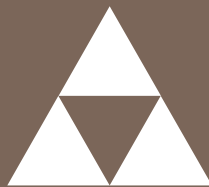


A PUBLIC POLICY PRACTICE NOTE

# The Application of C-3 Phase II and Actuarial Guideline XLIII

*March 2011*

American Academy of Actuaries  
Variable Annuity Practice Note Work Group



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AMERICAN ACADEMY *of* ACTUARIES

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Developed by the Variable Annuity Practice Note Work Group  
of the American Academy of Actuaries



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The American Academy of Actuaries is a professional association with over 17,000 members, whose mission is to assist public policymakers by providing leadership, objective expertise, and actuarial advice on risk and financial security issues. The Academy also sets qualification, practice, and professionalism standards for actuaries in the United States.

Practice Note for the Application of C-3 Phase II and Actuarial Guideline XLIII

This practice note was prepared by the Academy's VA Practice Note Work Group, a work group of the Academy's Life Practice Note Steering Committee. It is an update of both the July 2009 C-3 Phase II and Actuarial Guideline XLIII practice note and its December 2009 addendum.

This updated practice note represents a description of practices believed by the VA Practice Note Work Group to be commonly employed by actuaries in the United States in 2011. This practice note is not a promulgation of the Actuarial Standards Board, is not an actuarial standard of practice, is not binding upon any actuary and is not a definitive statement as to what constitutes generally accepted practice in the area under discussion. Events occurring subsequent to this publication of the practice note may make the practices described in this practice note irrelevant or obsolete.

This practice note follows a structure similar to the previous C-3 Phase II and Actuarial Guideline XLIII practice note and utilizes most of the questions and answers from those notes. This practice note has been organized into a "Question & Answer" format, providing answers to a variety of issues companies may need to address when implementing C-3 Phase II and Actuarial Guideline XLIII (referred to as "AG 43" throughout this practice note). The primary changes from the July 2009 C-3 Phase II and Actuarial Guideline XLIII Practice Note are the incorporation of the December 2009 Addendum, updates to reflect emerging practice and the inclusions of new questions.

The National Association of Insurance Commissioner's (NAIC) website contains a list of questions that were received by the NAIC relative to implementing C-3 Phase II. The questions and suggested answers were posted on the NAIC website in January 2006 and can be found at:

[http://www.naic.org/documents/committees\\_e\\_capad\\_lrbc\\_c3\\_phasel1\\_questions.doc](http://www.naic.org/documents/committees_e_capad_lrbc_c3_phasel1_questions.doc).

Due to changes in the Risk-Based Capital (RBC) calculation, some line numbers and other references in this list of questions are outdated, but the information is still valid.

Additional information can be found on the NAIC website at:

[http://www.naic.org/committees\\_e\\_capad\\_lrbc\\_c3\\_market.htm](http://www.naic.org/committees_e_capad_lrbc_c3_market.htm).

Please direct any comments to the Academy's Life Policy Analyst at [lifepolicyanalyst@actuary.org](mailto:lifepolicyanalyst@actuary.org) [mailto:](mailto:lifepolicyanalyst@actuary.org).

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## 1) DETAILS ON PRODUCTS COVERED

### Q1.1 What are some examples of products that are covered by the AG 43 and C-3 Phase II requirements?

A: The scope sections of both AG 43 and C-3 Phase II requirements indicate they apply to the following examples of benefit features:

- (a) AG 43 applies to variable deferred annuity products subject to the Commissioner's Annuity Reserve Valuation Method (CARVM) whether or not they include Guaranteed Living Benefits (GLBs) or Guaranteed Minimum Death Benefits (GMDBs), as defined in the guideline. C-3 Phase II applies to individual VA products whether or not they include GLBs or GMDBs. Examples of GMDBs include return of premium, rollup of premiums less withdrawals at stated rates of interest, ratchets such as maximum anniversary values, resets, and enhanced death benefits (e.g., additional death benefit equal to 40% of the gain in the contract). Examples of GLBs include guaranteed minimum accumulation benefits (GMABs), guaranteed minimum income benefits (GMIBs) (e.g., annuitization at stated income rates of the larger of the account value and a rollup of premiums less withdrawals at stated rates of interest), and guaranteed minimum withdrawal benefits (GMWBs). GLBs may also include a minimum waiting period following issue or minimum attained age before benefit options may be elected.
- (b) Group life coverages that provide GMDB or GLB amounts for mutual funds, even if the company does not provide the funds to which these guarantees relate.
- (c) Variable universal life (VUL) products, to the extent they include GLBs not having a separate reserve standard, and then only to the extent of establishing a reserve or capital requirement for those benefits. Once a principle-based approach has been implemented for VUL products, VUL products may be expected to be included under that approach for new issues after the effective date of that approach, and removed from AG 43 and C-3 Phase II. More details about the extent to which AG 43 would apply and how it would apply are discussed in AG 43.
- (d) Group annuities (e.g., those covering participants of 401(k) plans), but only if they also contain guaranteed living or death benefits.
- (e) Any variable immediate annuity product, including those containing Guaranteed Payout Annuity Floor (GPAF) benefits.
- (f) Group life contracts that wrap a GMDB around a mutual fund.

**Q1.2 Are there examples of individual or group, life or annuity contracts that have a GMDB or other equity investment guarantees and are excluded from the AG 43 and C3 Phase II requirements?**

A: VUL products often contain minimum guaranteed death benefits, regardless of fund performance, as long as stated minimum premium payment rules have been satisfied by the policyholder. To the extent that reserve requirements covering these minimum guaranteed benefits are prescribed elsewhere, such as in Actuarial Guideline 37, AG 43 and C-3 Phase II would not apply.

Fixed indexed annuities (FIAs) can theoretically provide more extensive equity investment guarantees, including return of premium GMDBs or roll-up guarantees depending on whether the annuitant lives or dies. To the extent that reserve requirements explicitly covering these minimum guaranteed benefits are prescribed elsewhere, such as in Actuarial Guideline 35, AG 43 and C-3 Phase II would not apply. However, even if there is not an explicit reserve requirement, C-3 Phase II and AG 43 may not apply if the guarantees are not similar in nature to GMDBs or VAGLBs (variable annuity guaranteed living benefits).

**Q1.3 Modified guaranteed annuities are also excluded from covered products. What constitutes a modified guaranteed annuity?**

A: As is defined in the NAIC Modified Guaranteed Annuity Model Regulation, a “Modified guaranteed annuity” means a deferred annuity contract, the underlying assets of which are held in a separate account, and the values of which are guaranteed if held for specified periods. The contract contains nonforfeiture values that are based upon a market-value adjustment formula if held for shorter periods.

**Q1.4 Do Group Deferred Variable Annuities without GMDBs or Guaranteed Living Benefits (GLBs) fall under the scope of AG 43?**

A. AG 43 applies to all variable annuities subject to CARVM, whether or not they have guarantees, and it also applies to group annuity contracts that are not subject to CARVM, but only if those contracts contain guarantees similar in nature to GMDBs, VAGLBs, or any combination thereof. In the case of group variable annuity contracts without guarantees that are similar in nature to GMDBs or VAGLBs, the actuary should consider whether the contract being considered falls under the scope of CARVM in the Standard Valuation law

**Q1.5 How would the AG 43 and C-3 Phase II requirements be applied to a variable annuity product with a GMDB or GLB that has both variable and Modified Guaranteed subaccounts, given that the requirements do not apply to Modified Guaranteed Annuities?**

A: The C-3 Phase II documentation states in its scope\_section, “all variable annuities except for Modified Guaranteed Annuities” are included. AG 43 also excludes Modified Guaranteed Annuities, but does state that it applies to

contracts that include one or more subaccounts containing features similar in nature to those contained in Modified Guaranteed Annuities.

One approach under C-3 Phase II could be to view a variable annuity with one or more MGA subaccounts as being covered under the first category of the C-3 Phase II scope. An alternative approach could be to view the product as belonging to the third category which includes “all other products that contain guarantees similar in nature to GMDBs or VAGLBs where there is no explicit reserve requirement (other than AG 43) for such guarantees.” In this case, the scope paragraph of C-3 Phase II states: “If such a benefit is offered as a part of a contract that has an explicit reserve requirement other than AG VACARVM, the methods of this capital requirement shall be applied to the benefit on a standalone basis.”

Under the alternative approach, some actuaries may divide the product into three pieces:

- (a) The non-MGA subaccounts with any associated GMDBs and VAGLBs;
- (b) The MGA subaccounts; and
- (c) Any GMDB and VAGLB associated with the MGA subaccounts.

The C-3 Phase II requirements would apply to the first and third components.

**Q1.6 Are group annuity products such as those funding 401(k), 457, 403(b), etc. plans that do not have guaranteed living or death benefits covered by the AG 43 and C-3 Phase II requirements?**

A: No. Group annuities without death benefit or living benefit guarantees are outside the scope specified in AG 43 and C-3 Phase II.

**Q 1.7 Does AG 43 apply to synthetic Guaranteed Interest Contracts (GICs)?**

A: AG 43 does not apply to synthetic GICs since a synthetic GIC is not one of the types of products included under the AG 43 scope. However AG 43 is applicable to synthetic GIC contracts that contain guaranteed benefits similar in nature to GMDBs or VAGLBs. Section II(A)4)a) of the AG 43 Scope states that in this case “the Guideline shall be applied to the benefit on a standalone basis (i.e., for the purposes of the reserve calculation, the benefit shall be treated as a separate contract).”

**Q1.8 Are group life contracts that wrap guaranteed death benefits or living benefits around mutual funds that are offered by another company covered under the AG 43 and the C-3 Phase II requirements?**

A: Some actuaries believe this is what is anticipated by the phrase “products that contain guarantees similar in nature to GMDBs or VAGLBs, even if the insurer does not offer the mutual funds or variable funds to



which these guarantees relate” in AG 43, and by the nearly identical wording in the C-3 Phase II requirements.

Footnote 2 to the C-3 Phase II Scope and Footnote 5 to the AG 43 scope both state: “For example, a group life contract that wraps a GMDB around a mutual fund would generally fall under the scope of this requirement since there is not an explicit reserve requirement for this type of group life contract.”

**Q1.9 Are risk-based capital (RBC) and statutory reserves for variable life products containing either guaranteed death benefits or guaranteed living benefits determined under the AG 43 and C-3 Phase II requirements?**

A: RBC and statutory reserves for variable life products containing only guaranteed death benefits for which existing reserve requirements exist are determined following those existing requirements. If guaranteed living benefits are included in a variable life product or there are no requirements for RBC or statutory reserve determination that are otherwise prescribed, the AG 43 and C-3 Phase II requirements are applied on a “standalone basis,” as described therein and in the answer to question Q1.12.

**Q1.10 Does AG 43 apply to Guaranteed Minimum Accumulations Benefits (GMABs) or Guaranteed Minimum Income Benefits (GMIBs) embedded in Variable Universal Life (VUL) contracts?**

A. AG 43 Footnote 5 indicates that the Guideline may apply to GMABs and GMIBs in VUL contracts if these benefits are similar in nature to VAGLBs. Footnote 5 also indicates that “the Guideline would generally only apply to the VAGLB-type benefit, since there is an explicit reserve requirement that applies to the variable life contract.”

**Q1.11 Covered products are defined to include “all other products that contain guarantees similar in nature to GMDBs or VAGLBs.” How would that phrase be interpreted?**

A: Some actuaries believe the quoted phrase means that such a guarantee provides a minimum death or living benefit to a contractholder that relates to benefits derived from funds for which investment risk is ordinarily borne by the contractholder. Such funds could be held in a life insurer’s separate account or in mutual funds, whether or not they are owned or managed by the party making the guarantees.

Footnote 1 to the C-3 Phase II Scope and footnote 4 to the AG 43 Scope give guidance on this point: “Any product or benefit design that does not clearly fit the Scope should be evaluated on a case-by-case basis taking into consideration factors that include, but are not limited to, the nature of the guarantees, the definitions of GMDB and VAGLB and whether the contractual amounts paid in the absence of the guarantee are based on the investment performance of a market-value fund or market-value index (whether or not part of the company’s separate account).”

**Q1.12 It is stated in the requirements that if a guaranteed benefit “similar in nature to GMDBs or VAGLBs” is offered as part of a contract that has an explicit reserve requirement other than AG 43, the GMDB or VAGLB feature for which there is no explicit reserve requirement shall have RBC and reserves determined under C-3 Phase II and AG 43 on a standalone basis. How are the AG 43 and C-3 Phase II requirements determined on a standalone basis for such a guaranteed benefit?**

A: Some actuaries believe that to be “similar in nature to GMDBs or VAGLBs” means that the guaranteed benefit should be in lieu of, or supplemental to, a benefit that is dependent upon the growth of contractholder premiums that have been invested in separate accounts, mutual funds similar to the benefit provided by variable annuity products, or other market value funds or market indexed funds. Thus, these actuaries believe that applying the requirements on a “standalone basis” means that the projections required to calculate the Conditional Tail Expectation (CTE) Amount for AG 43 and the Total Asset Requirement (TAR) for C-3 Phase II should only reflect the revenues, benefit costs and expenses directly related to these benefits. Of course, the funds in which the premiums have been invested would usually also be projected, but only for purposes of determining the guaranteed benefits and to determine the excess, if any, of the guaranteed benefit over what would have been provided in the absence of the guarantee for purposes of calculating benefit costs

The scope section of AG 43 states “If such a benefit is offered as part of a contract that has an explicit reserve requirement other than AG 43 and that benefit does not currently have an explicit reserve requirement:

- (a) The Guideline shall be applied to the benefit on a standalone basis (i.e., for purposes of the reserve calculation, the benefit shall be treated as a separate contract);
- (b) The reserve for the underlying contract is determined according to the explicit reserve requirement; and
- (c) The reserve held for the contract shall be the sum of a) and b).”

The C-3 Phase II Scope states that “If such a benefit is offered as part of a contract that has an explicit reserve requirement other than AG VACARVM, the methods of this capital requirement shall be applied to the benefit on a standalone basis.”

**Q1.13 Does a General Account annuity product incorporating minimum death or living benefits and having a cash value minimum floor established by compliance with the Standard Nonforfeiture Law, but having amounts credited to it based on the investment performance of a segregated portfolio of assets, such as certain types of bonds, fall under the AG 43 and C-3 Phase II requirements?**

A: In evaluating whether the minimum death or living benefits associated with this type of product fall under the AG 43 and C-3 Phase II requirements the actuary should consider evaluating if the guarantees are similar in nature to GMDBs or VAGLBs and whether there is another explicit reserve requirement.

As was stated in the response to Q1.12, above, some actuaries believe that to be “similar in nature to GMDBs or VAGLBs” means that the guaranteed benefit should be in lieu of, or supplemental to, a benefit that is dependent upon the growth of contractholder premiums that have been invested in separate accounts, mutual funds similar to the benefit provided by variable annuity products, or other market value funds or market indexed funds. Assuming that there is not an explicit reserve requirement, those actuaries would believe that this type of product does fall under the scope of the AG 43 and C-3 Phase II requirements. The “similar in nature” requirement could be supported in this case by the fact that the guarantees are based on a segregated portfolio of assets.

**Q1 14. Does AG 43 apply to a lifetime Guaranteed Minimum Withdrawal Benefit (GMWB), or other Guaranteed Living Benefit (GLB), attached to an Equity Indexed Annuity?**

A. Some actuaries, based on AG 43 Section II A)4 footnote 5, believe that Lifetime GMWB and other GLBs attached to Equity Indexed Annuities are subject to AG 43, if the benefits are similar in nature to VAGLBs. While there is an explicit reserve requirement for the underlying contract, they believe that there is no explicit reserve requirement for the living benefits.

Others believe that the Lifetime GMWB or other GLB can be considered to be another guaranteed benefit stream valued under AG 33 and AG 35.

The actuary may wish to consider the nature of the benefit and whether the guarantee is similar in nature to a VAGLB, following the requirements and guidance in Section II)A). The actuary may wish to consider whether Section II)C), which states “Separate account products that guarantee an index and do not offer GMDBs or VAGLBs are excluded from the scope of the Guideline” implies that a VAGLB offered with an Equity Indexed Annuity are excluded from the scope of AG 43.

## 2) GUIDANCE ON COMMON PRACTICE

### Q2.1 Which Actuarial Standards of Practice (ASOPs) apply to the actuary when performing the tasks in conjunction with determining reserves and capital according to the requirements in C-3 Phase II and AG 43?

A: While the actuary is ultimately responsible for determining which ASOPs are applicable to any specific task, the following list of ASOPs may be among those that apply:

No. 7, Analysis of Life, Health, or Property/Casualty Insurer Cash Flows (Doc. No. 089; June 2002)

**Scope**—This standard applies to actuaries when performing the analysis of part or all of an insurer’s asset, policy, or other liability cash flows for life or health insurers (including health benefit plans). The standard also applies to actuaries when performing the analysis of cash flows involving both invested assets and liabilities for property/casualty insurers. Cash flow analysis subject to this standard should be considered in connection with professional services such as the following:

- (a) Determination of reserve adequacy;
- (b) Determination of capital adequacy;
- (c) Product development or ratemaking studies;
- (d) Evaluations of investment strategy;
- (e) Financial projections or forecasts;
- (f) Actuarial appraisals; and
- (g) Testing of future charges or benefits that may vary at the discretion of the insurer (for example, policyholder dividend scales and other non-guaranteed elements of the insurer’s liabilities).

No. 11. Financial Statement Treatment of Reinsurance Transactions Involving Life or Health Insurance (Doc. No. 098; June 2005)

**Scope**— This standard applies to actuaries when performing professional services in connection with preparing, reviewing, or analyzing financial statement items that reflect reinsurance ceded or reinsurance assumed on life insurance (including annuities) or health insurance.

To the extent that life/health insurance is reinsured by property/casualty companies, this standard will apply. If a reinsurance transaction involves both life/health and property/casualty insurance, the actuary should use professional judgment to determine whether this standard, ASOP No. 36, *Statements of Actuarial Opinion Regarding Property/Casualty Loss and*

*Loss Adjustment Expense Reserves*, or aspects of both are most appropriate to determine the proper treatment of the reinsurance transaction.

