility risk. Examples of methods a qualified actuary could use to support the actuarial certification include, but are not limited to:

- a) A demonstration that, for the group of contracts, reserves calculated using requirements under VM-A, VM-C, and VM-V are at least as great as the assets required to support the group of contracts and certificates using the company's cash-flow testing model under each of the 48 scenarios identified in Section 7.C.1 or alternatively each of the New York seven economic scenarios under each of the three mortality adjustment factors identified in Section 7.C.1. When using the cash-flow testing models, the company shall use the cash-flow testing model with explicit margins and/or sensitivities such that moderately adverse conditions are reflected for risks other than the economic scenarios.
- b) A qualitative risk assessment of the group of contracts that concludes that the group of contracts does not have material interest rate risk, mortality and/or longevity risk, or asset return volatility. Such assessment would include an analysis of product guarantees, the company's non-guaranteed elements (NGEs) policy, assets backing the group of contracts, the company's mortality and/or longevity risk, and the company's investment strategy.

C. Stochastic Exclusion Ratio Test

1. In order to exclude a group of contracts from the SR requirements under the stochastic exclusion ratio test (SERT), a company shall demonstrate that the ratio of $(b-a)/c$ is less than the lesser of 6.0% and the percentage change that would trigger the company's materiality standard, where:
 - a. a = the adjusted scenario reserve described in Section 7.C.2.a below using the baseline economic scenario ("scenario 9), as described in Appendix 1.F of VM-20, and no adjustment to future mortality improvement.
 - b. b = the largest adjusted scenario reserve described in Section 7.C.2.a below under any of the 16 economic scenarios described in Appendix 1.F of VM-20 with -1.0% future mortality improvement, +1.0% future mortality improvement, and no adjustments to future mortality improvement. For the purposes of this section, future mortality improvement refers to a percentage reduction in the mortality assumption applied each year between the valuation date and the projection year in the reserve calculation. Note the adjustments to mortality improvement described in this section do not apply from the central year of the mortality table up to the valuation date, commonly referred to as historical mortality improvement. Because mortality variability may differ by company, if the magnitude of the company's margin for mortality improvement exceeds +/-1.0% future mortality improvement, then the company shall use the baseline mortality improvement and the mortality improvement augmented by plus and minus the company's margin for this exercise.
 - c. c = an amount calculated from the baseline economic scenario described in Appendix 1.F of VM-20, and no adjustment to future mortality improvement, that represents the present value of benefits for the policies, adjusted for reinsurance by subtracting ceded benefits. For clarity, premium, ceded premium, expense, reinsurance expense

allowance, modified coinsurance reserve adjustment and reinsurance experience refund cash flows shall not be considered “benefits,” but items such as death benefits, surrender or withdrawal benefits and policyholder dividends shall be. For this purpose, the company shall use the benefits cash flows from the calculation of quantity “a” and calculate the present value of those cash flows using the same path of discount rates as used for “a.”

Guidance Note: Note that the numerator should be the largest adjusted scenario reserve, minus the adjusted scenario reserve for the baseline economic scenario and no adjustment to future mortality improvement. This is not necessarily the same as the biggest difference from the adjusted scenario reserve for the baseline economic scenario with no adjustment to future mortality improvement, or the absolute value of the biggest difference from the adjusted scenario reserve for the baseline economic scenario with no adjustment to future mortality improvement, both of which could lead to an incorrect test result. There are 47 (=16x3-1) combined economic and mortality scenarios that should be compared for the determination of b.

2. In calculating the ratio in Section 7.C.1 above:

- a. The company shall calculate an adjusted scenario reserve for the group of contracts for each of the 16 economic scenarios using the three levels of mortality adjustment factors that is equal to either (i) or (ii) below:
 - i. The scenario reserve defined in Section 4, but with the following differences:
 - a) Using the interest rates and equity return assumptions specific to each scenario.
 - b) Using NAER and discount rates defined in Section 4 specific to each scenario to discount the cash flows.
 - c) Shall reflect future mortality improvement in line with prudent estimate assumptions.
 - d) Shall not reflect correlation between longevity and economic risks.
 - ii. The gross premium reserve developed from the cash flows from the company’s asset adequacy analysis models, using the experience assumptions of the company’s cash-flow analysis, but with the following differences:
 - a) Using the interest rates and equity return assumptions specific to each scenario.
 - b) Using the mortality scalars described in Section 7.C.1.b of this section.
 - c) Using the methodology to determine NAER and discount rates defined in Section 4 specific to each scenario to discount the cash flows, but using the company’s cash-flow testing assumptions for default costs and reinvestment earnings.

When using the cash-flow testing models, the company shall use the cash-flow testing model with explicit margins and/or sensitivities such that moderately adverse conditions are reflected for risks other than the economic scenarios.

- b. The company shall use the most current available baseline economic scenario and the 15 other economic scenarios published by the NAIC. The methodology for creating these scenarios can be found in Appendix 1 of VM-20.
 - c. The company shall use assumptions within each scenario that are dynamically adjusted as appropriate for consistency with each tested scenario.
 - d. The company may not group together contract types with significantly different risk profiles for purposes of calculating this ratio.
 - e. If the company has reinsurance arrangements that are pro rata coinsurance and do not materially impact the interest rate risk, mortality and/or longevity risk, or asset return volatility in the contract, then the company may elect to conduct the stochastic exclusion ratio test on only a single basis, either pre-reinsurance-ceced or post-reinsurance-ceced.
3. If the ratio calculated in this section is less than 6.0% pre-non-proportional reinsurance, but is greater than 6.0% post-non-proportional reinsurance, the group of contracts will still pass the SERT if the company can demonstrate that the sensitivity of the adjusted scenario reserve to economic scenarios is comparable pre- and post-non-proportional reinsurance.

Guidance Note: Further description of non-proportional reinsurance is provided in Paragraph 16 of SSAP 61R.

- a. An example of an acceptable demonstration:
 - i. For convenience in notation • SERT = the ratio $(b-a)/c$ defined in Section 7.C.1 above
 - a) The pre-non-proportional reinsurance results are “gross of non-proportional,” with a subscript “gn,” so denoted $SERT_{gn}$
 - b) The post-non-proportional results are “net of non-proportional,” with subscript “nn,” so denoted $SERT_{nn}$
 - ii. If a block of business being tested is subject to one or more non-proportional reinsurance cessions as well as other forms of reinsurance, such as pro rata coinsurance, take “gross of non-proportional” to mean net of all prorata reinsurance but ignoring the non-proportional contract(s), and “net of non-proportional” to mean net of *all* reinsurance contracts. That is, treat non-proportional reinsurance as the last reinsurance in, and compute certain values below with and without that last component.
 - iii. So, if $SERT_{gn} \leq 6.0\%$ but $SERT_{nn} > 6.0\%$, then compute the largest percent increase in reserve ($LPIR$) = $(b-a)/a$, both “gross of non-proportional” and “net of non-proportional.”

$$LPIR_{gn} = (b_{gn} - a_{gn})/a_{gn}$$

$$LPIR_{nn} = (b_{nn} - a_{nn})/a_{nn}$$

Note that the scenario underlying b_{gn} could be different from the scenario underlying b_{nn} .

If $SERT_{gn} \times LPIR_{nn}/LPIR_{gn} < 6.0\%$, then the block of contracts passes the SERT.

- b. Another more qualitative approach is to calculate the adjusted scenario reserves for the 48 combined economic and mortality scenarios both gross and net of reinsurance to demonstrate that there is a similar pattern of sensitivity by scenario.
- 4. The SERT may not be used for a group of contracts if, using the current year's data, (i) the stochastic exclusion demonstration test defined in Section 7.D had already been attempted using the method of Section 7.D.2.a or Section 7.D.2.b and did not pass; or (ii) the qualified actuary had actively undertaken to perform the certification method in Section 7.B.3 and concluded that such certification could not legitimately be made.

D. Stochastic Exclusion Demonstration Test

- 1. In order to exclude a group of contracts from the SR requirements using the Stochastic Exclusion Demonstration Test, the company must provide a demonstration in the PBR Actuarial Report in the first year and at least once every three calendar years thereafter that complies with the following:
 - a. The demonstration shall provide a reasonable assurance that if the SR was calculated on a stand-alone basis for the group of contracts subject to the SR exclusion, the resulting stochastic reserve for those groups of contracts would not be higher than the statutory reserve determined pursuant to the applicable requirements in VM-A, VM-C, VM-M, and VM-V. The demonstration shall take into account whether changing conditions over the current and two subsequent calendar years would be likely to change the conclusion to exclude the group of contracts from the SR requirements.
 - b. If, as of the end of any calendar year, the company determines the statutory reserve determined pursuant to the applicable requirements in VM-A, VM-C, VM-M, and VM-V for the group of contracts no longer adequately provides for all material risks, the exclusion shall be discontinued, and the company fails the SET for those contracts.
 - c. The demonstration may be based on analysis from a date that precedes the valuation date for the initial year to which it applies if the demonstration includes an explanation of why the use of such a date will not produce a material change in the outcome, as compared to results based on an analysis as of the valuation date.
 - d. The demonstration shall provide an effective evaluation of the residual risk exposure remaining after risk mitigation techniques, such as derivative programs and reinsurance.
- 2. The company may use one of the following or another method acceptable to the insurance commissioner to demonstrate compliance with Section 7.D.1 above:
 - a. Demonstrate that the statutory reserve calculated in accordance with VM-A, VM-C, VM-M, and VM-V is greater than the SR calculated on a stand-alone basis.
 - b. Demonstrate that the statutory reserve calculated in accordance with VM-A, VM-C, VM-M, and VM-V is greater than the scenario reserve that results from each of a sufficient number of adverse deterministic scenarios.
 - c. Demonstrate that the statutory reserve calculated in accordance with VM-A, VM-C, VM-M, and VM-V is greater than the SR calculated on a stand-alone basis, but using a representative sample of contracts in the SR calculations.