No. 21. Responding to or Assisting Auditors or Examiners in Connection with Financial Statements for All Practice Areas (Doc. No. 095; September 2004).

**Scope**— This standard applies to actuaries when providing professional services as a responding actuary or as a reviewing actuary in connection with an audit or examination of a financial statement, where:

- (a) “Financial statement” means a report prepared for the purpose of presenting the financial position and the change in the financial position for the reporting period of an entity, prepared in accordance with accounting requirements prescribed or permitted by state regulators, governmental accounting standards, or applicable generally accepted accounting principles.
- (b) “Responding actuary” means an actuary expressly designated by an entity to respond to the auditor or examiner with respect to specified elements of the entity’s financial statement that are based on actuarial considerations. An entity may expressly designate one or more actuaries as responding actuaries for a particular audit or examination.
- (c) “Reviewing actuary” means an actuary expressly designated by the auditor or examiner to assist with the audit or examination of a financial statement with respect to specified elements of the financial statement that are based on actuarial considerations.

ASOP No. 23. Data Quality (Doc. No. 097; December 2004). This applies to actuarial work products begun on or after July 1, 2006; in addition, it applies to actuarial work products for which data is provided to, or developed by, an actuary on or after May 1, 2005. (See Section 1.4 for details.)

**Scope** – This standard applies to all areas of practice. Other actuarial standards may contain additional data quality requirements that are applicable to particular areas of practice, or types of actuarial assignment.

#### Other References

The actuary may also wish to review the following ASOPs to determine whether they provide relevant guidance (please note that some of these ASOPs are in the process of revision at the time of publication and may change):

- (a) If products under scope have non-guaranteed elements: ASOP No. 1

- (b) If products under scope have dividends: ASOP No. 15
- (c) Measuring pension obligations: ASOP No. 4
- (d) Statement of opinion based on asset adequacy analysis: ASOP No. 22
- (e) Credibility procedures for accident & health, group life and property & casualty: ASOP No. 25
- (f) Selection of economic assumptions for measuring pension obligations: ASOP No. 27
- (g) Using models outside the actuary's area of expertise: ASOP 38
- (h) Actuarial Communications ASOP: No. 41

### **3) SIMILARITIES AND DIFFERENCES BETWEEN C-3 PHASE II AND AG 43 REQUIREMENTS**

#### **Q3.1 What are the steps required for reporting C-3 Phase II amounts?**

A: C-3 Phase II amounts are included in Market Risk of the NAIC Life RBC forms. The instructions are given with the RBC instructions.

Because there are smoothing and transition rules specified, the actual steps and process are slightly different for each of the years 2005, 2006, 2007 and beyond. These smoothing and transition rules apply to all companies. However, as noted in the instructions, a company can opt to not smooth the TAR.

#### **Q3.2a What differences are there between the calculation of C-3 Phase II TAR and the AG 43 CTE amount under the stochastic process?**

A: The more significant differences under the stochastic process are as follows:

**Scope:** As far as scope is concerned, AG 43 applies to issues 1981 and later, whereas C-3 Phase II covers all issue years. Additional information is provided in Section 1 of this practice note.

**Tax basis on Accumulation and Discounting:** The key difference is that the calculation required by AG 43 is performed on a pre-tax basis (i.e., federal income tax is ignored in the projections and the discount rates are pre-tax). The calculation required by C-3 Phase II is performed on an after-tax basis (i.e., federal income tax is included in the projections and the discount rates are after-tax).

**Starting Assets:** The starting assets may also be different to the extent C-3 Phase II is calculated using actual AG 43 reserves (some actuaries believe this is allowed or required). See Q5.3 for more discussion on this issue.

**Treatment of AVR and IMR:** The Asset Valuation Reserve (AVR) and Interest Maintenance Reserve (IMR) may be treated differently between C-3 Phase II and AG 43. Section A1.1 (G) of AG 43 states that "the AVR and the IMR shall be handled consistently with the treatment in the company's cash flow testing", while the C-3 Phase II instructions do not explicitly address AVR and IMR. The RBC C-3 Phase I instructions state that existing AVR-related assets should not be included in the initial assets used in the C-3 modeling. These assets are available for future credit loss deviations over and above expected credit losses. These deviations are covered by C-1 risk capital. Similarly, future AVR contributions should not be modeled. However, the expected credit losses should be in the cash flow modeling (deviations from expected are covered by both the AVR and the C-1 risk capital). The same C-3 Phase I instructions also state that IMR assets should also be used for C-3 modeling.

Some actuaries consider the guidance given in the C-3 Phase I instructions regarding the treatment of AVR and IMR both in situations where the interest rate risk is calculated separately within C-3 Phase II and where interest rate risk is integrated with equity risk.

**Net Revenue Sharing Income:** Both C-3 Phase II and AG 43 describe what the actuary would consider in setting the Net Revenue Sharing Income assumption. It basically requires the actuary to consider the likelihood that the Net Revenue Sharing Income continues on to the future. A difference between C-3 Phase II and AG 43 exists in that AG 43 defines a cap for the Net Revenue Sharing Income (as outlined in A1.1E)

The amount of Net Revenue Sharing shall not exceed (a) + (b)

- (a) contractually guaranteed Net Revenue Sharing Income
- (b) estimated non-contractually guaranteed Net Revenue Sharing Income before any margins of uncertainty multiplied by the following factors:
  - i. 1.0 in the first projection year
  - ii. 0.9 in the second projection year
  - iii. 0.8 in the third projection year
  - iv. 0.7 in the fourth projection year
  - v. 0.6 in the fifth projection year
  - vi. 0.5 in the sixth and all subsequent projection years

Note that the contractually non guaranteed Net Revenue Sharing Income outlined in part b) above is not allowed to exceed 0.25% on separate account assets in the 6<sup>th</sup> and subsequent projection years.

**CTE:** C-3 Phase II requires a CTE 90 metric whereas AG 43 requires CTE 70.

**Hedging:** There are explicit limits on hedge efficiency included in AG 43. See Q11.7 for more detail.

**Standard Scenario:** The C-3 Phase II Standard Scenario is compared to the market risk portion of TAR, while in AG 43 the Standard Scenario result is compared to the entire reserve. In addition, the AG 43 Standard Scenario is calculated seriatim while the C-3 Phase II Standard Scenario is calculated in aggregate. Additional detail is provided in Section 9 of this practice note.

**Q3.2b What differences are there between the calculation of C-3 Phase II TAR and the AG 43 CTE amount under the Standard Scenario?**

A: The following table highlights some of the differences between the RBC C-3 Phase II and AG 43 Standard Scenarios. Details on the Standard Scenario can be found in section 9 of this practice note.



	AG 43	C-3 Phase II
Discount Rate	SVL interest rate for annuities	10 year CMT rate, plus 50 bps, with a floor of 3% and a cap of 9%
Drop and Recovery Assumptions		C-3 Phase II assumptions are more conservative
Aggregation	Not permitted	Allowed
Revenue Margins used to calculate Net Revenues	Likely to be higher under AG 43 because: <ol style="list-style-type: none"> <li>1) Guaranteed revenue sharing can be included</li> <li>2) Larger of 0.20% of AV and Explicit Contract charges in AG 43 vs. just Explicit Contract charges for C-3 Phase II</li> </ol>	
Mortality		Higher mortality under C-3 Phase II
Lapses/In-the-moneyness (ITM)	More developed under AG 43 and more consistent with emerging recommendations	
GMIB Election Rates	Tiered by ITM	15%

**Q3.3 Would the actuary use the same assumptions for both stochastic models (C-3 Phase II and AG 43)?**

A: The assumption setting process is similar for both C-3 Phase II and AG 43. However, it is possible that some assumptions, especially contractholder behavior assumptions, can be different. Contractholder behavior assumptions should be consistent with the behavior that would be anticipated in the scenarios that are employed in the CTE calculation. Since C-3 Phase II uses a CTE 90 metric versus CTE 70 for AG 43, the contractholder behavior assumptions may be more conservative for C-3 Phase II. Another assumption that would be different would be the discount rate, which is an after tax rate for C-3 Phase II and a before tax rate for AG 43.

**Q3.4 Could one use the same stochastic scenario set for both models?**

A: Since the calibration criteria in C-3 Phase II and AG 43 are similar, the same set of scenarios could be used for both models provided the criteria are met. However, if the actuary is using an integrated model of equity returns and interest rates for C-3 Phase II that is designed to be consistent with the C-3 Phase I requirements described in Appendix 6 of C-3 Phase II, or if the other optional methods of incorporating the interest rate risk scenarios into the C-3 Phase II model are used, then the actuary might be able to meet the interest rate scenario requirements by using a different scenario set for AG 43 (provided that set meets the calibration criteria).

**Q3.5 What are the differences in treatment of federal income taxes between C-3 Phase II and AG 43?**

A: All calculations used in AG 43 are pre-tax: accumulations, earnings, costs, and discount rates. All calculations used in the TAR calculation under C-3 Phase II are post-tax. In situations where the tax reserve as at the valuation date exceeds the starting “working reserve” used in developing the TAR, a tax adjustment (increase) to RBC may be necessary to account for future taxable income not captured in the TAR calculation.

**Q3.6 What are the differences between AG 43 and C-3 Phase II in the discount rates used to determine either the Conditional Tail Expectation (CTE) or the Standard Scenario? Is it appropriate to adjust the discount rate for default charges, investment expenses and credit spreads?**

A. CTE Calculation:

Section A1.2)B) of AG 43 states that “Accumulated Deficiencies shall be discounted using the same interest rates at which positive cash flows are invested, as determined in Section A1.4)D). Such interest rates shall be reduced to reflect expected credit losses.” Some actuaries interpret this approach to be a variation on new money rates.

Item 7 “Expected Interest Rates” under Modeling Methodology in the C-3 Phase II report states that “companies that do not use an integrated model are to use the implied forward rates from the swap curve. Companies that do have an integrated model may use the rates generated by that model or the swap curve, but must use the method chosen consistently from year to year. The Report further states that “Interest earnings on existing assets should be reduced to reflect expected credit losses.”

Neither AG 43 nor C-3 Phase II specifically mention an adjustment for investment expenses in determining the discount rate. However, Section A1.1)A) of AG 43, which describes the projection of accumulated deficiencies, states “Insurance company expenses (including overhead and investment expense), fund expenses, contractual fees and charges, revenue sharing income received by the company (net of applicable expenses) and cash flows associated with any reinsurance or hedging instruments are to be reflected on a basis consistent with the requirements herein.” Item 2 under Modeling

Methodology in the C-3 Phase II Report contains similar language. Some actuaries believe that the language in Section A1.1)A) of AG 43 as well as the language in Item 2 under Modeling Methodology in the C-3 Phase II report implies that discount rates should be reduced for investment expenses and credit spreads. Further discussion regarding the determination of the discount rate is provided in the response to Q7.5, below.

Standard Scenario Calculation:

AG 43 Section A3.1)B)2) defines the discount rate (DR) as “valuation interest rate specified by the Standard Valuation Law on an issue year basis, using Plan Type A and a Guarantee Duration greater than 10 years but not more than 20 years.”

C-3 Phase II – LR025 defines DR to be the “annual effective equivalent of the 10-year constant maturity treasury rate reported by the Federal Reserve for the month of valuation plus 50 basis points,” subject to a maximum and minimum.

**Q3.7 How would interest rate risk associated with the guaranteed fund option be treated under C-3 Phase II and AG 43?**

A: In both cases interest rate risk associated with the guarantee fund option is to be recognized.

Principle 2 of the C-3 Phase II and AG 43 reports refers to “...asset and liability cash flows produced by the application of a stochastic cash flow model to equity return and interest rate scenarios”. Section 1 of AG 43 explicitly mentions credit risk and disintermediation risk as risks that should be reflected in the reserve calculations. AG 43 Section A1.1)A) says that “cash flows from fixed account options should be included,” and AG 43 Section A1.4)D) then provides options for determining the interest rate returns on general account assets. The C-3 Phase II report also presents such options, and Appendix 6 discusses Methods of Calculating Capital Requirements for Interest Rate Risk on the Guaranteed Fund of Variable Annuities.

Subsection 8 of the Modeling Methodology section in the C-3 Phase II report ([http://www.actuary.org/pdf/life/c3\\_june05.pdf](http://www.actuary.org/pdf/life/c3_june05.pdf)) gives some suggestions to the actuary as to how to incorporate the interest rate risk associated with the guaranteed fund option of VAs into the determination of TAR. This paragraph allows for this risk to be handled in either an “integrated model” or a “non-integrated model”

Integrated Model

Appendix 6 of the C-3 Phase II report suggests that an integrated model is preferred and gives more guidance to the actuary for situations where one is used. Specifically, guidance is given on the interest rate scenarios used in the integrated model. It states:

Ideally, a fully integrated model of equity returns and interest rates, with rate volatility and expectations and frequency and duration of yield curve inversions consistent with the “Phase I” requirements, would be run to develop an estimate of the (combined) market risks. (Documentation of the Phase I model can be found on the Academy website at [www.actuary.org/pdf/life/lrbc\\_october.pdf](http://www.actuary.org/pdf/life/lrbc_october.pdf).) The U.S. Treasury Fund scenarios within the 10,000 prepackaged scenarios qualify as meeting this standard.

Appendix 6 also suggests how to determine what portion of the RBC is calculated using an integrated model to report as interest rate risk under C-3 for VAs in the company’s RBC report. It states: “If the method used to reflect interest rate risk doesn’t develop separate values for interest and equity risk, the factors used for interest rate risk for fixed contracts may be used as an approximate value for combining with other C-3 interest rate risk, with the remainder of the RBC being considered equity risk.”

Some actuaries believe this allows the company to use C-3 Phase I scenario testing as one of the ways to determine the portion of the RBC under C-3 Phase II that should be reported as interest rate risk. Some actuaries believe that other approaches may be appropriate as long as the approach effectively measures the interest rate risk within the integrated model and the approach is consistently applied each year (but allowing for model improvements over time).

#### Non-integrated Model

Appendix 6 of the C-3 Phase II report also suggests using a non-integrated model. It suggests that “a number of simpler approaches are acceptable,” and that “these methods” include:

- a) Using the Microsoft Excel workbook from C-3 Phase I to generate 200 interest scenarios and then assigning them in rotation to the stochastic equity scenarios being tested.
- b) Running the variable annuity model assuming a predetermined fixed crediting rate (not less than the contract guarantees). In the equity modeling, earned interest would equal that rate increased for fees. Then calculate the C-3 Phase I values using the scenario testing method as though that (or a higher rate) is the rate to be credited.
- c) Running the variable annuity model as though no assets were in the guaranteed fund. Then developing the C-3 requirement as if all the assets were in the guaranteed fixed fund. The final requirements for both equity and fixed C-3 components would be an appropriate weighted-average of these results. For these calculations, the actual assets and liabilities are increased in proportion to their actual distribution.

Some actuaries believe that there may be other approaches that may be used for non-integrated models. In using other approaches, these actuaries believe it is preferable for any such approach to appropriately reflect all of the interest rate

risks captured by the C-3 Phase I scenario testing and at a level comparable to a CTE 90 level.

Some actuaries (pointing to the language in Item 8 under Modeling Methodology in the C-3 Phase II report) believe that a company that is exempt from using C-3 Phase I scenario testing may use the original C-3 interest rate factors in place of C-3 Phase I scenarios in the non-integrated model approaches. However, a company cannot switch from one approach to another without regulatory approval.

While the AG 43 report does not provide explicit guidance in the manner of the C-3 Phase II report, some actuaries may view the general principles underlying the use of either an integrated or non-integrated model as applicable to an AG 43 calculation. Use of a non-integrated model does not eliminate the actuary's need to consider asset risks included in reserve calculation.

**Q3.8 What are considerations for modeling the general account funds in determining the AG 43 and C-3 Phase II requirements?**

A. It is the responsibility of the actuary to determine the best method for modeling the general account. As a practical starting point, some actuaries believe that the materiality of the general account funds relative to the total fund values should be considered, with increasing materiality indicating the need for increased precision. Some actuaries believe both the amount and nature of the general funds needs to be considered; just because the amount of general account dollars may be small, they may present a disproportionate amount of risk. That is, while general account funds are not subject to the volatility that can impact separate account funds, their performance can still impact future exposures and reserves. For example, if a VAGLB is indexing at 5% (and is applied to funds in the general account), and the general account fund credited rate has been 3%, then the general account funds have not kept pace with the index and exposure has increased. Similarly, if credited rates were, say, 8% during a period of weak equity market performance, then the general account funds will mitigate the increase in guaranteed benefit risk exposure.

An example of a high level of precision would be the use of an integrated model utilizing distinct sets of stochastically generated interest rate and equity scenarios. An example of a lower level of precision would be to aggregate the general funds into a variable fund. In this case, the actuary should consider the materiality of the general account funds and the similarity of the variable fund to the general account fund; for example a money market fund may be a more appropriate variable fund to aggregate with the general fund.

Whatever approach is used, the actuary may wish to consider whether it is necessary to perform sensitivity testing to confirm that a more precise methodology will not produce a materially higher calculated amount, with both the method and the testing being documented in the certification report.

**Q3.9 Section A.2.2) of AG 43 states that “the amount of the reserve held in the General Account shall not be less than the excess of the Aggregate Reserve over the sum of the Basic Reserve, as defined in section A3.2), attributable to the variable portion of all such contracts.”**

- a. How is the portion of the Basic Reserve attributable to the variable portion determined?

A. One simplification for determining the portion of the Basic Reserve attributable to the variable portion of the contracts might be to split the Basic Reserve for each contract between General Account and Separate Account based on the ratio of the total fund value of the contract in each fund type (General Account or Separate Account).

- b. How is the excess of the Aggregate Reserve over the sum of the Basic Reserve broken down as to what is attributable to the variable portion and fixed portion of the contracts?

A. Some actuaries believe that one acceptable approach would be to first set the variable portion of the AG 43 reserve equal to the variable portion of either the fund value or the cash surrender value of all such contracts. This would then be the liability held in the Green Book. The difference between the variable portion of the fund value/cash surrender value and the Basic Reserve for the variable portion of the contracts would then be transferred from the Separate Account to the General Account as the CARVM Allowance. The reserve allocated to the fixed portion of the contract would then be equal to the Aggregate Reserve less the Basic Reserve for the fixed portion of the contract less the CARVM Allowance. In addition, some actuaries believe that the general account reserve should be split between the reserve supporting the fixed account and the reserve supporting guarantees and that these amounts should be held in different places in Exhibit 5.

Other approaches, which meet the requirements of AG 43 and the annual statement instructions, may be acceptable.

**Q3.10 GMIB Purchase Rate Questions**

- a. Stochastic Scenarios

AG 43 Section A1.5) A) states that the projected annuitization purchase rates for GMIBs shall be determined assuming that market interest rates available at the time of election are the interest rates used to project General Account assets. If a company does not currently offer or plan to offer annuitization purchase rates in excess of policy guarantees, is the company allowed to use only the guaranteed rates in the projections?

A. While some actuaries believe this may be an appropriate assumption, the actuary may wish to consider the guidance in AG 43 Section III) B) 8) relative to Prudent Estimate assumptions.

b. Standard Scenario

AG 43 Section A3.3) C) 3) is silent regarding purchase rates for GMIBs, however, when determining the current value of unexercised GMIBs, the actuary must compare income generated by GMIB election and income produced under “normal settlement option provisions of the contract.” This seems to imply guaranteed rates if that is company practice. Is the actuary free to choose GMIB purchase rates under the Standard Scenario?

A. Since the document is silent on the purchase rate assumption to use under the Standard Scenario then some actuaries believe that the actuary is given the authority to use what he or she believes is a reasonable assumption and to document the reason for the choice. However, the individual product contract likely states the various settlement options available and those should be considered when making this comparison. For example, if the account value can be annuitized at current purchase rates, it is possible that the income generated under this normal settlement option may be larger than the income guaranteed by the living benefit, which may have less favorable guaranteed purchase rates.

In contrast, the interpretation of some actuaries is that the income stream is projected using the contractual guarantees and the method of discounting specified in Section A3.3)C)3) of AG 43. Under this interpretation there appears to be no need for ‘current’ GMIB purchase rates within the Standard Scenario.

**Q3.11 Are you aware of any requirements for using the phase-in provision?**

A. LR025 allows a company to smooth the TAR. LR025 states that “a company is required to get approval from its domestic regulator prior to changing its decision about smoothing from the prior year.”

Phase-in for AG 43 is an option the company may request from the domiciliary commissioner. It is not an automatic option as certain conditions (see AG 43 Section V Effective date) and permission is required. The NAIC’s Life and Health Actuarial Task Force allowed a standardized methodology for the phase-in provision for companies that do obtain such permission. The grading shall be applied only to the reserves for contracts in-force as of Dec. 31, 2009. The reserves for these contracts under the old basis and new basis shall be compared each year – two-thirds of the difference shall be subtracted from the reserve under the new basis in 2009 and one-third of the difference shall be subtracted from the reserve under the new basis in 2010.

**Q3.12 How would the actuary integrate the work to calculate AG 43 reserves and C-3 Phase II TAR with the requirements for the Actuarial Opinion and Memorandum?**

A: To the extent a company is using projections to calculate AG 43 reserves and C-3 Phase II, the actuary may wish to consider whether the projections can

be a substitute for the work otherwise required to support the actuarial opinion under the NAIC Model Actuarial Opinion and Memorandum Regulation (AOMR).

The actuary may also wish to consult Section 3.3.2 of ASOP No. 22, *Statements of Opinion Based on Asset Adequacy Analysis by Actuaries for Life or Health Insurers* to determine whether the projections required for AG 43 and/or C-3 Phase II would be an acceptable asset adequacy analysis method.

Some actuaries believe the projections run to calculate AG 43 reserves and C-3 Phase II may be appropriate for the company-wide asset adequacy analysis in support of the actuarial opinion.

Other actuaries believe that it may be appropriate to rely on parts of the modeling work used to calculate AG 43 reserves or C-3 Phase II in support of the actuarial opinion (e.g., model cells, product characteristics).

In addition, some actuaries believe the modeling requirements in C-3 Phase II and AG 43 will provide emerging practice on modeling variable annuity risk and that the sensitivity tests and actuarial memorandums supporting the AG 43 reserve and C-3 Phase II calculations may have many similarities with the actuarial memorandum supporting the asset adequacy analysis of the relevant products.

In addressing these issues, the actuary may also wish to consider the differences between the model-based calculations required under this approach and asset adequacy analysis required in support of the actuarial opinion. Some of the differences include the following:

- The asset adequacy analysis applies to the entire company, while the scope of AG 43 and C-3 Phase II is limited to the types of products described in Section 1.
- The calculations for AG 43 and C-3 Phase II include the change in Working Reserves as an expense item, while the asset adequacy analysis may not.
- The calculations for AG 43 and C-3 Phase II employ results using the greatest present value of accumulated deficiencies (as defined in AG 43) and CTE measures. While these are not a required standard for asset adequacy analysis, some actuaries do consider interim shortfalls in accumulated surplus in analyzing results for asset adequacy analysis.

Where the Alternative Methodology (AM) is used, the appointed actuary may wish to consider additional analysis where asset adequacy analysis is required for the Actuarial Opinion. For instance, some companies may use deterministic assumed equity returns or a single representative index for equity funds.

However, if the actuary is using the AM, the actuary may find it preferable to perform asset adequacy analysis for the Actuarial Opinion. If the actuary adjusts



the factors, the actuary may wish to consider using the analysis supporting the adjustments.

In addition, there appears to be consistency between the sensitivity tests and the documentation required by these requirements and those required by the AOMR. Since AG 43 and C-3 Phase II provide more detail on this, including a section covering documentation, this detail may serve as additional guidance for the actuarial memorandum.

**Q3.13 How would the actuary combine the results of the AG 43 projections with cash flow testing projections to satisfy the requirements for asset adequacy analysis?**

A: The calculation of reserves under AG 43 is separate and distinct from asset adequacy requirements. Although many companies may use similar models, reserves are established to meet the requirements of AG 43. For asset adequacy analysis, combined projections of business may be utilized to determine adequacy or adequacy can be determined for individual segments of the business.

For companies that use an integrated model for cash flow testing supporting the Actuarial Opinion, the integrated model may be designed to be sufficient for products subject to AG 43 as well as other business. For these companies, products may be combined and projected in aggregate to determine asset adequacy when cash flow testing is used. Alternatively, companies may perform the projection separately for various blocks of business and combine results of the individual models.

Companies that do not use an integrated model and separate the projection of separate account funds versus general account funds may wish to consider whether the model used for general account funds could also be used for the fixed portion of products subject to AG 43.

**Q3.14 Suppose the actuary applies the same scenarios used to calculate AG 43 reserves and C-3 Phase II TAR for the company-wide asset adequacy analysis and the appointed actuary determines that the reserves for the company, in aggregate, are inadequate. Would the actuary increase the reserves calculated under AG 43?**

A: In the situation where the appointed actuary determines that reserves in aggregate for a company are inadequate, the AOMR requires (in AOMR Section 5E(2)) that the actuary set up additional reserves. Typically, the additional reserve is held on a separate line of the Annual Statement. There does not appear to be any requirement in either the AOMR or the SVL to allocate the additional reserve to any line of business. If the actuary is satisfied that the reserves calculated for the business falling under the scope of AG 43 meet the requirements of AG 43, then there does not appear to be a requirement to increase the reserves calculated under AG 43.

**Q3.15 Suppose the Standard Scenario reserve on a company's variable annuity business is larger than the reserve calculated from model projections and application of the CTE measure required by AG 43. Is it appropriate to use the excess to offset reserve shortfalls on other blocks of business that are outside the scope of AG 43?**

A: There is nothing in AG 43 or the Standard Valuation Law that expressly permits the Standard Scenario reserve, the reserve calculated using modeling, or the AM reserve to meet formulaic minimums on other blocks of business. Like other formulaic reserves, the amount of reserves held based on the Standard Scenario provide starting asset levels for asset adequacy analysis and not target liability requirements.

It is not required to aggregate asset adequacy analysis results; however, reserve redundancies under asset adequacy analysis for a given product may be used to offset reserve redundancies under asset adequacy analysis in another product.

#### **4) TYPES OF MODELS / GRANULARITY**

##### **Q4.1 Does the modeling approach call for one model to be created that covers all products within the Scope?**

A: Since the actuary may choose to use the Alternative Methodology (referred to as the “Alternative Method” in C-3 Phase II) for some contracts and the modeling method for others, a company does not need to use one model. For those contracts that are modeled, either one model or a multitude of models may be used, as deemed appropriate by the actuary.

##### **Q4.2 What granularity of models is usually appropriate?**

A: For the CTE projection method and the application of the Alternative Methodology, the actuary may choose to employ grouping methods to in-force seriatim data in order to improve model run times. The actuary should normally use enough model points such that results would not materially change with additional model points (model cells). Grouping methods usually retain the characteristics required to model all material risks and options embedded in the liabilities.

Under the Alternative Methodology, materially similar contracts within the group may be combined together into subgroups (i.e., all policies within a subgroup must display substantially similar characteristics for those attributes expected to affect the capital requirements or reserves.)

Appendix 8 of AG 43 and Appendix 11 of C-3 Phase II both specify that the supporting memorandum should specify the grouping of contracts. Appendix 3.1) C) of AG 43 describes additional illustrative demonstrations required to assist in validating the reasonableness of the contract groupings used in the CTE projection method and Alternative Methodology. Similar descriptions are contained in the NAIC Risk Based Capital Instructions – Interest Rate and Market Risk. The actuary may wish to consider describing in the supporting memorandum any testing performed to support the degree of granularity that has been used in the modeling of results.

##### **Q4.3 What time step should be used for projections?**

A: Both Appendix 2 of C-3 Phase II and Subsection A5.7 of AG 43 state that use of an annual cashflow frequency (“timestep”) is generally acceptable for benefits/features that are not sensitive to projection frequency. Both sections state that the actuary should validate by testing that the use of a more frequent time step does not materially increase capital requirements or reserves. As most cash flows on insurance products occur no more frequently than monthly, some actuaries believe that a monthly model should suffice in most circumstances. However, the actuary should assess the impact of modeling benefits/features determined on a more frequent “timestep” than that used for the projections (e.g., step up features where the guarantee may be set equal to the account value annually, monthly or even daily).

The actuary may wish to consider providing support for the choice of time step in the supporting memorandum. Appendix 11 of C-3 Phase II and Subsection A8.3 of AG 43 state that the actuary should identify the time step used in the supporting memorandum.

**Q4.4 Is there specific software that the actuary normally would use to perform the analysis? Is it acceptable to use a different platform for different components of the calculation?**

A: Any software, whether purchased commercially or developed in-house, may be used. Some actuaries may use a different platform for different components of the calculation. For example, the seriatim output functionality of a valuation platform may make it a more useful platform for the determination of the Standard Scenario amount, while a modeling platform would typically be used for calculating the CTE amount. However, the actuary normally would use software that is capable of performing the sophisticated calculations required, incorporating stochastic modeling techniques and contractholder behavior dynamics critical for this analysis, as well as having auditable calculation processes.

**Q4.5 To what extent is the decision of using the CTE projection method versus using the Alternative Methodology for one of the requirements (either C-3 Phase II or AG 43) binding on the other?**

A: There is no specific requirement that the method used for a block of business under C-3 Phase II to be the same as that used under AG 43 (and vice versa).

**Q4.6 Once a company selects either the CTE projection method or the Alternative Methodology, can the selection be changed?**

A: Per Section IV)E) of AG 43, moving from the CTE projection method to the Alternative Methodology requires regulatory approval from the domiciliary commissioner. C-3 Phase II states (page 17) “Once a company uses the stochastic modeling methodology for a block of business, the option to use the Alternative Method is no longer available for that part of its business.” Some actuaries believe that moving from the Alternative Methodology to the CTE projection method does not require approval and point to Section IV)E) of AG 43 and Appendix 8 of C-3 Phase II.

**Q4.7 Is a company permitted to make changes in the modeling platform used to determine the requirements of AG 43 (e.g., migrating from a modeling system developed in-house to a vendor-licensed system)?**

A: Changes in modeling platforms including model improvements, updates, error corrections, the addition of new product features, as well as the migration to new actuarial software platforms may be made. Section A8.3)D)5) of AG 43 requires “documentation of all material changes in the model or assumptions from that used previously and the

estimated impact of such changes.” However, if the change in modeling platforms also involved changing from the CTE projection method to the Alternative Methodology, then Section IV(E) of AG 43 requires regulatory approval from the domiciliary commissioner.

**Q4.8 Is it appropriate for models developed for C-3 Phase II and AG 43 purposes to be used for cash flow testing purposes as well?**

A: The same model may be appropriate for cash flow testing purposes. Regardless of the model structure used, the actuary typically considers whether the model structure and the underlying assumptions appropriately reflect all material risks, and all options embedded in the liabilities and the underlying assets, and are appropriate for the purpose for which they were created.

While it may be appropriate to use the same basic model structure, the actuary may wish to consider taking into account the calculation differences and difference in purpose of C-3 Phase II, AG 43 models, and cash flow testing. For example, C-3 Phase II and AG 43 are focused on tail risk, whereas the focus of cash flow testing is usually the adequacy of reserves over a range of scenarios. See Section 3 of this practice note for more discussion and examples of the differences.

To the extent the company is using projections to calculate AG43 reserves and C-3 Phase II, the actuary may also wish to consider whether the projections can be a substitute for the work otherwise required to support the AOMR. A detailed discussion of the similarities and differences as well as suggested considerations are included in Section 3 of this Practice Note.

**Q4.9 Principle 2 in Section I of AG 43 and Appendix 7 of C-3 Phase II recognizes the fact that the modeling-based approach of both C-3 Phase II and AG 43 permits the aggregation of results over all products subject to the recommendation. The guidance in Principle 2 contains the statement “performed in aggregate (subject to limitations related to contractual provisions) to allow the natural offset of risks within a given scenario”. What contractual provisions could limit aggregation?**

A: Two examples of such contractual provisions are: (1) group annuities with GMDBs and/or VAGLBs that are experience rated or pooled with a limited number of other similar contracts; (2) contracts within the scope of the requirements that are reinsured under a reinsurance treaty containing an experience refund feature.

**Q4.10 When using the model for performing sensitivity testing of key assumptions is it necessary to perform the sensitivity testing for the entire set of scenarios?**

A: The actuary would ordinarily consider performing sensitivity tests to identify those assumptions that materially impact results. Sensitivity testing is especially important in creating assumption margins, if little or no

company or industry experience data is available. Sensitivity testing can range from re-running the model using the full set of stochastic scenarios to testing on a subset of scenarios to testing a single deterministic scenario.

The C-3 Phase II report (see page 17 – Actuarial Memorandum) requires the actuary to include sensitivity tests he/she believes is appropriate. Based on the June 2006 summary of the results of the Life Capital Adequacy Subcommittee's C-3 Phase II survey (survey results summary), which can be located at [http://www.actuary.org/pdf/life/survey\\_june06.pdf](http://www.actuary.org/pdf/life/survey_june06.pdf), companies most frequently based sensitivity testing on the full set of scenarios or a subset of the scenarios. Sensitivity testing was also performed using the scenario that replicated the CTE 90 value, the scenarios that produced the worst X% of results, or a specified number of scenarios. Methodology Note C3-03 of C-3 Phase II provides further guidance.

Sensitivity testing is required under AG 43 Section A.2.3.B and the results of the tests performed should be included in the supporting memorandum.

**Q4.11 In the creation of the C-3 Phase II and AG 43 models, what are the considerations for determining an appropriate proxy for each variable fund in order to develop the investment return path? As a default, is it appropriate for the actuary to simply map the various variable accounts into the AG 34 classifications?**

A: Methodology Note C3-01 (Note) of the Life Capital Adequacy Subcommittee's June 2005 C-3 Phase II report incorporated into the NAIC's RBC Instructions (C-3 Phase II Report) provides some suggestions to assist actuaries in the determination of an appropriate crafted proxy fund for each variable account. The Note states that "the proxy would normally be expressed as a linear combination of recognized market indices (or sub-indices)". For example a mid-cap stock fund might use a proxy that was a linear combination of the S&P 500 index and the Russell 2000 index. The Note goes on to state that "[i]t would rarely be appropriate to estimate the stochastic model parameters (for the proxy funds) directly from actual company data."

As a default, it would not appear appropriate to simply map the variable accounts into the AG 34 classifications. The proxy construction process would ordinarily include an analysis that establishes a firm relationship between the investment return proxy and the specific variable funds. Such an analysis can include, but would not be limited to, the following:

- Portfolio objectives
- Morningstar classification
- Asset Composition
- Historical returns
- Performance benchmark
- Market beta
- AG 34 classifications

If sufficient recent historical performance data is available, the analysis would ordinarily examine the relationship of these data to market/sector indices. If credible historical data is not available, the proxy may be constructed by combining asset classes and/or employing allocation rules that most closely reflect the expected long-term composition of the specific fund given the investment objectives and management strategy. It may be imprudent to ignore the concept of market efficiency in establishing the proxy funds and the associated model parameters used to generate the investment return scenarios. Higher expected returns can only be attained by assuming greater risk.

The actuary may consider verifying that the fund mapping and grouping methods used in creating the C-3 Phase II and AG 43 models are comparable to the fund methodology and assumptions used by the company for other purposes, such as internal capital models, pricing analysis and the company's actual hedging program. Some actuaries would also consult with the individuals at their companies who are familiar with the investment objectives and performance data of each fund. The actuary should verify that the fund mapping and grouping methods used in creating the C-3 Phase II and AG 43 models meet the guidance provided in the AG 43 and C-3 Phase II requirements.

**Q4.12 For a small block, must all modeling outlined in the report be done or is there a safe harbor provision?**

A: There are no safe harbor provisions. For certain variable annuities (as defined in the requirements), the actuary has the option of using the Alternative Methodology. If the actuary chooses not to use the Alternative Method or is not allowed to (e.g., because of the existence of VAGLBs), the actuary may simplify the modeling by choosing methods and assumptions that are demonstrably conservative. Some actuaries believe that it may not be necessary to value small blocks of business as rigorously as more material blocks and that shortcuts may be taken for practical reasons. In this case estimates should be on the conservative side so as to meet the minimum reserve requirements. Some actuaries believe it may be easier to make estimates on blocks of business that do not have either guaranteed death or living benefits.