- d. Demonstrate that any risk characteristics that would otherwise cause the SR calculated on a stand-alone basis to exceed the statutory reserve calculated in accordance with VM-A, VM-C, VM-M, and VM-V, are not present or have been substantially eliminated through actions such as hedging, investment strategy, reinsurance or passing the risk on to the contract holder by contract provision.

E. Single Scenario Test

- 1. Instead of a SR, the company may determine a Deterministic Reserve (DR) for a group of contracts using a single deterministic economic scenario, subject to the following conditions. The company must satisfy all of the following conditions to be eligible to determine a DR.
 - a. The company certifies that the contracts and certificates have predictable, stable cash flows and limited contract holder behavior, and economic conditions do not materially influence anticipated contract holder behavior for the group of contracts and certificates. Examples of contract holder options that are materially influenced by economic conditions include surrender benefits, recurring premium payments, and guaranteed living benefits.
 - b. The company certifies that the contracts and certificates are not supported by a future hedging strategy, except in the case where all future hedging strategies supporting the policies are solely associated with product features that are determined to not be material under VM-22 Section 4.A due to low utilization.
 - c. The company passes the Single Scenario Test (SST), which follows the requirements in Sections 7.A to 7.D appropriately modified to reflect the DR as the baseline reserve:
 - i. For following Section 7.C regarding the SERT, for the SST, test using only the 16 economic scenarios paired with the no adjustment to future mortality improvement scenario.
 - ii. For following Section 7.D regarding the Stochastic Exclusion Demonstration Test, for the SST, compare to the DR rather than the statutory reserve determined pursuant to the applicable requirements in VM-A, VM-C, and VM-V.
 - iii. For following Section 7.B.3 regarding the SET Certification Method, for the SST, the certification does not need to state or support that there is not material mortality and/or longevity risk. However, the support for the certification method should include a quantitative demonstration, such as a demonstration that, for the group of contracts, reserves are at least as great as the assets required to support the group of contracts and certificates using the company's cash-flow testing model under each of the SERT 16 economic scenarios paired with the no adjustment to future mortality improvement scenario or each of the New York seven economic scenarios. When using the cash-flow testing models, the company shall use the cash-flow testing model with explicit margins and/or sensitivities such that moderately adverse conditions are reflected for risks other than the economic scenarios.
 - d. The company must disclose a description of contracts and associated features in the certification.

2. The DR for the group of contracts under the Single Scenario Test is determined as follows:
 - a. Cash flows are projected in compliance with the applicable requirements in Section 4, Section 5, Section 10, and Section 11 of VM-22 over a single economic scenario (scenario 12 found in Appendix 1 of VM-20).
 - b. The DR equals the scenario reserve following the requirements for Section 4.

Section 8: Scenario Generation

A. General

1. This section outlines the requirements for the stochastic cash-flow models used to simulate interest rates, fund returns, and implied volatility to be used in the modeled projections. Specifically, it prescribes scenarios for interest rates, as well as investment returns for general account equity assets and separate account fund returns. A more complete documentation of the prescribed scenarios can be found in VM-20 Appendix 1. In addition, this section sets certain standards that must be satisfied by fund returns, implied volatility scenarios, and non-prescribed scenario generators. It also discusses general modeling considerations, such as the number of scenarios and projection frequency.
2. The scenarios discussed in this section are applicable to gross investment returns (before the deduction of any fees or charges). To determine the net returns appropriate for the projections required by these requirements, the company shall reflect applicable fees and contract holder charges in the development of projected account values. The projections also shall include the costs of managing the investments and converting the assets into cash when necessary.
3. As a general rule, funds with higher expected returns should have higher expected volatilities, and in the absence of well-documented mitigating factors (e.g., a highly reliable and favorable correlation to other fund returns), they should lead to higher total asset requirements.

Guidance Note: While the model need not strictly adhere to “mean-variance efficiency,” prudence dictates some form of consistent risk/return relationship between the proxy investment funds. In general, it would be inappropriate to assume consistently “superior” expected returns (i.e., risk/return point above the frontier).

4. For non-prescribed generators, the interest rate, equity, and implied volatility scenarios used to determine reserves must be available in an electronic spreadsheet to facilitate any regulatory review.

B. Prescribed Interest Rate Scenario Generator

1. Treasury Department interest rate curves shall be determined on a stochastic basis using the prescribed interest rate scenarios, or scenarios based on a non-prescribed generator that meets the requirements described in Section 8.E.
2. The prescribed interest rate scenarios can be found on Conning’s website address, <https://naic.conning.com/scenariofiles>.

C. Prescribed Total Investment Return Scenario Generator for Equity Assets and Separate Account Funds

1. Total investment return paths for general account equity assets and separate account fund returns shall be determined on a stochastic basis using the prescribed economic scenarios.

Guidance Note: In lieu of the prescribed economic scenarios, the company may substitute scenarios from a non-prescribed economic generator that meets the requirements described in Section 8.E.

2. The prescribed economic scenarios for equity returns and bond funds can be found on Conning’s website address, <https://naic.conning.com/scenariofiles>.
3. The company shall map each of the proxy funds defined in Section 4.A.2 to the fund returns

projected by the prescribed economic scenarios. This mapping process may involve blending the accumulation factors from two or more of the prescribed fund returns to create the projected returns for each proxy fund. If a proxy fund cannot be appropriately mapped to some combination of the prescribed returns, the company shall determine an appropriate return using a non-prescribed scenario generator and disclose the methodology underlying the non-prescribed scenario generator.

4. In using non-prescribed scenario generators to determine the return for proxy funds that cannot be mapped to the prescribed economic scenarios, the scenarios so generated must be consistent with the general relationships between risk and return observed in the fund returns from the prescribed economic scenarios. This does not imply a strict functional relationship between the model parameters for various markets/funds, but it would generally be inappropriate to assume that a market or fund consistently “outperforms” (lower risk, higher expected return relative to the efficient frontier) over the long term.
5. When parameters are fit to historic data without consideration of the economic setting in which the historic data emerged, the market price of risk may not be consistent with a reasonable long-term model of market equilibrium. One possibility for establishing “consistent” parameters (or scenarios) across all funds would be to assume that the market price of risk is constant (or nearly constant) and governed by some functional (e.g., linear) relationship. That is, higher expected returns can only be garnered by assuming greater risk.

Guidance Note: As an example, the standard deviation of log returns often is used as a measure of risk. Specifically, two return distributions Rx and Ry would satisfy the following relationship:

$$\text{Market Price of Risk} = \left(\frac{E[R_X] - r}{\sigma_X} \right) = \left(\frac{E[R_Y] - r}{\sigma_Y} \right)$$

Where $E[R]$ and σ are respectively the (unconditional) expected returns and volatilities, and r is the expected risk-free rate over a suitably long holding period commensurate with the projection horizon. One approach to establish consistent scenarios would set the model parameters to maintain a near-constant market price of risk.

6. A closely related method would assume some form of “mean-variance” efficiency to establish consistent model parameters. Using the historic data, the mean-variance (alternatively, “drift-volatility”) frontier could be constructed from a plot of (mean, variance) pairs from a collection of world market indices. The frontier could be assumed to follow some functional form, with the coefficients determined by standard curve fitting or regression techniques. Recognizing the uncertainty in the data, a “corridor” could be established for the frontier. Model parameters would then be adjusted to move the proxy market (fund) inside the corridor.

Guidance Note: The function forms quadratic polynomials, and logarithmic functions tend to work well.

7. Clearly, there are many other techniques that could be used to establish consistency between the scenarios. While appealing, the above approaches do have drawbacks, and the company should not be overly optimistic in constructing the model parameters or the scenarios.

Guidance Note: For example, mean-variance measures ignore the asymmetric and fat-tailed profile of most equity market returns.

8. For each proxy fund not within the scope of the prescribed economic scenarios, the company

must consider the following:

- a. The Market Price of Risk, as defined in the Guidance Note found in Section 8.C.5, implied in the projected fund returns when compared against the Market Price of Risk for all funds generated by the prescribed economic scenarios should produce reasonable relationships. In calculating the Market Price of Risk, the company shall use an expected risk-free rate consistent with the long-term risk-free rate used in determining the Market Price of Risk or equivalent quantities in the calibration of the prescribed scenario generator.
- b. The average correlations, across all scenarios and all time periods, of the projected fund returns with the fund returns in the prescribed economic scenarios should be in a reasonable range.

The company may also consider any other information that provides assurance that the returns for proxy funds not generated using the prescribed economic scenarios do not consistently outperform over the long term if the company believes that the Market Price of Risk and correlations described above are misleading or not relevant.

- 9. It is not necessary to assume that all markets are perfectly positively correlated, but an assumption of independence (zero correlation) between the equity markets would inappropriately exaggerate the benefits of diversification. An examination of the historic data suggests that correlations are not stationary and that they tend to increase during times of high volatility or negative returns. As such, the company should take care not to underestimate the correlations in those scenarios used for the reserve calculations.

D. Implied Volatility Scenarios

The projection of implied volatility scenarios for interest rates, equities, or other asset classes is left to the judgment of the company, but the scenarios so generated must satisfy the following properties:

- 1. At each projection time step, all projected implied volatility surfaces must be arbitrage free after considering appropriate transaction costs.
- 2. Relationships between the projected implied volatility scenarios, the scenarios for the underlying asset investment returns, and the realized volatility of the scenarios for the underlying asset returns should be consistent with relationships observed in historical data.

For instance, projected implied volatility should generally exhibit positive correlation with the realized volatility of the scenarios for the underlying asset returns over the same time period. In addition, it would also be appropriate to assume that projected implied volatility generally exhibits negative correlation with the short-term performance of the underlying asset over the same time period.

- 3. For a company not using the safe harbor described in Section 9.B.5, any implied volatility scenarios generated using a non-prescribed scenario generator shall not result in a TAR less than that obtained by assuming that the implied volatility level – at all ITM levels – at a given time step in a given scenario is equal to the realized volatility of the underlying asset scenario over the same time period. In other words, the TAR shall not be reduced by assumptions of any realizable spread between implied volatility and realized volatility. For the purposes of demonstrating compliance with this standard, a company may rely on only the values from the stochastic calculations and exclude impacts from the additional standard projection and the alternative methodology.

E. Use of Non-Prescribed Scenario Generators

At the option of the company, interest rates and total investment return scenarios for equity assets and separate account fund returns may be generated in part or in full using non-prescribed scenario generators in lieu of the prescribed economic generators, provided that the scenarios thus generated do not result in a DR or SR that is materially lower than the DR or SR resulting from the use of the scenarios from the prescribed economic generators as defined in 8.B and 8.C above. For purposes of demonstrating compliance with this standard, a company may rely on only the values from the stochastic calculations and exclude impacts from the additional standard projection.

F. Number of Scenarios

Use of fewer scenarios rather than a higher number of scenarios is permissible as a model efficiency technique provided that the use of the technique is consistent with Section 3.J.

Section 9: Modeling Hedges under a Future Non-Index Credit Hedging Strategy

A. Initial Considerations

1. This section applies to modeling of hedges other than situations where the company only hedges index credits.
2. If the company is following one or more future hedging strategies supporting the contracts, in accordance with an investment policy adopted by the board of directors, or a committee of board members, the appropriate costs and benefits of hedging instruments that are currently held by the company in support of the contracts falling under the scope of these requirements shall be included in the calculation of the DR and/or SR, determined in accordance with Section 3.D and Section 4.D.
3. The company shall take into account the costs and benefits of hedge positions expected to be held by the company in the future along each scenario. The investment policy must clearly articulate the company's hedging objectives, including the metrics that drive rebalancing/trading. This specification could include maximum tolerable values for investment losses, earnings, volatility, exposure, etc. in either absolute or relative terms over one or more investment horizons vis-à-vis the chance of occurrence. Company management is responsible for developing, documenting, executing and evaluating the investment strategy, including the hedging strategy, used to implement the investment policy.
4. For this purpose, the investment assets refer to all the assets, including derivatives supporting covered products and guarantees. This also is referred to as the investment portfolio. The investment strategy is the set of all asset holdings at all points in time in all scenarios. The hedging portfolio, which also is referred to as the hedging assets, is a subset of the investment assets. The hedging strategy is the hedging asset holdings at all points in time in all scenarios. There is no attempt to distinguish what is the hedging portfolio and what is the investment portfolio in this section. Nor is the distinction between investment strategy and hedging strategy formally made here. Where necessary to give effect to the intent of this section, the requirements applicable to the hedging portfolio or the hedging strategy are to apply to the overall investment portfolio and investment strategy.
5. This particularly applies to restrictions on the reasonableness or acceptability of the models that make up the stochastic cash-flow model used to perform the projections, since these restrictions are inherently restrictions on the joint modeling of the hedging and non-hedging portfolio. To give effect to these requirements, they must apply to the overall investment strategy and investment portfolio.

B. Modeling Approaches

1. The analysis of the impact of the hedging strategy on cash flows is typically performed using either one of two types of methods as described below. Although a hedging strategy normally would be expected to reduce risk provisions, the nature of the hedging strategy and the costs to implement the strategy may result in an increase in the amount of the DR and/or SR otherwise calculated. Particular attention should be given to Section 1.B Principle 5 for the modeling of future hedging strategies.
2. The fundamental characteristic of the first type of method, referred to as the "explicit method," is that hedging positions and their resulting cash flows are included in the stochastic cash-flow model used to determine the scenario reserve, as discussed in Section 3.D, for each scenario.

3. The fundamental characteristic of the second type of method, referred to as the “implicit method,” is that the effectiveness of the current hedging strategy on future cash flows is evaluated, in part or in whole, outside of the stochastic cash-flow model. There are multiple ways that this type of modeling can be implemented. In this case, the reduction to the DR and/or SR otherwise calculated should be commensurate with the degree of effectiveness of the hedging strategy in reducing accumulated deficiencies otherwise calculated.
4. Regardless of the methodology used by the company, the ultimate effect of the current hedging strategy (including currently held hedge positions) on the DR and/or SR needs to recognize all risks, associated costs, imperfections in the hedges and hedging mismatch tolerances associated with the hedging strategy. The risks include, but are not limited to: basis, gap, price, parameter estimation and variation in assumptions (mortality, persistency, withdrawal, annuitization, etc.). Costs include, but are not limited to: transaction, margin (opportunity costs associated with margin requirements) and administration. In addition, the reduction to the DR and/or SR attributable to the hedging strategy may need to be limited due to the uncertainty associated with the company’s ability to implement the hedging strategy in a timely and effective manner. The level of operational uncertainty varies indirectly with the amount of time that the new or revised strategy has been in effect.

Guidance Note: No hedging strategy is perfect. A given hedging strategy may eliminate or reduce some but not all risks, transform some risks into others, introduce new risks, or have other imperfections.

5. A safe harbor approach is permitted for reflection of future hedging strategies supporting the contracts for those companies whose modeled hedge assets comprise only linear instruments not sensitive to implied volatility. For companies with option-based hedge strategies, electing this approach would require representing the option-based portion of the strategy as a delta-rho two-Greek hedge program. The normally modeled option portfolio would be replaced with a set of linear instruments that have the same first-order Greeks as the original option portfolio.

C. Calculation of SR (Reported)

1. The company shall calculate CTE70 (best efforts)—the results obtained when the CTE70 is based on incorporating the future hedging strategies supporting the contracts (including both currently held and future hedge positions) into the stochastic cash-flow model on a best efforts basis, including all of the factors and assumptions needed to execute the future hedging strategies supporting the contracts (e.g., stochastic implied volatility). The determination of CTE70 (best efforts) may utilize either explicit or implicit modeling techniques.
2. The company shall calculate a CTE70 (adjusted) by recalculating the CTE70 assuming the company has no future hedging strategies supporting the contracts except hedge purchases solely related to strategies to hedge index credits, therefore following the requirements of Section 4.A.4.a and 4.A.4.b.i.

However, for a company with a future hedging strategy supporting the contracts, existing hedging instruments, except hedging instruments solely related to strategies to hedge index credits, that are currently held by the company in support of the contracts falling under the scope of these requirements may be considered in one of two ways for the CTE70 (adjusted):

- a) Include the asset cash flows from any contractual payments and maturity values in the projection model; or

- b) No hedge positions – in which case the hedge positions held on the valuation date are replaced with cash and/or other general account assets in an amount equal to the aggregate market value of these hedge positions.

Guidance Note: If the hedge positions held on the valuation date are replaced with cash, then as with any other cash, such amounts may then be invested following the company's investment strategy.

A company may switch from method a) to method b) at any time, but it may only change from b) to a) with the approval of the domiciliary commissioner.

3. Because most models will include at least some approximations or idealistic assumptions, CTE70 (best efforts) may overstate the impact of the hedging strategy. To compensate for potential overstatement of the impact of the hedging strategy, the value for the SR is given by:

$$SR = CTE70 \text{ (best efforts)} + E \times \max[0, CTE70 \text{ (adjusted)} - CTE70 \text{ (best efforts)}]$$

4. The company shall specify a value for E (the “error factor”) in the range from 5% to 100% to reflect the company’s view of the potential error resulting from the level of sophistication of the stochastic cash-flow model and its ability to properly reflect the parameters of the hedging strategy (i.e., the Greeks being covered by the strategy), as well as the associated costs, risks and benefits. The greater the ability of the stochastic model to capture all risks and uncertainties, the lower the value of E . The value of E may be as low as 5% only if the model used to determine the CTE70 (best efforts) effectively reflects all of the parameters used in the hedging strategy. If certain economic risks are not hedged, yet the model does not generate scenarios that sufficiently capture those risks, E must be in the higher end of the range, reflecting the greater likelihood of error. Likewise, simplistic hedge cash-flow models shall assume a higher likelihood of error.
5. The company shall conduct a formal back-test, based on an analysis of the available relevant period of data (but no less than 12 months), to assess how well the model is able to replicate the hedging strategy in a way that supports the determination of the value used for E .
6. Such a back-test shall involve one of the following analyses:
 - a. For companies that model hedge cash flows directly (“explicit method”), replace the stochastic scenarios used in calculating the CTE70 (best efforts) with a single scenario that represents the market path that actually manifested over the selected back-testing period and compare the projected hedge asset gains and losses against the actual hedge asset gains and losses – both realized and unrealized – observed over the same time period. For this calculation, the model assumptions may be replaced with parameters that reflect actual experience during the back-testing period. In order to isolate the comparison between the modeled hedge results and actual hedge results for this calculation, the projected liabilities should accurately reflect the actual liabilities throughout the back-testing period; therefore, adjustments that facilitate this accuracy (e.g. reflecting actual experience instead of model assumptions, including new business, etc.) are permissible.

To support the choice of a low value of E , the company should ascertain that the projected hedge asset gains and losses are within close range of 100% (e.g., 80–125%) of the actual hedge asset gains and losses. The company may also support the choice of a low value of E by achieving a high R-squared (e.g., 0.80 or higher) when using a regression analysis technique.