## 5) DETAILS ON STARTING ASSETS

### Q5.1 How are starting assets determined?

A: C-3 Phase II (“Modeling Methodology,” Section 3) and AG 43 (Appendix 1, Section A1.4) require “the value of assets at the start of the projection be equal to the approximate value of statutory reserves at the start of the projection” (estimated reserves). This includes general and separate account reserves for products and product features in the scope of C-3 Phase II. Some actuaries believe the AVR and/or IMR may also be included in the estimated reserves as well, depending on the calculation (see Section 3 for a discussion on the treatment of the AVR and IMR).

Both C-3 Phase II (“Modeling Methodology,” Section 3) and AG 43 (Appendix 1, Section A1.4) require all separate account assets and hedge assets associated with products in-scope be included. All or a portion of the general account assets associated with products in scope (which may be negative in amount if representing a borrowed position) are then added such that the starting assets equal the statutory reserves in the model as of the start of the model projection. Note that the borrowed position may be significant enough such that the general account assets (exclusive of the hedge assets held in the general account) are negative. Assets should be valued consistently with their annual statement values.

Some companies use reserves as of the last reported date as an estimate. Other companies use a ratio of reserve to account value where the ratio is estimated based on analysis of historical data. Other reasonable approximation methods may also be used. See also Q5.2.

In determining which assets to include and how to project those assets, the actuary may wish to consider Actuarial Standards of Practice, such as Sections 3.3 and 3.4 in ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows*.

### Q5.2 How close are starting assets expected to be to the actual reserves ultimately held for in-scope products?

A: There are no specific criteria for C-3 Phase II or AG 43. Some believe that the actuary should be reasonably certain that the level of starting assets has not resulted in a material understatement/overstatement of the actual reserve.

### Q5.3 Could the same level of starting assets be used for the C-3 Phase II and AG 43 reserves?

A: To the extent the treatment of AVR and/or IMR differs, the starting asset amounts could be different. Some actuaries believe a way to avoid differing starting assets is to adjust the resulting reserve after the reserve calculation to account for the AVR. This is described in the December 2004 *Asset Adequacy Analysis Practice Note*, published by the Academy’s Life Practice Council.



Also, to the extent the actuary decides to set the starting assets for the C-3 Phase II calculation equal to the approximate or actual value of the reserve on the valuation date, it may be possible that the reserve as of the valuation date could be available by the time the calculation for C-3 Phase II is performed, depending upon the timing of calculating reserves.

For some companies, differences in starting assets may occur due to in-scope issue year considerations; for instance, AG 43 applies to contracts issued in and after 1981, whereas C-3 Phase II applies to all issue years for in-scope products

**Q5.4 If a direct writer has reinsured 100% of its variable annuities to a reinsurer, what assets can it use to do any modeling that requires assets?**

A. If under the terms of the reinsurance agreement, some or all of the assets supporting the reserve are held by the reinsurer or by another party, the ceding company may wish to consider whether to model such assets in order to determine projected cash flows. Since neither AG 43 nor C-3 Phase II prescribes a methodology for performing asset modeling, some actuaries believe that it is the responsibility of the certifying actuary to determine an appropriate methodology. In the absence of more explicit guidance from AG 43 and C-3 Phase II, some actuaries look to the most recent version of C-3 Phase III as being a reasonable source for the response that follows:

In some situations, it may not be necessary to model the assets held by the other party. Some actuaries would “consider at least the following to determine if modeling the assets is necessary:

- a. The degree of linkage between the portfolio performance, and the calculation of the modified coinsurance (modco) interest and modco reserve; and
- b. The sensitivity of the valuation result, both the direct and ceded amounts, to the asset portfolio performance.

If the company concludes that modeling is necessary, the modeling will take into account the following:

- a. The investment strategy of the company holding the assets, as codified in the reinsurance agreement or otherwise based on current documentation provided by that company; and
- b. Actions that may be taken by either party that would affect the net reinsurance cash flows (e.g., a conscious decision to alter the investment strategy within the guidelines).

If the company concludes that modeling is unnecessary, the company should document the testing and logic leading to that conclusion.”

**Note - Special considerations for modified coinsurance:** Although the modco reserve is called a reserve, it is substantively different from other reserves. It is a fixed liability from the ceding company to the reinsurer in an exact amount, rather than an estimate of a future obligation. The modco reserve is analogous to a

deposit. This concept is clearer in the economically identical situation of funds withheld. This should be considered by the actuary in determining whether or not to model the assets backing the modco reserve. Additional consideration needs to be given to the projection of modified coinsurance interest. In many cases, the modified coinsurance interest is determined by the investment earnings of an underlying asset portfolio, which in some cases will be a segregated asset portfolio or in others the ceding company's general account. Some agreements may use a rate not tied to a specific portfolio.

**Q5.5 For a particular scenario, can either the Scenario Greatest Present Value (under AG 43) or the Total Asset Requirement (under C-3 Phase II) be lower than the Starting Asset Amount?**

A. .In the case of AG 43 it is possible for the Scenario Greatest Present Value, as defined in Section A1.2)A) of AG 43, to be less than the Starting Asset Amount, implying that the greatest present value that is added to the Starting Asset Amount is negative. This would mean that the Starting Asset Amount would be more than enough to cover the projected benefits under the scenario. It is also possible for the Additional Asset Requirement (AAR) as defined section 9 of the C-3 Phase II report to be negative. In this the Total Asset Requirement would be the sum of the Starting Asset Amount and a negative AAR. However, the resulting risk base capital amount cannot be less than zero.

## **6) DETAILS ON SCENARIOS / SCENARIO GENERATORS / ECONOMIC ASSUMPTIONS**

### **Q.6.1 Could the same scenarios be used in AG 43 and C-3 Phase II calculations?**

A. Yes, as long as the scenarios chosen conform to the scenario requirements of AG 43 and C-3 Phase II.

### **Q6.2 With respect to the calibration of scenarios, both Appendix 2 of the C-3 Phase II Report and Subsection A5.2) of AG 43 provide calibration points for the S&P 500 index. How would one go about calibrating other fund types?**

A: This question essentially relates to determining how to generate returns for the funds underlying the VA product and to ensure that those returns are consistent with the S&P 500 calibration points.

Fund returns can be generated in many different ways. In a one-factor approach, returns are generated for a reference index (in this case, the S&P 500), and returns for various funds are specified by a linear relationship to this index. For example, in a Capital Asset Pricing Model (CAPM) approach we find slope (beta) and intercept (alpha) terms which can then be applied to modeled S&P 500 returns to give the desired fund returns for different paths and steps. In this setting, systematically riskier funds have a greater slope term (beta), and less risky funds have a lower beta.

The references in both the C-3 Phase II Report and AG 43 suggest that if the fund being simulated is riskier than the S&P 500, then the calibration points would usually be more “fat tailed” than those of the S&P 500. Under a CAPM approach, this would typically be the case, unless a high intercept term (alpha) was used. Therefore, the actuary would not usually assume an alpha term that results in a thinner left tail for a more risky fund, unless there is persistent evidence to the contrary. As stated in A5.4) AG 43 “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.”

Another related one-dimensional approach to determining fund returns is to assume a constant or rational market price of risk across different funds. This may be expressed through a Sharpe ratio. For example, one may compare the historical Sharpe ratio of the S&P 500 to the Sharpe ratio implied by the distribution of returns created to meet the calibration points, and use this relationship as a guide in modeling returns of other funds. This method would normally require a reasonably stable relationship between the historical Sharpe ratios for the fund and the S&P 500.

While the one-dimensional nature of a CAPM or market-price-of-risk approach can simplify fund modeling, it can also oversimplify it, by failing to appropriately represent cross-correlations among funds or fund types. Therefore, another common fund modeling approach is to generate correlated

returns simultaneously for all funds. The required parameter estimation and computational intensity can be prohibitive as the number of funds increases, so under this method, the actuary may map funds to a limited number of proxy indices (e.g., S&P 500, Lehman Aggregate Bond, Russell 2000, etc.). Returns are then modeled for the proxy indices rather than for the underlying funds.

The mapping from funds to indices often takes the form of a constrained linear regression as first outlined by Sharpe and the actuary would usually consider appropriate constraints. For example, the actuary may force the regression coefficients to be nonnegative, or to add to 100%, or both. The actuary typically tests any mapping to ensure that the returns of proxy mappings are consistent with the returns of underlying funds. In particular, the actuary is usually prudent to take care that the proxy mapping does not systematically overstate mean returns or understate volatility.

As with other fund modeling approaches, when using a multiple-mapping approach, distribution parameters are developed for each of the proxy indices. When doing so, the actuary is usually prudent to maintain a constant or rational market price of risk across different asset classes. As noted above with regard to the Sharpe ratio, adjustment may be made to reflect the market price of risk inherent in the S&P 500 calibration points.

If sufficient historical data is not available to draw robust conclusions the actuary usually relies on the stated investment objectives, policies and strategies of the fund and less direct information (e.g., similar funds run by the same managers).

The actuary shall document the actual 1-, 5-, 10- and 20-year wealth factors of the scenarios at the same frequencies as in the “S&P 500 Total Return Gross Wealth Ratios at the Calibration Points” table in Subsection A5.2) of AG 43.

Note: Subsection A5.4) of AG 43 is dedicated to the calibration of “Other Funds” and lists the full requirements therein.

**Q6.3 Is it appropriate to select a subset of scenarios from the C-3 Phase II prepackaged scenarios available on the Academy website at <http://www.actuary.org/life/phase2.asp>? If so, what does the actuary do if the subset of the scenarios fails to meet the calibration criteria?**

A: Both AG 43 Subsection A5.8) and C-3 Phase II, Appendix 2 appear to imply that a subset of the prepackaged scenarios may be used but the “the actuary shall verify that the scenario calibration criteria are met”. In fact, the Academy website at <http://www.actuary.org/life/phase3.asp> includes a “picking tool” that allows the actuary to choose a subset of the 10,000 scenarios.

If the chosen set of scenarios does not meet the calibration criteria, the actuary may wish to increase the number of scenarios or choose another subset. It is usually inappropriate to shop for scenarios or introduce selection bias. Additionally the actuary ordinarily considers the loss of

information and the increase in uncertainty when seeking to meet the criteria with as few scenarios as possible. The minimum number of scenarios will depend on the specifics of what the actuary is modeling and typically equal or exceed 1000 as per Subsection A5.6) of AG 43.

**Q6.4 How may the actuary determine if an appropriate number of scenarios has been used?**

A: Subsection A1.3)A) of AG 43 states: “The number of scenarios for which projected greatest present values of Accumulated Deficiencies shall be computed shall be the responsibility of the actuary and shall be considered to be sufficient if any resulting understatement in total reserves, as compared with that resulting from running additional scenarios, is not material.”

One method to determine this would be to perform a statistical analysis. For example, the variance of the CTE measure is approximated by this formula:

$$(\text{VAR}(x_1, \dots, x_k) + a (\text{CTE} - x_k)^2) / k,$$

where the x values are the results of the items being included in the CTE calculation (sorted in order with  $x_1$  being the worst present value of surplus and  $x_k$  being the best and  $x_{k+1} \dots x_n$  are excluded), a is the level of the CTE measure (such as 70% for reserves or 90% for Phase II), and n is the total number of scenarios, and k is the  $k^{\text{th}}$  sample order statistic  $x_k$  and equal to  $(1-a)n$ . (Source: Manistre and Hancock, Variance of the CTE Estimator, North American Actuarial Journal, volume 9, number 2 (April 2005), pages 129-156.)

Another method would be to compare the size of the standard deviation (SD) of the CTE measure to the CTE itself. If the ratio is relatively small one may accept the CTE measure as calculated. Otherwise, one could create and use additional stochastic scenarios. Doubling the number of scenarios may have a small impact on the CTE measure and reduce the standard deviation by about 30% (1 minus the inverse of the square root of 2).

Another method involves a form of stratified sampling to potentially reduce sampling error as described by Hancock in Record Volume 29, #3 available from the Societies of Actuaries (SOA). Determine a significant measure, S, for every scenario (10,000 if using the Academy scenario file) and note that S is a function of the scenario (inputs to the model), not the resulting cashflows from that scenario (outputs from the model). In words, S is the square root of the sum of squared discounting values over some time horizon. The discounted values are a function of the accumulation factors in the scenarios and the time horizon should be long enough to account for the majority of cash flows. To arrive at a representative scenario (to help determine if you have an appropriate number of scenarios) you sort the values of S and stratify into a desired number of samples followed by picking the midpoint of each stratum. This approach coupled with a ‘reference portfolio’ can help improve the quality of the CTE measure without the potential need for running more scenarios.

Some sampling methods select more scenarios from one or more sections of the underlying distribution (such as the tail); others select scenarios that are evenly spread out in the underlying distribution. The actuary needs to take this into consideration when choosing a sampling method.

Other methods include various variance reduction techniques, such as those described in the Manistre and Hancock paper referenced above.

Bootstrap techniques could also be used to estimate the standard error in the CTE estimate. If the estimated standard error is too large, it may be possible to add runs to the initial runs and re-estimate the standard error using the same bootstrap techniques. This can be continued until the standard error is deemed low enough. At the Society of Actuaries 2004 annual meeting in New York, Mary Hardy ran a teaching session, Session 72, showing how to apply bootstrap techniques to estimate the standard error of a CTE measure ([http://www.soa.org/files/pdf/072\\_hardy-ny04.pdf](http://www.soa.org/files/pdf/072_hardy-ny04.pdf)). Another way of accessing the material is to go to <http://www.soa.org/meetings-and-events/handouts/detail.aspx>, click on 2004 Handouts, then look for "Session #72 TS - Bootstrap Methods" in the handouts under "Annual Meeting (New York, NY)."

Other statistical procedures may be used to demonstrate appropriateness of the number of scenarios.

Disclosure requirements of the number of scenarios chosen and methods used to determine sampling errors are in Appendix 11 and Appendix 8 of the C-3 Phase II and AG43 reports.

**Q6.5 Are the Short-Term, Medium-Term, and Long-Term US Treasury pre-packaged fund yields appropriate for calculating the interest rate component of C-3 Phase II?**

A: Appendix 6 of C-3 Phase II states that "Ideally, a fully integrated model of equity returns and interest rates, with rate volatility and expectations and frequency and duration of yield curve inversions consistent with the 'Phase I' requirements, would be run to develop an estimate of the (combined) market risks". It goes on to say "The US Treasury Fund scenarios within the 10,000 prepackaged scenarios qualify as meeting this standard". If using a subset of the pre-packaged scenario, the actuary may wish to verify that the subset meets these characteristics. The scenarios for the different maturities are correlated and are used as a set.

Note that Appendix 6 of C-3 Phase II Report contains other simplified approaches for calculating the interest rate risk component of C-3 Phase II.

**Q6.6 What are the considerations for meeting the calibration points in the first 20 years? What calibration requirements apply to projected fund returns for time periods in excess of 20 years?**

A: S&P 500 calibration points are provided for a 20-year time horizon. An insurer using the modeling approach to calculate the TAR may use the pre-packaged scenarios or the fund scenarios meeting the calibration criteria produced by an internal company model that satisfy the calibration criteria as per Subsection A5.2) of AG 43. Strict compliance with all calibration points is not required for S&P 500 funds, but the actuary should be satisfied that any differences do not materially reduce the TAR.

Subsection A5.3) of AG 43 states that while “It is possible to parameterize some path and/or state dependent models to produce higher volatility (and/or lower expected returns) in the first 20 years in order to meet the calibration criteria, but with lower volatility (and/or higher expected returns) for other periods during the forecast horizon. While this property may occur for certain scenarios (e.g., the state variables would evolve over the course of the projection and thereby affect future returns), it would be inappropriate and unacceptable for a company to alter the model parameters and/or its characteristics for periods beyond year 20 in a fashion not contemplated at the start of the projection and primarily for the purpose(s) of reducing the volatility and/or severity of ultimate returns.” These adjustments should be clearly documented and justified by historical data.

For many investment funds the actuary may not have more than 10 years of historical data. As industry experience increases with these issues, the actuary’s practice in dealing with such cases would normally reflect the sophistication or rigor consistent with a range of industry practice. This does not mean, however, that the actuary would always use the most complicated or newest method. The dollar value of non-S&P 500 funds would usually be a consideration, as well as whether these funds are balanced funds or bond funds which have lower risk.

Calibration of other markets (funds) is left to the judgment of the actuary, but the scenarios so generated must be consistent with the calibration criteria in subsection A5.2). This does not imply a strict functional relationship between the model parameters for various markets/funds, but it may 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.

Appendix 2 and Section A5.4) of the C-3 Phase II and AG43 reports cover requirements for the other market funds.

**Q6.7 What are the considerations in modeling fund returns?**

A: The type of fund is a primary consideration. Another consideration is the amount of historical data available for a fund. A variety of models can be used. If the actuary has two closely related funds, similar models would

normally be used for each. A larger fund would usually receive more attention. For example a lognormal model could be used for a small fund and a regime switching model could be used for a larger fund. Calibration criteria would usually have a reasonable relationship among the different funds modeled. This can result from a combination of theory and empirical analysis. See Appendix 2 of C-3 Phase II report.

Appendix 2 and Section A5.4) of the C-3 Phase II and AG43 reports cover requirements for the other market funds.

**Q6.8 What characteristics would integrated equity/interest rate scenarios typically have?**

A: Principle 5 (AG 43 Section 1) would suggest that integrated equity/interest rate scenarios and trading strategies should be such that they do not produce riskless profits. If a company is hedging, it may be appropriate for the models to determine the prices of hedge instruments using an appropriate set of risk-neutral scenarios which do not underestimate the cost of hedging.

According to Appendix 6 of the C-3 Phase II report, a fully integrated model of equity returns and interest rates, with rate volatility and expectations and frequency and duration of yield curve inversions consistent with the Phase I requirements, would need to be run to develop an estimate of the (combined) market risks. The US Treasury Fund scenarios within the 10,000 prepackaged scenarios available on the Academy website qualify as meeting this standard. [However, it should be noted that the prepackaged equity and interest rate scenarios are not correlated. Hence, they may not be appropriate when incorporating hedging analysis.]