- b. Companies that model hedge cash flows implicitly by quantifying the cost and benefit of hedging using the fair value of the hedged item (an “implicit method” or “cost of reinsurance method”), should calculate the delta, rho and vega coverage ratios in each month over the selected back-testing period in the following manner:
 - i. Determine the hedge asset gains and losses—both realized and unrealized—incurred over the month attributable to equity, interest rate, and implied volatility movements.
 - ii. Determine the change in the fair value of the hedged item over the month attributable to equity, interest rate, and implied volatility movements. The hedged item should be defined in a manner that reflects the proportion of risks hedged (e.g., if a company elects to hedge 50% of a contract’s market risks, it should quantify the fair value of the hedged item as 50% of the fair value of the contract).
 - iii. Calculate the delta coverage ratio as the ratio between (i) and (ii) attributable to equity movements.
 - iv. Calculate the rho coverage ratio as the ratio between (i) and (ii) attributable to interest rate movements.
 - v. Calculate the vega coverage ratio as the ratio between (i) and (ii) attributable to implied volatility movements.
 - vi. To support the company’s choice of a low value of E, the company should be able to demonstrate that the delta and rho coverage ratios are both within close range of 100 % (e.g., 80–125%) consistently across the back-testing period.
 - vii. In addition, the company should be able to demonstrate that the vega coverage ratio is within close range of 100 % in order to use the prevailing implied volatility levels as of the valuation date in quantifying the fair value of the hedged item for the purpose of calculating CTE70 (best efforts). Otherwise, the company shall quantify the fair value of the hedged item for the purpose of calculating CTE70 (best efforts) in a manner consistent with the realized volatility of the scenarios captured in the CTE (best efforts).
 - c. Companies that do not model hedge cash flows explicitly, but that also do not use the implicit method as outlined in Section 9.C.6.b above, shall conduct the formal back-test in a manner that allows the company to clearly illustrate the appropriateness of the selected method for reflecting the cost and benefit of hedging, as well as the value used for E.
7. A company that does not have 12 months of experience to date shall set E to a value that reflects the amount of experience available, and the degree and nature of any change to the hedge program. For a material change in strategy, with less than 12 months of experience and without robust mock testing, E should be 1.0. For a material change in strategy with less than 3 months of history, E should be 1.0. However, when a material change in hedging strategy with less than 3 months history is the introduction of hedging for a newly introduced product or newly acquired block of business and is supplemented by robust mock testing, E should instead be at least 0.3. Moreover, with prior approval from the domestic regulator, material changes in hedge strategy with less than 3 months history but with robust mock testing may have error factors less than 1.0, though still subject to the minimum error factor specified in Section 9.C.4 and with an appropriate prudent estimate to account for additional uncertainty in anticipated hedging

experience beyond that of a robust hedging program already in existence. E may also be lower than 1.0 if the change in strategy is a minor refinement rather than a material change in strategy, though still subject to the minimum error factor specified in Section 9.C.4 and with an appropriate prudent estimate to account for any additional uncertainty associated with the refinement.

The following examples are provided as guidance for determining the E factor when there has been a change to the hedge program. These examples are not intended to be exhaustive, and a company must support the determination of whether a hedge methodology change is material based on a review of the company's specific change in methodology.

- The error factor should be temporarily 100% for substantial changes in hedge methodology (e.g., moving from a fair-value based strategy to a stop-loss strategy) without robust mock-testing.
 - An increase in the error factor may not always be needed for minor refinements to the hedge strategy (e.g., moving from swaps to Treasury futures).
8. The company shall set the value of E reflecting the extent to which the future hedging program is clearly defined. To support a value of E below 1.0, there should be very robust documentation outlining the future hedging strategies. To the extent that documentation outlining any of the future hedging strategies is incomplete, the value of E shall be increased. In particular, the value of E shall be 1.0 if documentation is materially incomplete for any of the individual CDHS attributes (a) through (j), as listed in VM-01.

Any increases required to the value of E to reflect that documentation is not available to support that the future hedging strategies are clearly defined shall be in addition to increases to the value of E to reflect a lack of historical experience or to reflect the back-testing results, subject to an overall ceiling of 1.0 for E.

Guidance Note: Companies must use judgment both in determining an E factor and in applying this requirement in the case where there are multiple future hedging strategies, particularly where some may be CDHS and some may not be CDHS. In this case, the SR should be ensured to be no less than the CTE(70) reflecting the future hedging strategies that are CDHS and not reflecting those that are not CDHS. Companies with multiple future hedging strategies with very different levels of effectiveness or with multiple future hedging strategies that include both CDHS and non-CDHS should discuss with their domestic regulator.

D. Additional Considerations for CTE70 (best efforts)

If the company is following one or more future hedging strategies supporting the contracts, the fair value of the portfolio of contracts falling within the scope of these requirements shall be computed and compared to the CTE70 (best efforts) and CTE70 (adjusted). If the CTE70 (best efforts) is below both the fair value and CTE70 (adjusted), the company should be prepared to explain why that result is reasonable.

For the purposes of this analysis, the SR and fair value calculations shall be done without requiring the scenario reserve for any given scenario to be equal to or in excess of the cash surrender value in aggregate for the group of contracts modeled in the projection.

E. Specific Considerations and Requirements

1. As part of the process of choosing a methodology and assumptions for estimating the future effectiveness of the current hedging strategy (including currently held hedge positions) for purposes of reducing the DR and/or SR, the company should review actual historical hedging effectiveness. The company shall evaluate the appropriateness of the assumptions on future trading, transaction costs, other elements of the model, the strategy, the mix of business and other items that are likely to result in materially adverse results. This includes an analysis of model assumptions that, when combined with the reliance on the hedging strategy, are likely to result in adverse results relative to those modeled. The parameters and assumptions shall be adjusted (based on testing contingent on the strategy used and other assumptions) to levels that fully reflect the risk based on historical ranges and foreseeable future ranges of the assumptions and parameters. If this is not possible by parameter adjustment, the model shall be modified to reflect them at either anticipated experience or adverse estimates of the parameters.
2. A discontinuous hedging strategy is a hedging strategy where the relationships between the sensitivities to equity markets and interest rates (commonly referred to as the Greeks) associated with the guaranteed contract holder options embedded in the non-variable annuities and other in-scope products and these same sensitivities associated with the hedging assets are subject to material discontinuities. This includes, but is not limited to, a hedging strategy where material hedging assets will be obtained when the non-variable annuity and other in-scope products account balances reach a predetermined level in relationship to the guarantees. Any hedging strategy can be a discontinuous hedging strategy if implementation of the strategy permits material discontinuities between the sensitivities to equity markets and interest rates associated with the guaranteed contract holder options embedded in the non-variable annuities and other in-scope products and these same sensitivities associated with the hedging assets. There may be scenarios that are particularly costly to discontinuous hedging strategies, especially where those result in large discontinuous changes in sensitivities (Greeks) associated with the hedging assets. Where discontinuous hedging strategies contribute materially to a reduction in the DR and/or SR, the company must evaluate the interaction of future trigger definitions and the discontinuous hedging strategy, in addition to the items mentioned in the previous paragraph. This includes an analysis of model assumptions that, when combined with the reliance on the discontinuous hedging strategy, may result in adverse results relative to those modeled.
3. A strategy that has a strong dependence on acquiring hedging assets at specific times that depend on specific values of an index or other market indicators may not be implemented as precisely as planned.
4. The combination of elements of the stochastic cash-flow model—including the initial actual market asset prices, prices for trading at future dates, transaction costs and other assumptions—should be analyzed by the company as to whether the stochastic cash-flow model permits hedging strategies that make money in some scenarios without losing a reasonable amount in some other scenarios. This includes, but is not limited to:
 - a. Hedging strategies with no initial investment that never lose money in any scenario and in some scenarios make money.
 - b. Hedging strategies that, with a given amount of initial money, never make less than accumulation at the one-period risk-free rates in any scenario but make more than this in one or more scenarios.
5. If the stochastic cash-flow model allows for such situations, the company should be satisfied that the results do not materially rely directly or indirectly on the use of such strategies. If the

results do materially rely directly or indirectly on the use of such strategies, the strategies may not be used to reduce the SR otherwise calculated.

6. In addition to the above, the method used to determine prices of financial instruments for trading in scenarios should be compared to actual initial market prices. In addition to comparisons to initial market prices, there should be testing of the pricing models that are used to determine subsequent prices when scenarios involve trading financial instruments. This testing should consider historical relationships. For example, if a method is used where recent volatility in the scenario is one of the determinants of prices for trading in that scenario, then that model should approximate actual historic prices in similar circumstances in history.
7. The company may also consider historical experience for similar current or past hedging programs on similar products to support the error factor or index credit hedge margin determined for the projection.

Section 10: Guidance and Requirements for Setting Contract Holder Behavior Prudent Estimate Assumptions

A. General

Contract holder behavior assumptions encompass actions such as lapses, withdrawals, transfers, recurring deposits, benefit utilization, option election, etc. Contract holder behavior is difficult to predict accurately, and variance in behavior assumptions can significantly affect the reserves level. In the absence of relevant and fully credible empirical data, the company should set behavior assumptions as guided by Principle 3 in Section 1.B and by Section 12.

In setting behavior assumptions, the company should examine, but not be limited by, the following considerations:

1. Behavior can vary by product, market, distribution channel, index performance, interest credited (current and guaranteed rates), time/product duration, etc.
2. Options embedded in the product may affect behavior.
3. Utilization of options may be elective or non-elective in nature. Living benefits often are elective, and death benefit options are generally non-elective.
4. Elective contract holder options may be more driven by economic conditions than non-elective options.
5. As the value of a product option increases, there is an increased likelihood that contract holders will behave in a manner that maximizes their financial interest (e.g., lower lapses, higher benefit utilization, etc.).
6. Behavior formulas may have both rational and irrational components (irrational behavior is defined as situations where some contract holders may not always act in their best financial interest). The rational component should be dynamic, but the concept of rationality need not be interpreted in strict financial terms and might change over time in response to observed trends in contract holder behavior based on increased or decreased financial efficiency in exercising their contractual options.
7. Options that are ancillary to the primary product features may or may not be significant drivers of behavior. Whether an option is ancillary to the primary product features depends on many considerations, such as:
 - a. The purpose for which the product was purchased.
 - b. Whether the option is elective or non-elective.
 - c. Whether the value of the option is well-known.
8. External influences may affect behavior.