**Q6.9 Are the pre-packaged scenarios appropriate for the purposes of projecting the market value of future hedge instruments within a projection?**

A: Because AG 43 and C-3 Phase II involve cash flow projections, the pre-packaged scenarios were developed on a “real-world” basis (as opposed to a “risk-neutral” basis). Therefore, the pre-packaged scenarios are not appropriate for purposes of valuing hedge instruments within a projection. For this purpose, it is usually more appropriate to use risk-neutral scenarios to determine the market value of hedge instruments in the cash flow projections that are based on real-world scenarios.

**Q6.10 How can correlations between funds and market indices be incorporated into scenarios produced by an internal model?**

A: This can be difficult as many funds lack adequate data. There can also be changes in fund management that make the correlation relationship to market indices unstable. When developing fund correlation assumptions, the actuary may consider the standard error associated with pair wise correlation estimates and may consider the overall portfolio variance and return characteristics for consistency. Alternatively, one may estimate the correlation structure of individual fund returns using single index (CAPM)



models, multi-index models (Chen/Roll/Ross, Fama/French, Rosenberg), or factor/principal component analysis.

**Q6.11 Section A5.8) of AG 43 states “If all or a portion of these scenarios are used, then the actuary shall verify that the scenario calibration criteria are met.” This statement is referring to the pre-packaged scenarios. Does this mean that the full set of 10,000 scenarios does not meet the calibration criteria?**

A: The March 2005 C-3 Phase II Supplement Report states, within the “Model Descriptions and Notes” section, that “The S&P500 TR scenarios (Diversified Equity) satisfy the calibration criteria within sampling error.” This implies the full set of 10,000 pre-packaged scenarios meets the calibration criteria. Refer to page 13 of the report, “Scenario Statistics – Accumulation Factors” and Tables 12 through 15 for further details.

The actuary is required to verify that the scenario calibration criteria are met if the actuary uses the full set of 10,000 scenarios or chooses a subset from the full set of 10,000 scenarios.

The March C-3 Phase II supplement can be found at:  
[http://www.actuary.org/pdf/life/c3supp\\_March05.pdf](http://www.actuary.org/pdf/life/c3supp_March05.pdf)

**Q6.12 For companies developing internal equity return models, must a specific model be used?**

A: No. While the stochastic log volatility model was the basis for the S&P 500 Total Return Diversified Equity Calibration Points, any model with suitable parameterization that meets the Calibration Criteria can be used. For examples of models and parameterizations that have been evaluated, see the Life Capital Adequacy Subcommittee’s June 2005 Report – Appendix 2 - page 32 ([http://www.actuary.org/pdf/life/c3\\_june05.pdf](http://www.actuary.org/pdf/life/c3_june05.pdf)).

**Q6.13 Could the actuary use a state or path dependent equity return model?**

A: Yes, as long as the actual scenarios produced by the model and used in the calculation required by C-3 Phase II meet the Calibration Criteria. The calibration requirements that the actual scenarios produced by the state or path dependent model must fulfill can be found in the NAIC RBC Instruction (currently LR025 Line 37 Step (1) for 2009).

**Q6.14 Is there a standardized way to extend the prepackaged scenarios beyond 30 years? When is it expected that they will next be updated?**

A. The Academy’s Economic Scenario Generator Work Group has recently released a new economic scenario generator that is capable of providing treasury, fixed income, and equity returns up to 150 years. The generator is available on the Academy’s website (<http://www.actuary.org/life/phase3.asp>), and is able to produce up to 10,000 scenarios. Consequently, the Academy

work group has indicated that it will not be providing an updated set of prepackaged scenarios.

**Q6.15 What other reference materials are available to assist an actuary indetermining how to generate integrated scenarios from an internal model?**

A: The actuary should consider the FAQ on scenario generators currently under development by the Academy Economic Scenario Implementation Working Group (ESIWG). In addition, here is a select list of titles that may be of help to the interested reader:

Title	Author	Publisher
Active Portfolio Management	Richard C. Grinold; Ronald N. Kahn	McGraw Hill
Applied Multivariate Statistical Analysis	Richard Johnson; Dean Wichern	Prentice-Hall
Bootstrap Methods and their Application	A.C. Davison; D.W. Hinkley	Cambridge University Press
Derivatives	Paul Wilmott	John Wiley & Sons
Derivative Securities	Robert Jarrow; Stuart Turnbull	South-Western College Publishing
Futures & Options: Theory and Applications	Hans R. Stoll; Robert E. Whaley	South-Western Publishing Company
A Guide to Simulation	Paul Bratley; Bennett L. Fox; Linus E. Schrage	Springer-Verlag
Interest Rate Modeling	Jessica James; Nick Webber	John Wiley & Sons
Interest-rate Option Models	Riccardo Rebonato	John Wiley & Sons
Modeling of Economic Series Coordinated with Interest Rate Scenarios	Keven C. Ahlgrim; Stephen P. D'Arcy; Richard W. Gorvett	SOA/CAS Research Project; downloadable from the SOA webpage
Modern Portfolio Theory & Investment Applications	Edwin J. Elton; Martin J. Gruber	John Wiley & Sons
Monte Carlo: Concepts, Algorithms, & Applications	George S. Fishman	Springer-Verlag

<b>Title</b>	<b>Author</b>	<b>Publisher</b>
Monte Carlo Methodologies and Applications for Pricing and Risk Management	Bruno Dupire (Editor)	Risk Books, a specialist division of Risk Publication
Monte Carlo Methods in Finance	Peter Jackel	John Wiley & Sons
Monte Carlo Methods in Financial Engineering	Paul Glasserman	Springer-Verlag
Nonparametric Regression and Generalized Linear Models	P.J. Green; B.W. Silverman	Chapman & Hall/CRC
A Non-Random Walk Down Wall Street	Andrew W. Lo; Craig A. MacKinlay	Princeton University Press
Numerical Analysis	Richard L. Burden; J. Douglas Faires	PWS Publishing Company
Options Markets	John C. Cox; Mark Rubenstein	Prentice-Hall
Options: Theory, Strategy and Applications	Peter Ritchken	HaperCollins Publishers
Pricing Financial Instruments, The Finite Difference Model	Domingo Tavella; Curt Randall	John Wiley & Sons
Quantitative Modeling of Derivative Securities	Marco Avellaneda in collaboration with Peter Laurence	Chapman & Hall/CRC
Quantitative Risk Analysis: A Guide to Monte Carlo Simulation Modeling	David Vose	John Wiley & Sons
Quasi-Likelihood and Its Application	Christopher C. Heyde	Springer-Verlag
Simulation	Sheldon M. Ross	Academic Press
Statistical Inference	George Casella; Roger L. Berger	Duxbury Press
A Stochastic Asset Model & Calibration for Long Term Planning Purposes	John Hibbert; Philip Mowbray; Craig Turnbull	Downloadable at <a href="http://www.barrhibb.com">www.barrhibb.com</a>
<b>Title</b>	<b>Author</b>	<b>Publisher</b>
The Treasury Bond Basis <small>American Academy of Actuaries</small>	Galen D. Burghardt; Terrence M. Belton	Probus Publishing Company <small>www.actuary.org</small>



## **7) DETAILS ON ACTUARIAL/MODELING ASSUMPTIONS**

### **Q7.1 What do "best estimate" and "anticipated experience" mean?**

A: The terms "best estimates" and "anticipated experience" are used in describing the setting of deterministic assumptions to be used for modeling.

The C-3 Phase II Report uses the term "best estimate" whereas AG 43 uses the term "anticipated experience". Both are defined to be an actuary's reasonable estimate of future experience, given the available, relevant information. Best estimate is defined in the Glossary of the C-3 Phase II report and anticipated experience is defined in Section III B) 8) of the AG 43 report.

The reason for the difference in nomenclature is that concerns were raised about the term "best estimate" after C-3 Phase II had been completed, and was subsequently replaced by the term "anticipated experience".

### **Q7.2 What do "prudent best estimate" and "prudent estimate" mean?**

A: The terms "prudent best estimate" and "prudent estimate" are used in describing the setting of deterministic assumptions to be used for modeling. The C-3 Phase II Report uses the term "prudent best estimate" whereas AG 43 uses the term "prudent estimate". A prudent best estimate (under C-3 Phase II) or prudent estimate (under AG 43) assumption would normally be defined by applying a margin to the actuary's best estimate or anticipated experience for the given assumption. The amount of margin applied to the best estimate or anticipated experience, typically may reflect some or all of the following:

- Potential estimate error;
- Potential random fluctuation from best estimates or anticipated experience;
- Potential for adverse trends in experience; and
- Potential anti-selection (e.g., possible correlation of lapses and mortality).

In general, the greater the uncertainty in any one of these factors the larger the margin, with each margin being set such that it increases the liability or provision over that which would be held in absence of the margin. For example, assumptions for circumstances that have never been observed would typically require more margin for estimation error than those for which abundant and relevant experience data are available. In addition, more margin might also be applied to risks that will occur farther into the future.

For further guidance, refer to Section III.B.(8), Appendix 9, and Appendix 10 of AG 43, and the Glossary (page 7), Methodology Note C3-03, and Methodology Note C3-04 of C-3 Phase II.

**Q7.3 Are the margins included in “prudent best estimate” or “prudent estimate” assumptions developed assumption by assumption or in the aggregate?**

A: Principle 3 in the Appendix 7 of the C-3 Phase II Report and Section I) of the AG 43 Report states, “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 Conditional Tail Expectation Amount at the required CTE level if it were possible to calculate results over the joint distribution of all future outcomes.”

As is further stated in Methodology Note C3-03 of the C-3 Phase II Report:

“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:

- Remain logical and internally consistent across the scenarios tested;
- Represent plausible outcomes; and
- Lead to appropriate, but not excessive, asset requirements.”

AG 43 includes similar language in Principle 3, but specifies that the intent of the Principle is to “describe the conceptual framework for setting assumptions” and that Appendix 9 provides “the requirements and guidance for setting contractholder behavior and includes alternatives to this framework if the actuary is unable to fully apply this principle”. In Appendix 9 Section A9.2) of the AG 43 report, it is recognized from a practical stand point, that it may not always be possible to determine the level of margin in aggregate for all behavior assumptions. Therefore it requires that “the actuary shall determine Prudent Estimate assumptions independently for each behavior (e.g., mortality lapses, and benefit utilization), using the requirements and guidance in this Appendix and throughout the guideline, unless the actuary can demonstrate that an appropriate method was used to determine the level of margin in aggregate for two or more behaviors.”

**Q7.4 Q3.3 suggests that policyholder behavior assumptions could be different between CTE70 and CTE90 with more conservatism in the CTE90. Is that viewed as a requirement or an option for the modelers?**

Some actuaries feel that assumptions would differ based on the CTE level; however other actuaries believe it is appropriate to use the same assumption especially for assumptions that are scenario dependent (e.g., lapses that vary by in-the-moneyness). The requirements don't specifically state that the actuary can or can't use the same assumptions, so the actuary should be comfortable that whatever assumptions are used meet the requirements of each standard.

### **Q7.5 What is an appropriate discount rate?**

A: C-3 Phase II addresses this in three areas. First, in the body of the C-3 Phase II Report, Modeling Methodology, Section 7. Expected Interest Rates, it states that “For discounting future surplus needs and for earnings on projected general account investments (beyond the maturity of the current assets), companies that do not use an integrated model are to use the implied forward rates from the swap curve. Companies that do have an integrated model may use the rates generated by that model or the swap curve, but must use the method chosen consistently from year to year. Whether from a model or from the swap curve, the discount rates need to be reduced for Federal Income Tax. Interest earnings on existing fixed assets should be reduced to reflect expected credit losses.”

Second, in Appendix 1- General Methodology, it states, “For each scenario, the C-3 asset increase needed is the smallest of the series of present values  $S(t) \cdot pv(t)$ , where  $S(t)$  is statutory assets less liabilities for the products in question at the end of year  $t$ , and  $pv(t)$  is the accumulated discount factor for  $t$  years using the after-tax swap rates (or post-tax one-year Treasury rates for that scenario, if applicable).”

Finally, in Appendix 2-Scenario Requirements it states, under the “Discount Rates” heading, “For discounting future capital strain, the Federal Income Tax adjusted swap curve rates may be used. Alternatively, an economic model built into the scenario generator may be used to simulate one-year Treasury rates. In the latter case, the rates must start at current levels, approximately satisfy the ‘no arbitrage’ principle (on an expected basis) and exhibit deviations from expected values generally consistent with the Phase I interest model.”

In the survey results summary, which covered the first year of practice, the predominant approach (36%) was the use of the after-tax one-year treasury rate. Another group of companies (12%) used the after-tax swap curve. Some companies appeared to use methodologies that do not directly appear to reflect the reduction for Federal Income Taxes. These included the use of the swap curve itself (14%), the portfolio yield (12%), a modified swap curve (10%) and LIBOR (4%) (see the last paragraph.)

AG 43 addresses discount rates in Appendix 1, Section A1.2)B),

“Discount Rates. In determining the Scenario Greatest Present Values, Accumulated Deficiencies shall be discounted using the same interest rates at which positive cash flows are invested, as determined in Section A1.4)D). Such interest rates shall be reduced to reflect expected credit losses. Note that the interest rates used do not include a reduction for Federal Income Taxes.”

Section A1.4)D) gives the actuary the choice among the following:

- (a) The forward rates implied by the swap curve in effect as of the valuation date,
- (b) The 200 interest rate scenarios available as prescribed for Phase I, C-

3 Risk Based Capital calculation, couple with the Separate Account return scenarios by mating them up with the first 200 such scenarios and repeating this process until all Separate Account return scenarios have been mated with a Phase I scenario, or

- (c) Interest rates developed for this purpose from a stochastic model that integrates the development for interest rates and the Separate Account returns.

AG 43 goes on to say, “When the option described in 1) above (the forward interest rates implied by the swap curve) is used, an amount shall be subtracted from the interest rates to reflect the current market expectations about future interest rates using the process described in Section A1.5)A).

The actuary may switch from a) to b), from a) to c) or from b) to c) from one valuation date to the next, but may not switch in the other direction without approval from the Domiciliary Commissioner.”

Whichever approach a company is using, the actuary should consider documenting the methodology and discuss how the approach meets the requirements.

**Q7.6 What assumptions might be used in the calculations required by C-3 Phase II and AG 43 and how would they be established?**

A: There are many assumptions that underlie these calculations. The complete list will be a function of the company doing the modeling and the type of product being modeled. The actuary may wish to consider the potential impact of any variable that is expected to have a material effect on the outcome. Values for each assumption are typically based on credible experience of the company doing the testing, company experience on similar products, or industry experience, in that order of preference. Margins are added, as discussed in Q7.3.

Sensitivity testing is a useful tool in creating assumptions for which no experience or industry data is available. The survey results summary indicated that in this situation, most companies developed their base and dynamic assumptions by creating a baseline assumption and using sensitivity testing. Possible sources of an appropriate baseline assumption might be the company’s Cash Flow Testing or pricing assumptions.

Several required assumptions are provided below:

- Mortality
- General account crediting rate strategy
- Lapse rates (including full and partial withdrawals)
- Expenses (including overhead and investment expenses)
- Living benefit utilization rates
- Expected credit losses
- Expected revenue sharing income
- Future premium flows
- Renewal and trail commissions



- Inforce grouping

Refer to Appendix 9 of AG 43 for more guidance and requirements.

**Q7.7 What process would the actuary follow in establishing the assumptions?**

A: Appendix 9 of AG 43 states that the company shall use actual experience data directly applicable to the business segment (i.e., direct data) if it is available. Appendix 9 goes on to say “In the absence of direct data, the company should then look to use data from a segment that are 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. The actuary shall document any significant similarities or differences between the two business segments, the data quality of the similar business segment and the adjustments and the margins applied”.

If company experience data is unavailable, then some actuaries may consider other sources of data such as industry studies from blocks of similar products. Pricing assumptions may also be a source; for dynamic assumptions it was a primary source for a majority of companies in the survey results summary.

Whatever the source of the data, the actuary may wish to consider the credibility of this data in creating assumptions and the appropriateness of those sources to the business being modeled. If the actuary used a feedback loop or some other method to evaluate actual versus expected results, the actuary may wish to consider discussing how this review was used in setting the assumptions.

Guidance for establishing these assumptions is provided in the prudent best estimate or prudent estimate definition in C-3 Phase II and AG 43 (e.g., the margin for error in assumptions should be directly related to uncertainty in the underlying risk factor).

In calculating results under C-3 Phase II the actuary may wish to consider adjusting assumptions based on historical experience to consider those guarantees that are available in the contracts that were not materially prevalent in the experience base. Appendix 9 of AG 43 states that the actuary should do this.

The actuary may also wish to consider the possibility of anti-selection impacting assumptions. For example, anti-selection may involve a combination of lapses, persistency, mortality, and in-the-moneyness of guarantees.

In calculating results under C-3 Phase II the actuary should consider performing sensitivity tests of assumptions to identify those that materially impact results and how various assumptions impact results (Appendix 9 of AG

43 states that sensitivity testing is required.) Sensitivity testing can range from full stochastic testing to testing on a subset of scenarios to testing a single deterministic scenario. Some actuaries will use asset adequacy sensitivity testing as a tool. These tests may be used as guidance regarding areas in which additional study may be warranted to increase the accuracy of the key assumptions. From the survey results summary, mortality and lapse assumptions were by far the most frequently sensitivity tested; however, assumptions such as expenses, revenue sharing and expected future premium also received significant attention.

The actuary may also wish to consider reviewing guarantees related to cash inflows and outflows to determine to what degree these future cash flows may be incorporated in the model.

The actuary may wish to consider the probability of events occurring that may materially impact future assumptions. Examples of these events include increased expected volatility of markets affecting the distribution of future returns or changes in inflation expectations affecting future expenses.

**Q7.8 What assumptions would the actuary consider making dynamic and would the addition of a dynamic element to a given assumption normally be expected to impact the actuary's determination of the prudent best estimate or prudent estimate for the underlying base assumption?**

A: According to the survey results summary, dynamic assumptions were amongst the most difficult to determine.