B. Aggregate vs. Individual Margins

1. Prudent estimate assumptions are developed by applying a margin for uncertainty to the anticipated experience assumption. The issue of whether the level of the margin applied to the

anticipated experience assumption is determined in aggregate or independently for each and every behavior assumption is discussed in Principle 3 in Section 1.B.

2. Although this principle discusses the concept of determining the level of margins in aggregate, it notes that the application of this concept shall be guided by evolving practice and expanding knowledge. From a practical standpoint, it may not always be possible to completely apply this concept to determine the level of margins in aggregate for all behavior assumptions.
3. Therefore, the company shall determine prudent estimate assumptions independently for each behavior (e.g., mortality, lapses and benefit utilization), using the requirements and guidance in this section and throughout these requirements, unless the company can demonstrate that an appropriate method was used to determine the level of margin in aggregate for two or more material behavior assumptions, if relevant to the risks in the product, and thus the approach will not underestimate the reserve.

C. Sensitivity Testing

The impact of behavior can vary by product, time period, etc. For any assumption that is not prescribed or stochastically modeled, the company shall use sensitivity testing to ensure that the assumption is set at the conservative end of the plausible range. The company shall sensitivity test:

- Surrenders.
- Partial withdrawals.
- Benefit utilization.
- Account transfers.
- Future deposits.
- Other behavior assumptions if relevant to the risks in the product.

Sensitivity testing of assumptions is required and shall be more appropriately reflective of the risk of adverse deviations from the baseline assumption. For example, a base lapse assumption plus or minus X% across all contracts may not achieve this objective. A more appropriate sensitivity test in this example might be to devise parameters in a dynamic lapse formula to reflect more out-of-the-money contracts lapsing and/or more holders of in-the-money contracts persisting and eventually using the guarantee. The company should apply more caution in setting assumptions for behaviors where testing suggests that stochastic modeling results are sensitive to small changes in such assumptions. For such sensitive behaviors, the company shall use higher margins when the underlying experience is less than fully relevant and credible.

The company shall examine the results of sensitivity testing to understand the materiality of prudent estimate assumptions on the modeled reserve. The company shall update the sensitivity tests periodically as appropriate, considering the materiality of the results of the tests. The company may update the tests less frequently (but no less than every 3 years) when the tests show less sensitivity of the modeled reserve to changes in the assumptions being tested or the experience is not changing rapidly. Providing there is no material impact on the results of the sensitivity testing, the company may perform sensitivity testing:

1. Using samples of the contracts in force rather than performing the entire valuation for each alternative assumption set.
2. Using data from prior periods.

D. Specific Considerations and Requirements

1. Within materiality considerations, the company should consider all relevant forms of contract holder behavior and persistency, including, but not limited to, the following:
 - a. Mortality (additional guidance and requirements regarding mortality is contained in Section 11).
 - b. Surrenders.
 - c. Partial withdrawals (systematic and elective).
 - d. Account transfers (switching/exchanges).
 - e. Resets/ratchets of the guaranteed amounts (automatic and elective).
 - f. Future deposits.
 - g. Income start date for the benefit utilization.
 - h. Commutation of benefit (from periodic payment to lump sum or vice versa.)
2. However, the company should exercise caution in assuming that current behavior will be indefinitely maintained. For example, it might be appropriate to test the impact of a shifting asset mix and/or consider future deposits to the extent they can reasonably be anticipated and increase the calculated amounts.
3. Normally, the underlying model assumptions would differ according to the attributes of the contract being valued. This would typically mean that contract holder behavior and persistency may be expected to vary according to such characteristics as (this is not an exhaustive list):
 - a. Gender.
 - b. Attained age.
 - c. Issue age.
 - d. Contract duration.
 - e. Time to maturity.
 - f. Tax status.
 - g. Account value.
 - h. Interest credited (current and guaranteed).
 - i. Available indices.

- j. Guaranteed benefit amounts.
- k. Surrender charges, transaction fees or other contract charges.
- l. Distribution channel.
- 4. Unless there is credible evidence to the contrary, behavior assumptions should be no less conservative than past experience. Margins for contract holder behavior assumptions shall assume, without relevant and credible experience or clear evidence to the contrary, that contract holders' efficiency will increase over time.
- 5. In determining contract holder behavior assumptions, the company shall use actual experience data directly applicable to the business segment (i.e., direct data) if it is available. In the absence of direct data, the company should then look to use data from a segment that is similar to the business segment (i.e., other than direct experience), whether or not the segment is directly written by the company. If data from a similar business segment are used, the assumption shall be adjusted to reflect differences between the two segments. Margins shall reflect the data uncertainty associated with using data from a similar but not identical business segment.
- 6. Where relevant and fully credible empirical data do not exist for a given contract holder behavior assumption, the company shall set the contract holder behavior assumption to reflect the increased uncertainty such that the contract holder behavior assumption is shifted towards the conservative end of the plausible range of expected experience that serves to increase the DR and/or SR. If there are no relevant data, the company shall set the contract holder behavior assumption to reflect the increased uncertainty such that the contract holder behavior assumption is at the conservative end of the range. Such adjustments shall be consistent with the definition of prudent estimate, with the principles described in Section 1.B, and with the guidance and requirements in this section.
- 7. Ideally, contract holder behavior would be modeled dynamically according to the simulated economic environment and/or other conditions. It is important to note, however, that contract holder behavior should neither assume that all contract holders act with 100% efficiency in a financially rational manner nor assume that contract holders will always act irrationally. These extreme assumptions may be used for modeling efficiency if the result is more conservative.

E. Dynamic Assumptions

- 1. Consistent with the concept of prudent estimate assumptions described earlier, the liability model should incorporate margins for uncertainty for all risk factors that are not stochastically modeled.
- 2. The company should exercise care in using static assumptions when it would be more appropriate to use a dynamic model or other scenario-dependent formulation for behavior. With due allowance for appropriate simplifications, approximations and modeling efficiency techniques, the use of dynamic models is encouraged, but not mandatory. Static assumptions that could reasonably be expected to vary according to a stochastic process, or future states of the world (especially in response to economic drivers), may require higher margins and/or signal a need for higher margins for certain other assumptions.
- 3. Risk factors that are modeled dynamically should encompass the plausible range of behavior consistent with the economic scenarios and other variables in the model, including the non-scenario tested assumptions. The company shall test the sensitivity of results to understand the materiality of making alternate assumptions and follow the guidance discussed above on setting assumptions for sensitive behaviors.

F. Consistency with the CTE Level

1. All behaviors (i.e., dynamic, formulaic and non-scenario tested) should be consistent with the scenarios used in the CTE calculations (generally, the top 30% of the loss distribution) or the DR scenario, where applicable. To maintain such consistency, it is not necessary to iterate (i.e., successive runs of the model) in order to determine exactly which scenario results are included in the CTE measure. Rather, in light of the products being valued, the company should be mindful of the general characteristics of those scenarios likely to represent the tail of the loss distribution and consequently use prudent estimate assumptions for behavior that are reasonable and appropriate in such scenarios. For non-variable annuities, these “valuation” scenarios would typically display one or more of the following attributes:
 - a. Declining, increasing and/or volatile index values, where applicable.
 - b. Price gaps and/or liquidity constraints.
 - c. Volatile interest rates or persistently low interest rates.
2. The behavior assumptions should be logical and consistent both individually and in aggregate, especially in the scenario or scenarios that govern the results. In other words, the company should not set behavior assumptions in isolation, but give due consideration to other elements of the model. The interdependence of assumptions (particularly those governing customer behaviors) makes this task difficult and by definition requires professional judgment, but it is important that the model risk factors and assumptions:
 - a. Remain logically and internally consistent across the scenarios tested.
 - b. Represent plausible outcomes.
 - c. Lead to appropriate, but not excessive, asset requirements.
3. The company should remember that the continuum of “plausibility” should not be confined or constrained to the outcomes and events exhibited by historic experience.
4. Companies should attempt to track experience for all assumptions that materially affect their risk profiles by collecting and maintaining the data required to conduct credible and meaningful studies of contract holder behavior.

G. Additional Considerations and Requirements for Assumptions Applicable to Guaranteed Living Benefits

Experience for contracts without guaranteed living benefits may be of limited use in setting a lapse assumption for contracts with in-the-money or at-the-money guaranteed living benefits. Such experience may only be used if it is appropriate (e.g., lapse experience on contracts without a living benefit may have relevance to the early durations of contracts with living benefits) and relevant to the business.

H. Policy Loans

If contract loans are applicable for the block of business, the company shall determine cash flows for each projection interval for contract loan assets by modeling existing loan balances either explicitly or by substituting assets that are a proxy for contract loans (e.g., bonds, cash, etc.) subject to the following:

1. If the company substitutes assets that are a proxy for contract loans, the company must demonstrate that such substitution:

- a. Produces reserves that are no less than those that would be produced by modeling existing loan balances explicitly.
 - b. Complies with the contract holder behavior requirements stated in Section 10.A to Section 10.G above.
2. If the company models contract loans explicitly, the company shall:
- a. Treat contract loan activity as an aspect of contract holder behavior and subject to the requirements above in this section.
 - b. Assign loan balances either to exactly match each contract's utilization or to reflect average utilization over a model segment or sub-segments if the results are materially similar.
 - c. Model contract loan interest in a manner consistent with contract provisions and with the scenario. Include interest paid in cash as a positive contract loan cash flow in that projection interval, per Section 4.A.1.i, but do not include interest added to the loan balance as a contract loan cash flow. (The increased balance will require increased repayment cash flows in future projection intervals.)
 - d. Model contract loan principal repayments, including those that occur automatically upon death or surrender. Include contract loan principal repayments as a positive policy loan cash flow, per Section 4.A.1.i.
 - e. Model contract loan principal. Include additional contract loan principal as a negative contract loan cash flow, per Section 4.A.1.i (but do not include interest added to the loan balance as a negative policy loan cash flow).
 - f. Model any investment expenses allocated to contract loans and include them either with negative contract loan cash flows or insurance expense cash flows.

I. Non-Guaranteed Elements

Consistent with the definition in VM-01, Non-Guaranteed Elements (NGEs) are elements within a contract that affect contract costs or values and are not guaranteed or not determined at issue. NGEs consist of elements affecting contract holder costs or values that are both established and subject to change at the discretion of the insurer.

Examples of NGEs specific to non-variable annuities include but are not limited to the following: the credited rates on fixed accounts, index parameters (caps, spreads, participation rates, etc.), rider fees, rider benefit features being subject to change (rollup rates, rollup period, etc.), account value charges, and dividends under participating policies or contracts.

1. Except as noted below in Section 10.I.5, the company shall include NGE in the models to project future cash flows beyond the time the company has authorized their payment or crediting.
2. The projected NGE shall reflect factors that include, but are not limited to, the following (not all of these factors will necessarily be present in all situations):
 - a. The nature of contractual guarantees.
 - b. The company's past NGE practices and established NGE policies.

- c. The timing of any change in NGE relative to the date of recognition of a change in experience.
 - d. The benefits and risks to the company of continuing to authorize NGE.
3. Projected NGE shall be established based on projected experience consistent with how actual NGE are determined.
4. Projected levels of NGE in the cash-flow model must be consistent with the experience assumptions used in each scenario. Contract holder behavior assumptions in the model must be consistent with the NGE assumed in the model.
5. The company may exclude any portion of an NGE that is not based on some aspect of the contract's experience.
6. However, if the board has guaranteed a portion of the NGE into the future, the company must model that amount. In other words, the company cannot exclude from its model any NGE that the board has guaranteed for future years, even if it could have otherwise excluded them, based on this subsection.
7. The liability for contract holder dividends declared but not yet paid that has been established according to statutory accounting principles as of the valuation date is reported separately from the statutory reserve. The contract holder dividends that give rise to this dividend liability as of the valuation date may or may not be included in the cash-flow model at the company's option.
 - a. If the contract holder dividends that give rise to the dividend liability are not included in the cash-flow model, then no adjustment is needed to the resulting DR and/or SR.
 - b. If the contract holder dividends that give rise to the dividend liability are included in the cash-flow model, then the resulting DR and/or SR should be reduced by the amount of the dividend liability.
8. All projected cash flows associated with NGEs shall reflect margins for adverse deviations and estimation error in prudent estimate assumptions.

Section 11: Guidance and Requirements for Setting Prudent Estimate Mortality Assumptions

A. Overview

1. Intent

The guidance and requirements in this section apply to setting prudent estimate mortality assumptions when determining the DR and/or SR. The intent is for prudent estimate mortality assumptions to be based on facts, circumstances and appropriate actuarial practice.

2. Description

Prudent estimate mortality assumptions shall be determined by first developing expected mortality curves based on either available experience or published tables. Where necessary, margins shall be applied to the experience to reflect data uncertainty. The expected mortality curves shall then be adjusted based on the credibility of the experience used to determine the expected mortality curve. Section 11.B addresses guidance and requirements for determining expected mortality curves, and Section 11.C addresses guidance and requirements for adjusting the expected mortality curves to determine prudent estimate mortality.

Finally, the credibility-adjusted tables shall be adjusted for mortality improvement (where such adjustment is permitted or required) using the guidance and requirements in Section 11.D.

3. Business Segments

For purposes of setting prudent estimate mortality assumptions, the products falling under the scope of these requirements shall be grouped into business segments with different mortality assumptions. The grouping, at a minimum, should differentiate between payout annuities or deferred annuity contracts that contain GLBs, and deferred annuity contracts with no guaranteed benefits or only GMDBs. Where appropriate, the grouping should also differentiate between segments which are known or expected to contain contract holders with sociodemographic, geographic, or health factors reasonably expected to impact the mortality assumptions for the segment (e.g., annuitants drawn from different countries, geographic areas, industry groups, or impaired lives on individually underwritten contracts such as structured settlements). The grouping should also generally follow the pricing, marketing, management and/or reinsurance programs of the company.

Guidance Note: This paragraph contemplates situations where it may be appropriate to differentiate mortality assumptions by segment or even by contract due to varying sociodemographic, geographic, or health factors. Particularly, though not exclusively, in the context of group payout annuity contracts, companies may have credible, contract-specific mortality experience data or relevant pooled data from annuitants drawn from similar industries or geographies that may be used to sub-divide inforce blocks into business segments for purposes of setting prudent estimate mortality assumptions.

For example, a company may sell group PRT contracts both to union plans in the U.S. and to private single-employer plans in another country. While both are “PRT contracts,” it would be appropriate to differentiate them for mortality assumption purposes, similar to how payout annuities vs. deferred annuities are distinguished.

4. Margin for Data Uncertainty

The expected mortality curves that are determined in Section 11.B may need to include a margin for data uncertainty. The margin could be in the form of an increase or a decrease in mortality, depending on the business segment under consideration. The margin shall be applied in a direction (i.e., increase or decrease

in mortality) that results in a higher reserve. A sensitivity test may be needed to determine the appropriate direction of the provision for uncertainty to mortality. The test could be a prior year mortality sensitivity analysis of the business segment or an examination of current representative cells of the segment.

For purposes of this section, if mortality must be increased (decreased) to provide for uncertainty, the business segment is referred to as a mortality (longevity) segment.

It may be necessary, because of a change in the mortality risk profile of the segment, to reclassify a business segment from a mortality (longevity) segment to a longevity (mortality) segment to the extent compliance with this section requires such a reclassification.

B. Determination of Expected Mortality Curves

1. Experience Data

In determining expected mortality curves, the company shall use actual experience data directly applicable to the business segment (i.e., direct data) if it is available. In the absence of direct data, the company should then look to use data from a segment that is similar to the business segment (i.e., other than direct experience). See Section 11.B.2 for additional considerations. Finally, if there is no data, the company shall use the applicable table, as required in Section 11.B.3.

2. Data Other Than Direct Experience

Adjustments shall be applied to the data to reflect differences between the business segments, and margins shall be applied to the adjusted expected mortality curves to reflect the data uncertainty associated with using data from a similar but not identical business segment.

To the extent the mortality of a business segment is reinsured, any mortality charges that are consistent with the company's own pricing and applicable to a substantial portion of the mortality risk also may be a reasonable starting point for the determination of the company's expected mortality curves.

3. Little or No Data Requirements

When little or no experience or information is available on a business segment, the company shall use expected mortality curves that are no less conservative than the mortality assumptions listed in Section 6.C.8. If mortality experience on the business segment is expected to be atypical (e.g., demographics of target markets are known to have higher [lower] mortality than typical), these "no data" mortality requirements may not be adequate.

4. Additional Considerations Involving Data

The following considerations shall apply to mortality data specific to the business segment for which assumptions are being determined (i.e., direct data discussed in Section 11.B.1 or other than direct data discussed in Section 11.B.2).

a. Underreporting of Deaths

Mortality data shall be examined for possible underreporting of deaths. Adjustments shall be made to the data if there is any evidence of underreporting. Alternatively, exposure by lives or amounts on contracts for which death benefits were in the money may be used to determine expected mortality curves. Underreporting on such exposures should be minimal; however, this reduced subset of data will have less credibility.

b. Experience by Contract Duration

Experience of a mortality segment shall be examined to determine if mortality by contract duration increases materially due to selection at issue. In the absence of information, the company shall assume that expected mortality will increase by contract duration for an appropriate select period. As an alternative, if the company determines that mortality is affected by selection, the company could apply margins to the expected mortality in such a way that the actual mortality modeled does not depend on contract duration.

c. Modification and Relevance of Data

Even for a large company, the quantity of life exposures and deaths are such that a significant amount of smoothing may be required to determine expected mortality curves from mortality experience. Expected mortality curves, when applied to the recent historic exposures (e.g., three to seven years), should not result in an estimate of aggregate number of deaths less (greater) than the actual number deaths during the exposure period for mortality (longevity) segments.

In determining expected mortality curves (and the credibility of the underlying data), older data may no longer be relevant. The “age” of the experience data used to determine expected mortality curves should be documented.

d. Other Considerations

In determining expected mortality curves, consideration should be given to factors that include, but are not limited to, trends in mortality experience, trends in exposure, volatility in year-to-year A/E mortality ratios, mortality by lives relative to mortality by amounts, changes in the mix of business and product features that could lead to mortality selection.

C. Adjustment for Credibility to Determine Prudent Estimate Mortality

1. Adjustment for Credibility

The expected mortality curves determined in Section 11.B shall be adjusted based on the credibility of the experience used to determine the curves in order to arrive at prudent estimate mortality. The adjustment for credibility shall result in blending the expected mortality curves including margins for uncertainty with the mortality assumptions described in Section 11.B.3. The approach used to adjust the curves shall suitably account for credibility.

Guidance Note: For example, when credibility is zero, an appropriate approach should result in a mortality assumption consistent with 100% of the industry mortality assumption described in Section 11.B.3 used in the blending.