Dynamic assumptions are most commonly used to model contractholder behavior. The survey results summary indicated that lapses and (re)election of benefits were by far the most common use of dynamic assumptions. As practice grows, it might be expected to also include activities such as partial withdrawals, transfers between investment options, inflation assumptions and recurring deposits. In establishing behavior-related assumptions, actuaries may wish to consider the following:

- (a) Contractholder behavior can vary by product, market, distribution channel, fund performance, time/product duration, etc.
- (b) Options embedded in the product may impact behavior.
- (c) Options may be elective or non-elective in nature. Living benefits are often elective, while death benefit options are often non-elective.
- (d) Elective contractholder options may be driven more by economic conditions than non-elective options.
- (e) As the "value" of a product option increases, the likelihood of contractholder behavior anti-selecting against the insurer increases.

- (f) Behavior formulas may have both a rational and irrational component. The rational component normally would be dynamic.

Contractholder behavior can be difficult to predict accurately, and the related assumptions can have a significant impact on the results. In determining these assumptions, some actuaries apply the following considerations:

- (a) Some actuaries believe that in the absence of empirical data, it is preferable to set behavior assumptions on the conservative side for purposes of determining C-3 Phase II requirements. This is required by AG 43.
- (b) As stated in Methodology Note C3-03 of the C-3 Phase II Report and Appendix 9 Section A9.6) of the AG 43 report, policyholder behavior assumptions should be consistent with the behavior that would be anticipated in the scenarios that are employed in the CTE calculation (generally, the top 1/3, or less, of the loss distribution).
- (c) Methodology Note C3-03-Contractholder Behavior and Appendix 9 Section A9.4) of the AG 43 report also states that it is reasonable to assume a certain level of non-financially motivated contractholder behavior. It states “The actuary need not assume that all contractholders act with 100% efficiency in a financially rational manner.”

Some actuaries believe the addition of a dynamic element to a given assumption does not impact the actuary’s determination of the prudent best estimate or prudent estimate for the underlying base assumption. Each dynamic contractholder behavior assumption reflects the actuary’s prudent best estimate or prudent estimate for how the given assumption will vary by economic scenario. This issue and more guidance on the setting of contractholder behavior assumptions is also further described in Methodology Note C3-03 in the C-3 Phase II and Appendix 9 of the AG 43 report. Section A9.5 of AG 43 specifically addresses dynamic assumptions.

**Q7.9 What factors might the actuary choose to consider in estimating how contractholder behavior is likely to impact assumptions that vary based on the underlying equity/interest rate scenario?**

A: Some actuaries consider the following items (among others) when estimating how contractholder behavior might impact assumptions:

- Results of company and industry experience studies;
- Product design;
- Distribution channel;
- In-the-moneyness;
- Combination of guaranteed benefits;
- Attained age (especially as retirement nears); and
- Contractholder/Agent sophistication.

**Q7.10 What factors might the actuary choose to consider in determining the earned rate for the general account assets?**

A: The C-3 Phase II Report is not specific regarding assets held as of the valuation date, but some actuaries believe that it is appropriate for the earned rates to be determined consistent with the book value of those assets and to be those rates expected to be realized in future periods. AG 43 is more specific, stating in Appendix 1, Section A1.4)D), “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.” In certain instances, it may be possible for the value of the assets at the start of the projection attributable to the general account to be negative (e.g., if the value of separate account assets and hedges exceeds the estimated reserve as of the start of the projection). In this case, some actuaries believe it is preferable for the earned rates used to reflect the cost of borrowing money to support such negative assets. Other actuaries believe an asset portfolio could be constructed in the amount of the negative assets with a return equal to the negative of the return such assets would produce if actually owned. This portfolio could be constructed consistent with the investment strategy used in the modeling exercise.

The C-3 Phase II Report discusses earnings on future asset purchases in Section 7 Expected Interest Rates. The report allows for the use of earned rates from an integrated model, or alternatively allows the use of implied forward rates from the swap curve. Some actuaries believe that to the extent these calculations already include a spread above the Treasury yields, no additional spread should be added to the earned rates derived in this manner, but that provision should be made for projected asset defaults.

Aside from these two choices, AG 43 in Section A1.4) D) General Account Assets mentions the possible use of the 200 C3 Phase I Scenarios in projecting General Account Cash flows.

Conceptually, the same earned rates may be used for both C-3 Phase II and AG 43 calculations.

While the commentary above discusses rates that potentially may be used for earnings on general account assets, see the previous question 7.5 for rates to be used for discounting.

**Q7.11 Could the actuary assume that cash flows generated from variable annuity contracts are reinvested into assets as part of the general account investment strategy for their models?**

A: Some actuaries believe that a true integrated model that reflects the price that assets can be purchased at is the desired approach, however this approach is not required. Other actuaries believe that it may not be practical or desirable to follow an integrated model approach. Item 1 of Section A1.4)D) of AG 43 provides an alternatives to an integrated model

and permits the use of forward interest rates implied by the swap curve (subject to the requirements in the guideline).

**Q7.12 What are special factors related to variable annuity guarantees that the actuary might choose to consider when establishing lapse assumptions?**

A: Variable annuities with guarantees may experience different lapse behavior than similar annuities without guarantees or with different guarantees.

In analyzing the lapse behavior of variable annuity policyholders, the actuary may wish to consider several factors, including, but not limited to: the current and potential value of policy guarantees, the nature of the guarantees (elective vs. non-elective), possible anti-selection on the part of contractholders, and increasing sophistication of policyholders and advisors.

The actuary may also wish to consider the credibility of applicable past experience and whether there are any factors that would indicate that past observed experience will differ from future experience. Possible factors may include replacement activity that may have resulted in artificially high lapse experience that may not be sustained and lapse experience trends for business in which projected results are sensitive to lapse experience.

**Q7.13 As mentioned in the Modeling Methodology section, item 3 Assets of the C-3 Phase II Report and Appendix 1 Section A1.4A) Starting Asset Amount of the AG 43 report, assets at the start of the projection may include negative general account assets. At what rate would negative general account assets normally be financed?**

A: As mentioned in Q7.10, some actuaries believe it is preferable for the earned rates used to reflect the cost of borrowing money to support such negative assets. Other actuaries believe an asset portfolio could be constructed in the amount of the negative assets with a return equal to the negative of the return such assets would produce if actually owned. This portfolio could be constructed consistent with the investment strategy used in the modeling exercise.

**Q7.14 The C-3 Phase II Report provides (Section 10, paragraph 2) that "The Risk-Based Capital requirement is the Total Asset Requirement adjusted for taxes, minus the statutory reserve actually held."**

**(a) What is the reason for the tax adjustment?**

A: The working reserve included in the projections is typically the cash surrender value. To the extent that actual tax reserves as of the valuation date exceed the working reserve, there is an element of future expense that is not considered in the projection (i.e., the tax associated with the release of the portion of the tax reserve in excess of the working reserve). This adjustment is made to reflect this item.

**(b) What is included in the "statutory reserve actually held"?**

A: The actual reserve would include the actual statutory reserve held by the company on the valuation date for contracts within the scope of C-3 Phase II. For the treatment of AVR and IMR, please see Appendix 1(a), items 3 & 4 under Single Scenario C-3 Measurement Considerations of the RBC Instructions or its equivalent on the most recent RBC instruction. For further guidance on AVR/IMR please see Questions 3.2.

**Q7.15 The sixth paragraph of Section 10 of the C-3 Phase II Report describes a method for approximating the Tax Adjustment.**

**(a) What is the Tax Adjustment?**

A: The C-3 Phase II Instructions state: "Under the U.S. IRC the tax reserve is defined. It can never exceed the statutory reserve nor be less than the cash surrender value. If the tax reserves assumed in the model are set equal to the working reserves and if the tax reserves actually exceed the working reserves at the beginning of the projection, a tax adjustment is required.

The Tax Adjustment is not required in the following situations:

1. Tax reserves are projected directly; that is, it is not assumed that projected tax reserves are equal to Working Reserves, whether these are cash values or other approximations.
2. Tax reserves at the beginning of the projection period are equal to Working Reserves.
3. Tax reserves at the beginning of the projection period are lower than Working Reserves. This situation is only possible for contracts without cash surrender values and when these contracts are significant enough to dominate other contracts where tax reserves exceed Working Reserves. In this case the modeled tax results are overstated each year for reserves in the projection, as well as the projected tax results reversed at the time of claim.

If a tax adjustment is required the Total Asset Requirement (TAR) must be increased on an approximate basis."

**(b) Are other approximation methods appropriate?**

A: The illustrated methodology adds the tax adjustment recognizing the understatement of tax reserves at the start of the projection to the duration producing the lowest present value for each scenario. Some actuaries believe that other reasonable approximations may be made as long as the adjustment is consistent with the principles for C-3 Phase II.

A large majority of the C3 Phase II survey respondents did use the tax adjustment to TAR defined in the report. A few companies actually model tax reserves.

Some actuaries believe it is permissible to calculate tax reserves, as well as any other tax items that may be applicable, within both the stochastic and the Standard Scenario models in order to compute taxable income. Whenever an explicit assessment of taxable income has already been included in the models, no additional tax adjustment would be needed.

Section 1)A) in the section of LR025 that details the calculation of the Standard Scenario Amount states “If the Standard Scenario Amount is greater than the Total Asset Requirement less any amount included in the TAR but attributable to and allocated to C-3 (Interest Rate Risk) otherwise determined based on the report, then the Total Asset Requirement before tax adjustment used to determine C-3 Phase II (Market Risk) RBC shall be the Standard Scenario Amount.” As a result of this statement, some actuaries believe that it is appropriate to include a tax adjustment in calculating the Standard Scenario result.

**(c) The approximation specified is based on numbers of contracts or lives. Would it be appropriate to use an approximation based on account values?**

A: Some actuaries believe that other reasonable approximations may be used provided the results of the approximation are consistent with the principles for C-3 Phase II.

**Q7.16 What can be done to shift some of the work for C-3 Phase II compliance into periods other than the busy year-end period?**

A. Two methods that some actuaries have identified as a basis for meeting the criteria were described in the March 2004 report of the Variable Annuity Reserve Work Group to the Life and Health Actuarial Task Force. They are called the Interpolation Method and the Informed Projection Method. These methods may be appropriate for estimating TAR. Other methods will likely emerge as practice develops.

The survey results summary indicated that the overwhelming majority of companies used the year-end inforce for the actual determination of TAR in 2005. Of those companies which choose a date other than year-end, there was a relatively equal split between September 30 and November 30. A variant of the “Informed Projection” Method appeared to be the most popular.

Actuaries using these approaches are usually prudent to determine whether they are appropriate for the business to which they are being applied.

**Q7.17 Do companies base the projections needed for C-3 Phase II on business in force prior to the valuation date?**

A: Section I of the *General Instruction LR025 Interest Rate Risk and Market Risk* for C-3 Phase II titled “Calculation of the Standard Scenario Amount” appears to anticipate that companies might base their models on business

in force prior to the valuation date. Specifically, Subsection (C) of this section, titled “Illustrative Application of the Standard Scenario Method to a Projection, Model Office and Contract-by-Contract” references “a projection of an inforce prior to the statement date.”

Both the Interpolation Method and the Informed Projection Method referenced above use business in force prior to the valuation date for purposes of running the stochastic projections. Each method also incorporates an adjustment to reflect the actual business in force on the valuation date. For the electronic filing of risk-based capital the reported Authorized Control Level Risk-Based Capital would be no less than the amount required using year-end data.

**(a) What is the Interpolation Method?**

This method attempts to relate projected fund performance to resulting changes in TAR by measuring the present values of "Risk Elements" in three categories: death benefits, living benefits, and surrender charge amortization. An estimate of the TAR on the valuation date can be obtained by interpolating between the CTE results, expressed as an amount per dollar of net amount at risk, which are obtained from running multiple calculations (perhaps as many as five) on the business in force on a previous valuation date. An estimate for TAR at a later valuation date can then be obtained by applying the interpolated result to the actual Risk Elements. The steps in the process are as follows:

- 1) The account values as of the previous valuation date are “shocked” up and down by various percentages to simulate market movements that could occur before the end of the financial reporting period (this is referred to below as the “shocked account values”).

For example, an actuary might assume that market values would go up or down by no more than 15% over this period (if markets change by more than this, the actuary then runs an additional valuation since “extrapolation” would not be permitted – only interpolation). To improve the accuracy of the interpolation, the actuary might also choose to run projections at +/- 10%, as well. The starting account values and asset values would then be increased by +/- 10% and +/- 15%, resulting in calculation of CTE results on five different starting values (including the original values).

- 2) A CTE result is calculated for each of these shocked account values.
- 3) For each of these CTE results, the present value of the Risk Elements is determined by measuring the net amounts at risk for each of the Risk Elements on a seriatim basis, assuming a single scenario occurs following the initial shock and using statutory valuation mortality and interest rates. A separate present value of Risk Elements is established for CTE (90).



The single scenario is determined by selecting, from the scenarios run to determine the CTE (90) TAR on the previous valuation date, the scenario producing the greatest present value of accumulated deficiencies numerically closest to the reserve held on the previous valuation date. The present value of the Risk Elements is measured over the period at which the greatest present value of Accumulated Deficiency for reserves, or lowest present value of accumulated statutory surplus for TAR, occurs within the single scenario (e.g., if the greatest present value of Accumulated Deficiency occurs at year 5, the present value is based on the Risk Elements over five years).

Note that the determination of the present value of Risk Elements is similar to that of Actuarial Guideline 34 (i.e., an immediate drop or growth at the shock percentage, followed by assumed returns associated with the single scenario described above).

- 4) For each of the shock scenarios, the CTE value from the projection in step #2 is set equal to the corresponding present value of Risk Elements (from step #3) multiplied by a factor that is a function of the shock percentage associated with the projection. In formulas for CTE (90), this can be expressed as a series of equations for each shock percentage “P” as shown below. Formulas for TAR determination at CTE (90) are similar.

$${}_pCTE(90) = PV(RiskElements_p) \times f(P)$$

And in our example from above, we would have five equations as follows:

$${}_0CTE(90) = PV(RiskElements_0) \times f(0)$$

$${}_{10}CTE(90) = PV(RiskElements_{10}) \times f(10)$$

$${}_{-10}CTE(90) = PV(RiskElements_{-10}) \times f(-10)$$

$${}_{15}CTE(90) = PV(RiskElements_{15}) \times f(15)$$

$${}_{-15}CTE(90) = PV(RiskElements_{-15}) \times f(-15)$$

In each of these equations, the function value  $f(P)$  can be solved for by setting it equal to the CTE value divided by the present value of the Risk Elements corresponding to that CTE. This may be

thought of as the CTE value per dollar of present value of Risk Elements.

- 5) Mathematical interpolation can then be used to calculate this ratio for intermediate shock values and the interpolated value can be applied to the present value of Risk Elements to obtain an estimate of the corresponding TAR.

For example, in order to illustrate a TAR estimate, the VARWG used the LaGrange interpolation method with five valuations to construct a fourth degree polynomial that relates the CTE (90) values per dollar of present value of Risk Elements to changes in the market values underlying the account values. That is, the CTE (90) per dollar of present value of Risk Elements is the dependent variable,  $f(P)$ , with the independent variable, "P" representing the percentage change in the market values underlying the account values. The coefficients of the interpolation formula are derived from the five CTE (90) values per dollar of present value of Risk Elements.

- 6) Once the actual account values at the end of the financial reporting period are known, the present values of Risk Elements corresponding to each CTE value can be calculated on a seriatim basis using the corresponding single scenario used to develop the CTE value per dollar of Present Value of Risk Element calculated in step #4. The interpolated result is then applied to these values to obtain the estimated reserve or TAR at the end of the financial reporting period.

Some actuaries believe this could result in fairly accurate reserve and TAR estimates. The primary advantages to this approach are that the seriatim Risk Element calculation reflects the actual characteristics of the business in force and "in-the-moneyness" on the valuation date and that it could be performed at year-ends and quarter-ends on a routine basis. A potential concern is the amount of work needed to perform the additional projections.

#### **(b) What is the Informed Projection Method?**

Under this approach, reserves and TAR are estimated on the "current date" and prior to the valuation date using the actual in-force file from a prior period (the "prior period start date"), updated for actual experience through the "current date". An example would be to estimate the December 31 reserves on December 15 (the "current date") using the in-force file from a "prior period start date" of September 30, updated for actual fund performance and new sales through December 15. Such an estimate would allow the company additional time to meet its reporting deadlines.

The description below assumes that TAR are being estimated for year end. This method could also be used for estimates at other time periods.

Some actuaries believe estimated results would be more accurate for shorter observation periods (e.g., starting with the November 30 in-force file instead of September 30) and where the current date is closer to the end of the year (e.g., December 22 vs. December 15). The method may also need to take into consideration the time step of the underlying model (e.g., if the model is a quarterly time step model, it may be difficult to use November 30 as the "prior period start date"). The usual steps in the process are as described below:

- 1) Start with the actual in-force file as of the "prior period start date" (e.g., September 30, October 31 or November 30).
- 2) Determine the increase or decrease in the S&P 500 and other representative indices during the "observation period" (i.e., the period starting with the "prior period start date" through the "current date").
- 3) Estimate performance of the S&P 500 and the other representative indices for the remainder of the calendar year (or use 0%).
- 4) Determine the actual sales during the "observation period", along with its actual or estimated age/gender/fund mix, etc.
- 5) Estimate the expected sales for the remainder of the calendar year along with its estimated age/gender/fund mix, etc. This can be done based on the actual sales during the observation period adjusted for cyclical trends (i.e. sales activity at end of quarter or end-of-year) or assuming no sales for the remainder of the calendar year.
- 6) Model the business starting with the "prior period start date" using the in-force file as of that date. Use fund performance during the "observation period" based on the information in 2) and fund performance based on 3) for the remainder of the calendar year. Incorporate actual and new sales, similarly using the information from 4) and 5).
- 7) Beginning January 1 within the projection, use stochastically generated returns and no new sales in the model.
- 8) Calculate the CTE assuming the model start date is December 31 (i.e., using gains and losses beginning on January 1 and discounting to December 31).
- 9) Subtract the result in 8) from the projected account value as of December 31. It is possible (especially for TAR) that this will result in a negative amount, but the ultimate result in step 10 is still correct.
- 10) Subtract the amount in 9) from the actual December 31 account value to determine the estimated reserve or TAR as of December 31.