2. Adjustment of Industry Mortality for Improvement

For purposes of the adjustment for credibility, the industry mortality table for a mortality segment may be and the industry mortality table for a longevity segment must be adjusted for mortality improvement. Such adjustment shall reflect the mortality improvement scale described in Section 11.B.3 from the effective date of the respective industry mortality table to the experience weighted average date underlying the data used to develop the expected mortality curves.

3. Credibility Procedure

The credibility procedure used shall:

- a. Produce results that are reasonable.
- b. Not tend to bias the results in any material way.
- c. Be practical to implement.
- d. Give consideration to the need to balance responsiveness and stability.
- e. Take into account not only the level of aggregate claims but the shape of the mortality curve.
- f. Contain criteria for full credibility and partial credibility that have a sound statistical basis and be appropriately applied.

4. Further Adjustment of the Credibility-Adjusted Table for Mortality Improvement

The credibility-adjusted table used for mortality segments may be and the credibility adjusted table used for longevity segments must be adjusted for mortality improvement using the applicable mortality improvement scale described in Section 11.B.3 from the experience weighted average date underlying the company experience used in the credibility process to the valuation date.

Any adjustment for mortality improvement beyond the valuation date is discussed in Section 11.D.

D. Future Mortality Improvement

The mortality assumption resulting from the requirements of Section 11.C shall be adjusted for mortality improvements beyond the valuation date if such an adjustment would serve to increase the resulting DR or SR. If such an adjustment would reduce the DR or SR, such assumptions are permitted, but not required. In either case, the assumption must be based on current relevant data with a margin for uncertainty (increasing assumed rates of improvement if that results in a higher reserve or reducing them otherwise).

Section 12: Other Guidance and Requirements for Assumptions

A. Overview

This section provides guidance and requirements in general for setting prudent estimate assumptions when determining either the DR or SR. It also provides specific guidance and requirements for expense assumptions.

B. General Assumption Requirements

1. The company shall use prudent estimate assumptions for risk factors that are not stochastically modeled by applying margins to the anticipated experience assumptions if such risk factors have been categorized as material risks by following Section 1.B Principle 3 and requirements in Section 12.C.
2. The company shall establish the prudent estimate assumptions for risk factors in compliance with the requirements in Section 12 of Model #820 and must periodically review and update the assumptions as appropriate in accordance with these requirements.
3. The company shall model the following risk factors stochastically unless the company elects the stochastic exclusion test defined in Section 7.A or single scenario test defined in Section 7.E:
 - a. Interest rate movements (i.e., Treasury interest rate curves).
 - b. Equity performance (e.g., Standard & Poor's 500 index [S&P 500] returns and returns of other equity investments).
4. If the company elects to stochastically model risk factors in addition to the economic scenarios, the requirements in this section for determining prudent estimate assumptions for these risk factors do not apply.

It is expected that companies will not stochastically model risk factors other than the economic scenarios, such as contract holder behavior or mortality, until VM-22 has more specific guidance and requirements available. Companies shall discuss with domiciliary regulators if they wish to stochastically model other risk factors.

5. The company shall use its own experience, if relevant and credible, to establish an anticipated experience assumption for any risk factor. To the extent that company experience is not available or credible, the company may use industry experience or other data to establish the anticipated experience assumption, making modifications as needed to reflect the circumstances of the company.
 - a. For risk factors (such as mortality) to which statistical credibility theory may be appropriately applied, the company shall establish anticipated experience assumptions for the risk factor by combining relevant company experience with industry experience data, tables or other applicable data in a manner that is consistent with credibility theory and accepted actuarial practice.
 - b. For risk factors (such as utilization of guaranteed living benefits) that do not lend themselves to the use of statistical credibility theory, and for risk factors (such as some of the lapse assumptions) to which statistical credibility theory can be appropriately applied but cannot currently be applied due to lack of industry data, the company shall establish anticipated experience assumptions in a manner that is consistent with accepted actuarial practice and that reflects any available relevant company experience, any available relevant industry experience, or any other experience data that are available and relevant. Such techniques

include:

- i. Adopting standard assumptions published by professional, industry or regulatory organizations to the extent they reflect any available relevant company experience or reasonable expectations.
 - ii. Applying factors to relevant industry experience tables or other relevant data to reflect any available relevant company experience and differences in expected experience from that underlying the base tables or data due to differences between the risk characteristics of the company experience and the risk characteristics of the experience underlying the base tables or data.
 - iii. Blending any available relevant company experience with any available relevant industry experience and/or other applicable data using weightings established in a manner that is consistent with accepted actuarial practice and that reflects the risk characteristics of the underlying contracts and/or company practices.
- c. For risk factors that have limited or no experience or other applicable data to draw upon, the assumptions shall be established using sound actuarial judgment and the most relevant data available, if such data exists.
 - d. For any assumption that is set in accordance with the requirements of Section 12.B.5.c, the qualified actuary to whom responsibility for this group of contracts is assigned shall use sensitivity testing and disclose the analysis performed to ensure that the assumption is set at the conservative end of the plausible range.
 - e. The qualified actuary, to whom responsibility for this group of contracts is assigned, shall annually review relevant emerging experience for the purpose of assessing the appropriateness of the anticipated experience assumption. If the results of statistical or other testing indicate that previously anticipated experience for a given factor is inadequate, then the qualified actuary shall set a new, adequate, anticipated experience assumption for the factor.
6. The company shall sensitivity test material risk factors that are not stochastically modeled and examine the impact on the stochastic reserve. The company shall update the sensitivity tests periodically as appropriate. The company may update the tests less frequently, but no less than every 3 years, when the tests show less sensitivity of the stochastic reserve to changes in the assumptions being tested or the experience is not changing rapidly. Providing there is no material impact on the results of the sensitivity testing, the company may perform sensitivity testing:
- a. Using samples of the contracts in force rather than performing the entire valuation for each alternative assumption set.
 - b. Using data from prior periods.
- Guidance Note:** Sensitivity testing every risk factor on an annual basis is not required. For some risk factors, it may be reasonable, in lieu of sensitivity testing, to employ statistical measures for margins, such as adding one or more standard deviations to the anticipated experience assumption.
7. The company shall vary the prudent estimate assumptions from scenario to scenario within the stochastic reserve calculation in an appropriate manner to reflect the scenario-dependent risks.

C. Assumption Margins

The company shall include margins to provide for adverse deviations and estimation error in the prudent estimate assumptions for all risk factors that are not stochastically modeled or prescribed, subject to the following:

1. The level of margin applied to the anticipated experience assumptions may be determined in aggregate or independently as discussed in Section 1.B Principle 3. It is not permissible to set a margin less toward the conservative end of the spectrum to recognize, in whole or in part, implicit or prescribed margins that are present, or are believed to be present, in other risk factors.

Risks that are stochastically modeled (e.g., interest rates, equity returns) or have prescribed margins or guardrails (e.g., assets, revenue sharing) shall be considered material risks. Other risks generally considered to be material include, but are not limited to, mortality, contract holder behavior, maintenance and overhead expenses, inflation and implied volatility. In some cases, the list of material risks may also include acquisition expenses, partial withdrawals, policy loans, annuitizations, account transfers and deposits, and/or option elections that contain an element of anti-selection.

2. The greater the uncertainty in the anticipated experience assumption, the larger the required margin, with the margin added or subtracted as needed to produce a larger DR or SR than would otherwise result. For example, the company shall use a larger margin when:
 - a. The experience data have less relevance or lower credibility.
 - b. The experience data are of lower quality, such as incomplete, internally inconsistent or not current.
 - c. There is doubt about the reliability of the anticipated experience assumption, such as, but not limited to, recent changes in circumstances or changes in company policies.
 - d. There are constraints in the modeling that limit an effective reflection of the risk factor.
3. In complying with the sensitivity testing requirements in Section 12.B.6 above, greater analysis and more detailed justification are needed to determine the level of uncertainty when establishing margins for risk factors that produce greater sensitivity on the stochastic reserve.
4. A margin is permitted but not required for assumptions that do not represent material risks.
5. A margin should reflect the magnitude of fluctuations in historical experience of the company for the risk factor, as appropriate.
6. The company shall apply the method used to determine the margin consistently on each valuation date but is permitted to change the method from the prior year if the rationale for the change and the impact on the stochastic reserve is disclosed.

D. Expense Assumptions

1. General Prudent Estimate Expense Assumption Requirements

In determining prudent estimate expense assumptions, the company:

- a. May spread certain information technology development costs and other capital expenditures over a reasonable number of years in accordance with accepted statutory accounting principles as defined in the Statements of Statutory Accounting Principles.

Guidance Note: Care should be taken with regard to the potential interaction with the inflation assumption below.

- b. Shall assume that the company is a going concern.
- c. Shall choose an appropriate expense basis that properly aligns the actual expense to the assumption. If values are not significant, they may be aggregated into a different base assumption.

Guidance Note: For example, death benefit expenses should be modeled with an expense assumption that is per death incurred.

- d. Shall reflect the impact of inflation.
- e. Shall not assume future expense improvements.
- f. Shall not include assumptions for federal income taxes (and expenses paid to provide fraternal benefits in lieu of federal income taxes) and foreign income taxes.
- g. Shall use assumptions that are consistent with other related assumptions.
- h. Shall use fully allocated expenses.

Guidance Note: Expense assumptions should reflect the direct costs associated with the block of contracts being modeled, as well as indirect costs and overhead costs that have been allocated to the modeled contracts.

- i. Shall allocate expenses using an allocation method that is consistent across company lines of business. Such allocation must be determined in a manner that is within the range of actuarial practice and methodology and consistent with applicable ASOPs. Allocations may not be done for the purpose of decreasing the stochastic reserve.
- j. Shall reflect expense efficiencies that are derived and realized from the combination of blocks of business due to a business acquisition or merger in the expense assumption only when any future costs associated with achieving the efficiencies are also recognized.