The steps in 9) and 10) are intended to adjust for differences between modeled and actual December 31 account value. A good test of the modeling is to see how close these two account values are.

Possible refinements include: determine actual surrenders, deaths, fund transfers, subsequent premium, etc. for the "observation period", rather than using model assumptions.

**Q7.18 If you don't have fully credible mortality experience and need to blend your experience with the 94 Minimum Guaranteed Death Benefit (MGDB) Table, but you currently have A/E ratios based on the Annuity 2000 Table, is it better to rerun your mortality study against 94 MGDB to do the blending?**

A: Some actuaries believe that one approach is to run the mortality study under the 94 MGDB and note the actual to expected mortality ratio prevailing, and then run the regular study based on the Annuity 2000 table. The actual to expected ratio (A/E) based on 94 MGDB to the A/E based on the Annuity 2000 table would provide an estimate of the ratio of the 94 MGDB expected to the Annuity 2000 expected deaths. This ratio may now be used as a proxy for the ratio to blend with when doing credibility weighting.

**Q7.19 Are any adjustments made for the valuation of policies that are still within their free look period at the time of the valuation?**

A: Some actuaries believe it is appropriate to make no additional adjustments for policies that are still within the free look period.

## **8) DETAILS ON ALTERNATIVE METHOD/METHODOLOGY(AM)**

### **Q8.1 What is the AM?**

A: C-3 Phase II (“Alternative Method”) and AG 43 (Appendix 4 – Alternative Methodology) allow a factor based approach (as opposed to scenario testing) for certain variable annuity contracts that either contain no guaranteed benefits or only GMDBs (i.e. no VAGLBs).

### **Q8.2 Can the AM be used for all variable contracts?**

A. Section IV and Appendix 4 of AG 43 describe the Alternative Methodology as one for “variable deferred annuity contracts” that contain either “no guaranteed benefits or only GMDBs (i.e. no VAGLBs)”

Although C-3 Phase II is silent here, some actuaries believe the Alternative Method for RBC is also only to be used for deferred annuity contracts. This belief is based on the fact that the Alternative Methodology was designed just for deferred annuities.

Discussions with the developers of the Alternative Methodology confirm that the Alternative Methodology for both AG 43 and C-3 Phase II was designed for deferred contracts and was not designed, for example, for variable immediate payout annuities. Based on this confirmation some actuaries believe that it is not appropriate to use the Alternative Methodology for variable immediate payout annuities.

### **Q8.3 May one switch back and forth between scenario testing and the AM?**

A. Section IV of AG 43 allows one to switch from the scenario testing method to the Alternative Methodology with approval from the domiciliary commissioner. C-3 Phase II does not allow one to switch from the scenario testing method to the Alternative Method. However some actuaries believe that one may switch under C-3 Phase II with domiciliary commissioner approval.

Both C-3 Phase II and AG 43 are silent on switching from the AM to scenario testing. Some actuaries believe that this is allowable and approval from the domiciliary commissioner is not needed.

### **Q8.4 Is moving from the AM to scenario testing or vice versa a change in reserve basis in the Exhibit 5A sense?**

A. Some actuaries believe the answer is “no” in that the method is still defined by AG 43. Their reasoning is that changes in assumptions, for example, that historically were considered a change in valuation basis are fundamental to a principle-based reserve method and should not be considered a change in basis.

**Q8.5 How is non-proportional reinsurance incorporated into the AM?**

A: Some actuaries believe that the only way non-proportional reinsurance can be incorporated into the AM is by use of stochastic modeling to support any adjustment or approximation. Other actuaries believe non-stochastic approaches may be appropriate as well.

**Q8.6 Would credit be taken for hedging when using the AM?**

A: No credit is allowed for hedging when using the AM.

**Q8.7 What happens when the margin offset is either less than 20% of the management expense ratio (MER) or greater than 60% of the MER?**

A: C-3 Phase II (Appendix 8, “Base Margin Offset Factor”) and AG 43 (Appendix 4, Section A4.1, Subsection E) requirements state that, when looking up the appropriate factors for GC, the margin offset, expressed as a percentage of MER, should never be less than 20%, nor more than 60%. Thus, if the actual margin offset is less than 20%, one should use the factor value for 20% and if greater than 60%, one should use the factor value for 60%.

**Q8.8 How is  $\varphi$  calculated?**

A:  $\varphi$  reflects an overall in-the-moneyness. AG 43, section A4.1(E)(g) determines  $\varphi$  “in the aggregate for all contracts sharing the same product characteristics.” C-3 Phase II (Appendix 8) determines  $\varphi$  in aggregate for contracts subject to “the product form being evaluated (e.g. all 5% Roll-up policies).” For both AG 43 and C-3 Phase II it equals the aggregate account value for includable contracts divided by the aggregate guaranteed value, multiplied by 90%.

**Q8.9 At what level of aggregation would the margin offset, alpha, be calculated? For example, would it usually be expressed as an aggregate percentage of the MER for the block as a whole?**

A: The margin offset is intended to represent the portion of the MER that is available to fund the cost of the guaranteed benefits exceeding the account value. The highest level of aggregation for this determination would normally be the product level. As a result, unless the structures of several or all of the products in a portfolio were substantially the same, one would not usually expect alpha to be determined in the aggregate. Hence, alpha would normally not be a constant percentage of MER across products.

**Q8.10 Is a Standard Scenario calculation appropriate when using the AM?**

A: Yes, the Standard Scenario calculation is still required even for companies using the AM. However, under C-3 Phase II the Standard Scenario

amount equals the Total Asset Requirement when the AM is applied on a seriatim basis with mortality assumed at 100% of the 1994 Variable Annuity MGDB Mortality Table. See Section 9 for further details.

**Q8.11 How are the assets backing each contract assigned to the predefined asset classes for purposes of calculating the GC component and the CA component of the AM?**

A: For the GC component, each contract's entire asset exposure is assigned to one of the eight asset classes that are prescribed under the AM. Each separate account and general account investment option is first mapped to one of the eight prescribed asset classes. Then, the overall expected long-term volatility for the contract's combined asset holdings is determined, based on the volatilities for each fund and the correlations between the prescribed asset classes. Finally, the asset composition and expected volatility for the contract is evaluated to determine which prescribed asset class best represents the overall asset exposure for the contract.

For the CA component, such a mapping usually is only done if the surrender charges are a function of the projected account value. In such cases, the mapping process for the CA is similar to that for the GC, except that each contract's entire asset exposure is not mapped to a single "equivalent" prescribed asset class. Each separate account and general account investment option is still assigned to one of the eight prescribed asset classes, but then each of those prescribed asset classes is projected under the CA calculation. This means that up to eight asset classes will be modeled when projecting account values for the CA calculation.

**Q8.12 Is it possible for the GC component to be negative for a given contract?**

A: Yes, it is possible for the GC component to be negative for a contract. In fact, it is even possible for the amount " $R \times (CA+FE) + GC$ " to be negative. This will generally not be the case for newer issues, but it would be more likely to occur in contracts that have more conservative guarantees (such as return of premium), that are relatively far out of the money, that have their assets invested in less volatile funds, and/or that have a relatively large margin offset factor.

**Q8.13 In the description of the CA component, what is meant by "amount needed to amortize the unamortized surrender charge allowance for persisting policies plus an implied borrowing cost?"**

A: The CA component is intended to reflect the future financial impact of the runoff of surrender charges. For companies that hold the cash surrender value as the basic reserve, the runoff of the surrender charge for persisting contracts reduces the net gain by contributing to the increase in reserves. The CA component is intended to capture that future hit to gain. Presumably, that cost will be at least partially offset by charges that are

assessed against the contract to recoup acquisition costs. These charges will generally be reflected in the MER and margin offset in the GC calculation, leaving the related costs to be reflected in the CA component. The CA component requires companies to project the year-by-year runoff of the surrender charge and then discount back to the valuation date reflecting both interest and survival.



## 9) DETAILS ON STANDARD SCENARIO

### Q9.1 Where is the Standard Scenario for C-3 Phase II/AG 43 described?

A: The C-3 Phase II Standard Scenario is described in the NAIC Risk Based Capital Instructions - Interest Rate and Market Risk. The Standard Scenario for Reserves is defined in AG 43, Appendix 3.

### Q9.2 What differences are there between the Standard Scenario calculation of C-3 Phase II and AG 43?

A: The more significant differences between the C-3 Phase II and AG 43 Standard Scenarios are as follows:

**Discount Rate (DR):** C-3 Phase II defines this to be the annual effective rate of the 10 year CMT plus 50 bps. AG 43 defines this to be the valuation rate under the Standard Valuation Law for annuities on an issue year basis, plan type A and a guarantee duration greater than 10 but not more than 20 years. The presence of guarantees of interest on future premium and/or cash settlement options is to be determined using the terms of the contract.

**Basic Adjusted Reserve:** For C-3 Phase II this is the working reserve which is generally the Cash Surrender Value. For AG 43, this is similar to an AG33 reserve calculation, however, it requires that the asset based charges, GMDB charges and GLB charges are deducted from the accumulation rate, and that partial withdrawal provisions are disregarded when determining surrender charges. See Appendix 3 of AG 43 for more detail.

**Tax basis on Accumulation and Discounting:** The calculation required by AG 43 is performed on a pre-tax basis (i.e., federal income tax is ignored in the projections and the accumulation and discount rates are pre-tax). The calculation required by C-3 Phase II is performed on an after-tax basis (i.e., federal income tax is included in the projections and the accumulation and discount rates are after-tax). C-3 Phase II Standard Scenario is accumulated and discounted at  $AR = DR \cdot (1 - \text{FIT rate})$ .

**Gross Annual Rate of Return for Account Value Projections:** Drop and recovery scenarios for C-3 Phase II are more conservative than for AG 43. The C-3 Phase II account value gross annual effective rates of return can be found in Table I of the NAIC Risk-Based Capital Instructions. The AG 43 account value returns are defined in Table I of A3.3)C1).

#### C-3 Phase II Prescribed (Gross) Returns

	Initial	Yr 1	Yr 2+
Equity	-20%	0%	3.00%
Bond	0%	0%	4.85%
Balanced	-12%	0%	3.74%
Fixed/Gen	0%	Fixed Fund Rate	

Fixed Fund Rate =  $\text{Min}\{\text{Max}(\text{Min guar rate}, 3.5\%), \text{Curr credit rate}\}$

**AG 43 Prescribed (Gross) Returns**

	Initial	Yr 1	Yr 2-5	Yr 6+
Equity	-13.5%	0%	4%	5.5%
Bond	0%	0%	4.85%	4.85%
Balanced	- 8.1%	0%	4.34%	5.24%
Fixed/Gen	0%	Fixed Fund Rate		

Fixed Fund Rate= Min{ Max (Min guar rate, 4.0%), Curr credit rate}

**Margins on Account Value:** Margins used to calculate the Accumulated Net Revenue are different. The C-3 Phase II margins on account value can be found in Section III(D)1) of the NAIC Risk-Based Capital Instructions. The AG 43 margins are defined in section A3.3(C)1).

C3 Phase II

(a) During the Surrender Charge Period

- i. 0.10% of Account Value, plus
- ii. Maximum (0.20% of Account Value, Explicit and Optional Charges for Guaranteed Living and Death benefits)

(b) After the Surrender Charge Period

- i. the amount determined in (a) plus
- ii. Minimum {0.65% of Account Value , 50% \* [Maximum ( 0, All Contract charges less (a) above) ] }
- iii. But for fixed funds use (a) + 0.4%

If the surrender charge for the contract is determined based on individual contributions, the surrender charge period may be estimated for projection purposes. Such estimated period shall not be less than the remaining duration based on the normal period assuming it resulted from a single deposit, plus one year.

AG43

(a) During the Surrender Charge Amortization Period

- i. 0.20% of Account Value plus
- ii. Maximum (0.20% of Account Value, Explicit and Optional Charges for Guaranteed Living benefits) plus
- iii. Maximum (0.20% of Account Value, Explicit and Optional Charges for Guaranteed Death benefits) plus

- iv. Guaranteed net revenue sharing income

(b) After Surrender Charge Amortization Period

For Non Fixed Funds

- i. The amount in (a) plus
- ii. 50% of Maximum (0, all contract charges less ( ai + aii +aiii ) )

For Fixed Funds

- i. The amount in (a) plus
- ii. 0.4% of Account Value

To determine the Surrender Charge Amortization period

1. Determine the Basic Adjusted Reserve (BAR) duration, which is equal to the duration of the greatest present value of projected benefits.
2. Determine the Unamortized Surrender Charge in BAR:  
  
Maximum (0, Account Value at BAR duration less Cash Surrender Value at BAR duration)
3. Determine Surrender Charge Amortization Period before rounding:  
  
$$\text{BAR duration} + 100 * (\text{Unamortized Surrender Charge in BAR} / \text{Account Value})$$
4. Determine the Surrender Charge Amortization Period for the contract, which equals the result from Step 3 rounded to the nearest projection duration.

**Value of Aggregate Reinsurance / Value of Approved Hedges:**

C-3 Phase II and AG43 define different interest rates for

- a. discounting (1-year CMT for AG43 and AR for C-3 Phase II); and
- b. determining the liquidation value of hedges expiring more than 1 year from the valuation date within the Black-Scholes algorithm (5-year CMT for AG43 and DR for C-3 Phase II).

**AG43 specifies the method for allocating these values to the contracts supported by the applicable reinsurance agreements or hedges and seriatim limits may apply. The values are applied on an aggregate basis for C-3 Phase II.**

**Lapse assumption and (ITM) definition:** Both C-3 Phase II and AG 43 have lapse rates that vary by different levels of ITM. The primary difference is that AG 43 allows a 2% lapse rate on guaranteed minimum accumulation benefits

when they are ITM during the surrender charge period or only slightly ITM after the surrender charge period. ITM is also defined differently for C-3 Phase II and AG 43. ITM definitions as well as Table II, which defines the lapse assumptions, can be referenced in section III)D)3) of the NAIC Risk-Based Capital Instructions and AG 43 Section A3.3)C)3).

C-3 Phase II definition of ITM:

ITM = Max {1 – (Account Value / Value of Guarantee Benefit at time of Exercise of benefit), 0}, where maximum is over the future possible benefit payout start dates

AG 43 definition of ITM:

ITM = 100% \* ((Current Value of the guaranteed living benefit / Account Value) -

1)

C-3 Phase II Lapse Assumptions

Table II - Lapse Assumptions

	During Surrender Charge Period	After Surrender Charge Period		
		ITM < 10%	10% <= ITM < 20%	20% <= ITM
Death Benefit Only Contracts	5%	10%		
All Guaranteed Living Benefits OTM	5%	10%		
Any Guaranteed Account Balance Benefits ITM	0%	0%	0%	0%
Any Other Guaranteed Living Benefits ITM	3%	7%	5%	2%

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AG 43 Lapse Assumptions

Table II - Lapse Assumptions

	During Surrender Charge Period	After Surrender Charge Period		
		ITM < 10%	10% <= ITM < 20%	20% <= ITM
Death Benefit Only Contracts	5%	10%		
All Guaranteed Living Benefits OTM	5%	10%		
		ITM < 10%	10% <= ITM < 20%	20% <= ITM

Any Guaranteed Minimum Accumulation Benefit ITM	2%	2%	0%	0%
Any Other Guaranteed Living Benefits ITM	3%	7%	5%	2%

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**Mortality Assumption:**

C-3 Phase II uses 80% of 1994 MGDB table then grades to 100% from attained age 95 to 115.

AG 43 uses 70% of 1994 MGDB table then grades to 100% from attained age 85 to 115.

**Contractholder Election Rates for Living Benefits:** There are no differences between the C-3 Phase II and AG 43 guaranteed withdrawal assumptions for GMWBs.

Election rates for exercisable ITM guaranteed living benefits other than GMWBs are a constant 15% per year for C-3 Phase II. AG 43 varies the election rate by ITM levels as follows:

	ITM < 10%	10% ≤ ITM < 20%	20% ≤ ITM
Guaranteed Living Benefits other than GMWB	5%	15%	25%

**Other:**

The AG43 Standard Scenario Reserve is calculated on a seriatim basis while the C-3 Phase II Standard Scenario Amount is calculated on an aggregate basis.

**Q9. 3 Does the Standard Scenario for C-3 Phase II and AG 43 have to be applied to each contract? Is the Standard Scenario Amount determined in the aggregate or by summing the results for each contract?**

A: The Standard Scenario for C-3 Phase II is applied on a contract-by-contract basis as described in Section I)C) of the NAIC Risk-Based Capital Instructions. However, there are two results obtained from this application. The Standard Scenario Amount used for the comparison anticipated in Section I)A) is determined “in the aggregate,” meaning that the Accumulated Net Revenue is summed across all contracts before determining the greatest present value in Section III)B)2). This is result “A” in Table A contained within section I)C). The second result is when the greatest present value is determined for each contract by itself, and the resulting Standard Scenario Amount for each contract is summed to provide result “B” in Table A. As indicated in Section I)C), this is “To provide information on the significance of aggregation ...” In addition to these calculations performed on a contract-by-contract basis, section I)C) may

also require the application of the Standard Scenario method to a model office, see C and E of Table A, or a prior inforce, see D and E of Table A.

Similarly, the Standard Scenario is defined in Section IV(C) of AG 43 with additional detail found in Appendix 3 and it must be applied on a contract-by-contract basis. Section A3.1(C) may also require the application of the Standard Scenario method to a model office (see requirements for run D in the table included in that section) or a prior inforce (see requirements for run C in the same table).

**Q9.4 Is the discount rate used for the AG 43 Standard Scenario the same for all contracts for a given valuation date (i.e., on 12/31/2009 you use the valuation rate on an issue year basis, Plan Type A, and Guarantee Duration greater than 10 years but not more than 20 years for 2009 issues and use it for all contracts); or do you use the valuation rate applicable to each contract's issue year?**

A: Section A3.1(B)2) of AG 43 defines the Discount Rate (DR) to be “the valuation interest rate specified by the Standard Valuation Law for annuities valued on an issue year basis, using Plan Type A and a Guarantee Duration greater than 10 years but not more than 20 years. The presence of guarantees of interest on future premiums and/or cash settlement options is to be determined using the terms of the contracts”.