Guidance Note: For example, the combining of two similar blocks of business on the same administrative system may yield some expense savings on a per unit basis, but any future cost of the system conversion should also be considered in the final assumption. If all costs for the conversion are in the past, then there would be no future expenses to reflect in the valuation.

- k. Shall reflect the direct costs associated with the contracts being modeled, as well as an appropriate portion of indirect costs and overhead (i.e., expense assumptions representing fully allocated expenses should be used), including expenses categorized in the annual statement as “taxes, licenses and fees” (Exhibit 3 of the annual statement) in the expense assumption.

1. Shall include acquisition expenses associated with business in force as of the valuation date and significant non-recurring expenses expected to be incurred after the valuation date in the expense assumption.
 - m. For contracts sold under a new policy form or due to entry into a new product line, the company shall use expense factors that are consistent with the expense factors used to determine anticipated experience assumptions for contracts from an existing block of mature contracts taking into account:
 - i. Any differences in the expected long-term expense levels between the block of new contracts and the block of mature contracts.
 - ii. That all expenses must be fully allocated as required under Section 12.D.1.h above.
2. Margins for Prudent Estimate Expense Assumptions

The company shall determine margins for expense assumptions following Section 12.C.

Section 13: Allocation of Aggregate Reserves to the Contract Level

Section 3.H states that the aggregate reserve shall be allocated to the contracts falling within the scope of these requirements. That allocation should be done for both the pre- and post-reinsurance ceded reserves. Contracts that have passed the stochastic exclusion test as defined in Section 7.A will not be included in the allocation of the aggregate reserve; however, contracts that have passed the Single Scenario Test as defined in Section 7.E and for which a DR is calculated, are subject to the allocation methodology described in this section. Allocation calculations shall be done separately for the DR and SR, and for different reserving categories that have not been aggregated pursuant to Section 3.F.2. To the extent that aggregation is done across multiple model segments, the allocation calculations shall be done separately for each model segment. The method used to allocate the aggregate reserve post aggregation benefit to each model segment shall be disclosed in the VM-31 report.

Under the allocation methodology described in this section, the reserve held for any contract will be no less than the cash surrender value provided under that contract, after consideration of any reinsurance. Additionally, the reserve held for a Payout Annuity contract (whether life-contingent or not) will be no less than the present value of the liability cash flows provided under the contract, after consideration of any reinsurance, discounted using the NAER described in Section 13.B.1 or 13.B.2, as applicable. The allocation methodology is a formulaic approach that is designed, generally, to allocate the excess aggregate reserves based on a measure of the risk and, therefore, to generally allocate a greater portion of the excess aggregate reserves to contracts that have greater risk. For example, an indexed annuity contract with a high benefit GLWB will typically have a larger allocated excess reserve than an otherwise identical indexed annuity contract with a low benefit GLWB or no GLWB.

A. Contract-level reserve

The contract-level reserve for each contract shall be the sum of the following:

1. The contract's minimum allocation value (MAV), as defined in Section 13.C.
2. The contract's allocated excess reserve (AER), as defined in Section 13.D.

B. Scenario actuarial present value (APV)

1. For a group of contracts for which a company does not calculate a DR pursuant to Section 7.E, the Scenario APV for each contract is equal to the discounted liability cash flows at the NAER, pursuant to requirements in Section 4, for the scenario that produces the aggregate scenario reserve for the group that is closest to, but not greater than the SR defined in Section 3.D.

If the Direct Iteration Method is used to satisfy the requirements in Section 4.B.1, then the company shall:

- a. Determine a path of NAER for each model segment that reflects the net general account portfolio rate in each projection interval (i.e., monthly, quarterly, annually), which will depend primarily on:
 - i. Projected net investment earnings from the portfolio of starting assets.
 - ii. Pattern of projected asset cash flows from the starting assets and subsequent reinvestment assets.
 - iii. Pattern of net liability cash flows.
 - iv. Projected net investment earnings from reinvestment assets.

- b. The company shall calculate the NAER as the ratio of net investment earnings divided by invested assets subject to the requirements in i through iv below. All items reflected in the ratio are consistent with statutory asset valuation and accrual accounting, including reflection of due, accrued or unearned investment income where appropriate.
 - i. The NAER for each projection interval is calculated in a manner that is consistent with the timing of cash flows and length of the projection interval of the related cash-flow model.
 - ii. Net investment earnings include:
 - a) Gross investment income plus capital gains and losses, minus prescribed default costs, and minus investment expenses.
 - b) Income from derivative asset programs, subject to the requirements in Sections 4 and 9 of VM-22.
 - iii. Invested assets are determined in a manner that is consistent with the timing of cash flows within the cash-flow model and the length of the projection interval of the cash-flow model.
 - iv. The annual statement value of derivative instruments or a reasonable approximation thereof is in invested assets.
- 2. For a group of contracts for which a company calculates a DR pursuant to Section 7.E, the Scenario APV for each contract is equal to the discounted liability cash flows at the NAER in the single scenario used to calculate the reserve.
- 3. For projecting future liability cash flows under either Section 13.B.1 or 13.B.2, as applicable, assume the same liability assumptions that were used to calculate the SR defined in Section 3.D.

C. Minimum allocation value (MAV)

- 1. For Payout Annuity contracts, the MAV is equal to the greater of:
 - a. The Scenario APV for the contract, or
 - b. The cash surrender value provided under the contract, if any.
- 2. For Account Value Based Annuity contracts, the MAV is equal to the cash surrender value provided under the contract, if any, otherwise zero.
- 3. For contracts in the Longevity Reinsurance Reserving Category, the MAV is equal to 2% of the scheduled longevity benefits payable by the benefit provider within the next 12 months from the date of valuation, as defined by Section 4.A.1.

D. Allocated excess reserve (AER)

- 1. For each contract in a group of contracts, the AER is determined by allocating the excess, if any, of the group's aggregate reserve over the group's aggregate MAV to the contract in proportion to the excess of the Scenario APV over the MAV for such contract.
- 2. If the Scenario APV for any contract is less than the MAV, then the excess Scenario APV to be used for allocating the excess aggregate reserve to that contract shall be floored at zero.

3. If all contracts in the group have an excess Scenario APV that is floored at zero, then use the MAV to allocate any excess aggregate reserve over the aggregate MAV.
4. If a group's aggregate reserve is less than the group's aggregate MAV, that difference should be allocated to life contingent contracts in proportion to each life contingent contract's MAV to the sum of the life contingent contracts MAV. All contracts are floored at their cash surrender value.

E. Example

As a hypothetical example, consider a company with the results of the following eight contracts in reserving categories:

Table 13.1.A: Hypothetical Sample Allocation of Aggregate Reserve: Group A, Account Value Based Annuity Contracts

Contract	Example Product Type	CSV	Excess (floored)			Excess of Aggregate		Allocated	Total Contract Level Reserve
			Minimum Scenario Allocation	of Scenario APV over MAV	Aggregate Reserve	Reserve over Aggregate MAV	(7) = (4) x [(6 Total)] / (4 Total)]		
			(1)	(2)	(3) *	(4) = Max[(2)-(3),0]	(5)	(8) = (3)+(7)	
1	Individual annuity w/ no GLWB	95.0	91.0	95.0	-			-	95.0
2	Indexed annuity w/ low benefit GLWB	92.0	98.0	92.0	6.0			6.3	98.3
3	Indexed annuity w/ medium benefit GLWB	90.0	104.0	90.0	14.0			14.7	104.7
4	Indexed annuity w/ high benefit GLWB	88.0	111.0	88.0	23.0			24.1	112.1
Total		365.0	404.0	365.0	43.0	410.0	45.0	45.0	410.0

* MAV for Payout Annuity contracts equals $\text{Max}[(1), (2)]$. MAV for Account Value Based Annuity contracts equals (1) if any, otherwise zero.

Table 13.1.B: Hypothetical Sample Allocation of Aggregate Reserve: Group B, Payout Annuity Contracts that do not have Cash Surrender Values

Contract	Example Product Type	CSV	Excess (floored)			Excess of Aggregate		Allocated	Total Contract Level Reserve
			Minimum Scenario Allocation	of Scenario APV over MAV	Aggregate Reserve	Reserve over Aggregate MAV	(7) = (3) x [(6 Total)] / (3 Total)]		
			(1)	(2)	(3) *	(4) = Max[(2)-(3),0]	(5)	(8) = (3)+(7) **	
1	Fixed Life Contingent payout annuity	-	91.0	91.0	-			1.4	92.4
2	Fixed Life Contingent payout annuity	-	111.0	111.0	-			1.6	112.6
3	Fixed Non-life Contingent payout annuity	-	98.0	98.0	-			1.5	99.5
4	Fixed Non-life Contingent payout annuity	-	104.0	104.0	-			1.5	105.5
Total		-	404.0	404.0	-	410.0	6.0	6.0	410.0

* MAV for Payout Annuity contracts equals $\text{Max}[(1), (2)]$. MAV for Account Value Based Annuity contracts equals (1) if any, otherwise zero.

** Because all contracts have an excess Scenario APV of 0, the AER is allocated in proportion to MAV.

Guidance Note: The Scenario actuarial present value (APV) in the section above is separate from the Guarantee Actuarial Present Value (GAPV) referred to in the additional standard projection amount calculation in VM-21. The GAPV is only applicable to guaranteed minimum benefits and uses prescribed liability assumptions. In contrast, the Scenario APV in this section applies to the entire contract, irrespective of whether guaranteed benefits are attached, and uses company prudent estimate liability assumptions.

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