Some actuaries believe that the intent of this definition is to use the valuation rate applicable to each contract's issue year and those actuaries point to the language in section 3.3(D)1) of AG 43 as support.

**Q9.5 Section I(C) of the NAIC Risk Based Capital Instructions - Interest Rate and Market Risk document and Section A3.1(C) of AG 43 describe situations where the Standard Scenario Amount is determined on a contract-by-contract basis and others where it is determined using a model office. Since the calculation depends on deriving death and living benefits within the projection of Accumulated Net Revenue, how would those benefits be derived?**

A: For the contract-by-contract calculation, some actuaries believe it is preferable to reflect the terms of each individual contract in the determination of these benefits. If any modifications or additional assumptions are made, Section III(A) of the NAIC Risk-Based Capital Instructions and Section A3.1(C) of AG 43 require explicit documentation of the modifications. For calculations based on a model office, some actuaries believe, for the purposes of validation given in Table A, it is preferable to derive the benefits using the characteristics of the model plans making up the model office.

**Q9.6 Would the actuary normally do anything in the Standard Scenario for death benefits based on a dollar-for-dollar reduction for partial withdrawals when the C-3 Phase II or AG 43 Standard Scenario Amount is not based on the Alternative Methodology?**

A: Partial withdrawals are included in the Standard Scenario calculation only if the withdrawals are elected as a guaranteed benefit or required contractually. When projecting withdrawal benefits, the death benefit exposure would reflect the reduction that would occur based on the terms of the contract, dollar for dollar or pro-rata. No other distinction is made between dollar for dollar and pro-rata death benefits in the Standard Scenario.

**Q9.7 Section A3.3)C)4) of AG 43 states: “No future deposits to Account Value shall be assumed unless required by the terms of the contract to prevent contract or guaranteed benefit lapse, in which case they must be modeled.” Would the actuary usually include future deposits needed to prevent the lapse of a benefit but not include future deposits necessary to prevent lapse of the whole contract?**

A: As stated in that section of AG 43, future deposits must be modeled if required to prevent either a guaranteed benefit in the contract or the entire contract from lapsing.

**Q9.8 Regarding the requirement to use a contractholder election rate of 15% for any elective ITM guaranteed living benefit (but only to the extent such election does not terminate a more valuable benefit subject to election), assume that a contract has two guaranteed living benefits that are both ITM. Benefit A is first available at age 60 and Benefit B is first available at age 70. The contractholder at a particular model duration is 65. Benefit B is more ITM than Benefit A. Would the election rate at age 65 for Benefit A be zero since it would terminate the more valuable Benefit B even though B is not yet available to be exercised?**

A: Yes. However, there appear to be no such restrictions on GMWB withdrawals. Thus, if Benefit A is a GMWB, a GMWB withdrawal (at the utilization rate specified in the Standard Scenario) would still be made irrespective of the relationship of ITM-ness for the two living benefits.

**Q9.9 What are some examples of determining ITM percentages under the Standard Scenario?**

A: The following situations provide possible methods for calculating ITM percentages for guaranteed living benefits for C-3 Phase II and for AG43. Other methods might be used as well

GMIB – C-3 Phase II

The projected GMIB benefit base under the terms of the contract to the year-end subsequent to the first date on which the benefit base is available to purchase an annuity is \$110,000. The monthly GMIB purchase rate on that

year end given the contractholder's age and sex is \$8.00 per \$1,000 of benefit base. Further, the projected account value under the Standard Scenario assumptions on that year-end is \$100,000 and the monthly guaranteed purchase rate is \$7.80. The GMIB is currently in the money by 11.4% based on that year-end:  $1 - (7.80 \times 100) / (8 \times 110) = 0.114$ . The ITM percent would also be calculated for subsequent year-ends with the largest in the money percentage determining the actual lapse rate to be employed for each year.

GMIB – AG43

At a particular projection interval, the ITM percentage for a GMIB rider needs to be determined. Assume the contract has an account value of \$50,000 and the contractholder is a male age 65 at that projection interval. The rider is not currently exercisable and the earliest exercise date is exactly five years into the future. The projected benefit base for the rider 5 years in the future using the Standard Scenario returns is \$125,000. The GMIB rider purchase rate for the 10 year certain and life option payable annually for a male age 70 is \$57.37 per \$1000 of benefit base. Therefore, the projected annual GMIB income payment on the exercise date is \$7,216.25. If the projected income payment on the exercise date determined under the normal settlement option provisions of the contract is higher than the GMIB income payment, the Current Value is set equal to the account value. Otherwise, the Current Value should be determined assuming the option with a reserve closest to the reserve for a 10 year certain and life option using the discount rate DR and the Annuity 2000 Mortality Table. Assume the rate DR is 6%. The present value of a \$1 per annum 10 year certain and life annuity using the rate DR and the a2000 table for a male age 70 is \$10.98. The present value at age 65 of \$1 payable at age 70 to a male using the rate DR and the modified 1994 MGDB table is \$0.6930. Thus, the Current Value of the rider is \$54,567:  $(125 \times 57.37) \times 0.6930 \times 10.98$ . The GMIB is 9.1% ITM at the particular projection interval in question:  $(\$54,567/\$50,000 - 1) \times 100$ .

GMWB – C-3 Phase II

After reflecting historical partial withdrawals, a contract at the end of the 7<sup>th</sup> contract year has a remaining GMWB amount of \$150,000 and an Account Value of \$125,000. The GMWB provisions allow the \$150,000 to be withdrawn in equal amounts at the end of the next three years regardless of the contract's account value. Assume that the projected net rate for the Account Value under the Standard Scenario is 4%. The table below shows the guaranteed withdrawals and projected Account Values. Some actuaries would determine the ITM percentage at the end of year 7 for purposes of the Standard Scenario to be 10.3%:  $1 - (50,000 + 50,000 + 34,528) / (150,000)$ .

EOY	AV before w/d	GMWB	AV after w/d
7	N/A	N/A	125,000
8	130,000	50,000	80,000
9	83,200	50,000	33,200
10	34,528	50,000	0



GMWB – AG43

At a particular projection interval, the ITM percentage for an exercisable GMWB rider needs to be determined. The contract has an account value of \$75,000 at the projection interval. The rider provides lifetime maximum annual withdrawals equal to a stated percentage of the benefit base on the date that the first withdrawal is made. Assume that the contractholder has previously taken a withdrawal under the rider and that the maximum annual withdrawal is \$7,500. The rate DR is 6% and the contractholder is a male age 70. The present value of a \$1 per annum straight life annuity using the rate DR and the a2000 table for a male age 70 is \$10.31. The Current Value of the GMWB rider is \$77,325:  $\$7,500 \times 10.31$ . The GMWB is 3.1% ITM:  $((\$77,325/\$75,000)-1) \times 100$ .

**Q9.10 Under the Standard Scenario does ITM-ness need to be determined for a guaranteed death benefit for the purpose of determining a lapse rate.**

A: No. Only guaranteed living benefits can give rise to a lower lapse rate under the Standard Scenario.

**Q9.11 What investment returns would the actuary normally use in order to project the account value to a future date for the purpose of the C-3 Phase II in-the-moneyness calculation?**

A: The Standard Scenario requires the use of the Standard Scenario return assumptions.

Returns are stated for four asset classes: equity, bond, balanced, and fixed accounts. The Standard Scenario states that Money Market funds shall be considered as part of the Bond class.

The specified returns for the equity, bond and balanced classes are gross rates. These gross rates would be reduced for fund and contract charges according to the provisions of the funds and contracts. The fixed funds rate should be applied as if it were the resulting net rate after the deduction for fund or contract charges.

Note that different drop and recovery return assumptions exist for the Standard Scenario calculation under C-3 Phase II and AG 43.

**Q9.12 The C-3 Phase II Standard Scenario defines a contract as ITM if it includes a guaranteed living benefit and at any time (including future years) the portion of the projected account value required to obtain the benefit would be less than the value of the guaranteed benefit at the time of exercise or payment. Does this mean that in a period when a contract is ITM the relevant ITM lapse assumptions are used? If a contract subsequently goes out of the money (OTM), would the OTM lapse factors be used?**

A: Some actuaries believe the OTM lapse rates would be used when the event causing the contract to be ITM has passed and the contract will no

longer be ITM at any projected duration. In other words, since ITM for living benefits is determined by “looking ahead,” a contract only becomes OTM once there are no living benefits that will be ITM at any time in the future

This is in contrast to the definition specified in A.3.3)C)3) of AG 43 which states that “the contract shall be considered “out of the money” for a projection interval if the Current Value of the guaranteed living benefit at the beginning of the projection interval is less than or equal to the Account Value at the beginning of the same projection interval”.

**Q9.13 Does “in the money” in sections III(D)(3) and III(D)(8) of the NAIC Risk-Based Capital Instructions or A.3.3)C)3) and A.3.3)C)7) of AG 43 prescribe a point-in-time test or a forward-looking test and is the definition consistent in the lapse and election rate sections of the instructions?**

A: Some actuaries believe the definition of ITM in Section III(D)(3) of the NAIC Risk Based-Capital Instructions is a forward-looking test based on the inclusion of the phrase “at any time”. The full definition states that “a contract is in the money (ITM) if it includes a guaranteed living benefit and at any time the portion of the future projected account value under the Standard Scenario Method required to obtain the benefit would be less than the value of the guaranteed benefit at the time of exercise or payment”. This requires the actuary to determine the guaranteed living benefit at future projection intervals. The definition of ITM in III(D)(8) is a point-in-time determination since it is dealing with the actual utilization of an elective benefit. However, the election rate should only be applied to the extent it does not terminate a more valuable benefit and the inclusion in III(D)(8) of the sentence “A benefit is more valuable if it is more ITM in absolute dollars using the definition of ITM in paragraph III(D)(3)” requires a forward-looking evaluation of the value of other optional benefits.

The definition of ITM in AG 43 Section A.3.3)C)3) is a point-in-time test based on the inclusion of the phrase “for any projection interval”. The full definition states that “For purposes of determining the dynamic lapse assumptions shown in Table II below, a guaranteed living benefit is ITM for any projection interval if the Account Value at the beginning of the projection interval is less than the Current Value of the guaranteed living benefit (as defined below) also at the beginning of that projection interval.” The definition of ITM in A.3.3)C)7) is also point in time and therefore they are consistent.

**Q9.14 Are there simplifications in the C-3 Phase II Standard Scenario that can be made to determine ITM-ness (and hence Standard Scenario lapse rates) such as utilizing the AG 43 type approach of a point in time test?**

A. Some actuaries may argue that as long as the future value of the guarantee is accounted for, calculating the ITM as of each projection point (similar to AG 43) will likely be a good representation of whether the policy will be ITM if the growth of the guarantee is always smaller than the growth of the account value from that point in time. A judgment that a policy is not ITM right now because it can't be exercised would seem to violate the language of C-3 Phase II

**Q9.15 Is it only in the AG43 Current Value calculation for GMWBs for which Annuity 2000 mortality is used? Otherwise 70% (graded to 100%) of the 94 MGDB table is used?**

Some actuaries would state that the Annuity 2000 Mortality Table language is only included in section A3.3)C)3) and, therefore, only required to establish the level of ITM for determining lapse rates. Others may conclude that this language is applicable whenever the account value goes to zero, even though this may conflict with A3.3)C)5). AG 43 section A3.3)C)3) states that after a GMWB with payments that are contingent upon the survival of the annuitant or owner has commenced, then the Current Value is required to assume survival using the Annuity 2000 Mortality Table. AG 43 Section A3.3)C)5) states that the mortality to be used in the projection to determine the greatest present value amount is the 1994 MGDB graded table

**Q9.16 When calculating the AG43 Current Value for ITM purposes, is the present value calculated using the whole stream of benefits or does it only represent those benefit payments made once the account value is less than zero?**

Since the Current Value is compared to the account value, all benefit payments should be included---not just those payments made after the account value goes to zero.

**Q9.17 What is the meaning of the statement in Section A3.3)C)3) of AG 43 that “all lapse rates should be applied as full contract surrenders”?**

A: As is also stated in that section of AG 43, no partial withdrawals, including free partial withdrawals, other than those withdrawals that are required under the Standard Scenario are to be deducted from the account value. Some actuaries believe that, because of the probability of prior deaths and lapses, future years in the projection will reflect less than a full unit of the contract and the portion of the contract assumed to lapse would have all the characteristics of a full surrender. These actuaries believe that the statement does not mean that a “coin should be flipped” to decide whether the entire contract terminates or persists but, rather, that lapses would be reflected as a probability that the contract remains in force.

**Q9.18 What guaranteed investment rate would usually be assumed on fixed funds when the current credited rate guaranteed period expires? Would it be a bond rate or minimum contract level guarantee?**

A: The fixed fund rate for the C-3 Phase II Standard Scenario calculation would be the greater of 3.5% and the minimum contract level guaranteed credited rate, but not more than the current credited rate. A similar provision exists for AG 43, except that a floor of 4% rather than 3.5% is assumed.

**Q9.19 What is the Basic Adjusted Reserve for an assuming company that only reinsures the guaranteed death or guaranteed living benefit?**

A: The C-3 Phase II Basic Adjusted Reserve is defined as the Working Reserve in the NAIC Risk-Based Capital instructions. The AG 43 Basic Adjusted Reserve is defined in section A3.2). Under these definitions, assumed reinsurance covering only guaranteed death benefits or guaranteed living benefits would typically have a Basic Adjusted Reserve of zero.

**Q9.20 Is reinsurance eligible for credit on the valuation date under the Standard Scenario?**

A: As is stated in Section A3.3)B) of AG 43: "No reinsurance shall be considered in the Standard Scenario Amount if such reinsurance does not meet the statutory requirements that would allow the treaty to be accounted for as reinsurance." Section III(C) of the NAIC Risk-Based Capital Instructions states: "The positive value of any reinsurance treaty that is not guaranteed to the insurer or its successor shall be excluded from the value of reinsurance." If these conditions are satisfied, reinsurance is either reflected in the calculation for Accumulated Net Revenue (in the case of individual reinsurance) or in the allocation of the value for aggregate reinsurance.

Section A3.3)B) of AG 43 requires that all treaty limitations to be reflected and any options in the treaty are assumed to be exercised so as to reduce the value of the reinsurance to the reporting company. Under certain circumstances, the commissioner may require the exclusion of any portion of the value of the reinsurance.

**Q9.21 The value of aggregate reinsurance is based on the "... excess of a) the benefit payments from the reinsurance; over b) the reinsurance premiums...." Does this mean that the value of aggregate reinsurance can only be positive?**

A: The value of aggregate reinsurance can be either positive or negative.

**Q9.22 Assume a reinsurance treaty would otherwise qualify as individual reinsurance, except that it includes one or more provisions that are applied in the aggregate (e.g., a cap so that reinsurance claims cannot exceed a percentage of the account value). If those aggregate provisions do not govern at any time during the Standard Scenario projection, can the reinsurance be categorized as individual reinsurance in Section III(B)(2)(iii) of the NAIC Risk-Based Capital Instructions and Section A.3.3.B)2)b)(iii) of AG 43?**

A: The Standard Scenario categorizes the reinsurance as individual or aggregate based on the treaty's provisions. In the example of a treaty with an aggregate cap provision, the treaty would only be included if it meets the statutory requirements that would allow the treaty to be accounted for as reinsurance. If the treaty meets these requirements, it would be categorized

as aggregate reinsurance, regardless of the impact of aggregate provisions during the Standard Scenario projection, because in this case the total premiums for and/or benefits of the reinsurance can not be determined by applying the terms of the reinsurance to each contract covered without reference to the premiums or benefits of any other contract covered.

Some actuaries believe that because the aggregate provision does not affect the calculation in this example, it may be possible to model this treaty as an individual reinsurance treaty for practical purposes if they can demonstrate that it does not result in a lower Standard Scenario Amount.

**Q9.23 In the AG 43 Standard Scenario, is the reinsurance premium paid to a reinsurer included in the Projected Net Revenue as a prescribed margin in the formulas defined Section in A3.3)C)1) for the reinsurer's Standard Scenario calculation, or is it included as an individual reinsurance premium defined in Section A3.3)C)2)?**

A. Section A3.3)C)2) states that "Individual reinsurance premiums projected to be payable on ceded risk and receivable on assumed risk shall be included in the Projected Net Revenue. Similarly, individual reinsurance benefits projected to be receivable on ceded risk and payable on assumed risk shall be included in the Projected Net Revenue. No aggregate reinsurance shall be included in Projected Net Revenue."

In the case of GMDB and/or VAGLB only reinsurance, some actuaries would agree that the reinsurance premium paid is considered to be "Individual reinsurance premium" for the reinsurance company in Section A3.3)B)2)b)(iii), provided the reinsurance treaty meets the definition of individual reinsurance in Section A3.3)C)2).

If the entire contract is fully or partially reinsured on a coinsurance or modified coinsurance, quota share basis, some actuaries believe the appropriate guiding principle would be to assume the Projected Net Revenue recognized by the insurer and reinsurer sums to the prescribed margin that would have been included by the insurer if there were no reinsurance. In this case, the reinsurer would determine the prescribed margin for A3.3)B)2)b)(ii) as if it were the direct writer of its share of the contract and the ceding company would set the individual reinsurance premium under A3.3)B)2)b)(iii) equal to the reinsurer's share of the prescribed margin.

The following examples provide possible approaches for some specific cases. Other approaches may also be reasonable and care should be taken when applying these examples to other situations.

In the following examples:

M&E	125 bp
Revenue sharing	0 bp
GMDB Fee	15 bp
GMAB Fee	25 bp

**Example #0: No reinsurance**

	Section A3.3)B)2)b)(ii) “Prescribed Margin”		Section A3.3)B)2)b)(iii) “Individual Reinsurance Premium”
	during SCAP	after SCAP	
Ceding Company	65 bp	115 bp	n/a
Reinsurer	n/a	n/a	n/a

This example has been designed to help illustrate the impact of reinsurance in the examples that follow.

**Example #1: Rider only reinsurance with an explicit reinsurance premium**

From the direct writer's perspective, the expected reinsurance cash flows for a treaty meeting the definition of individual reinsurance in Section A3.3)C)2) are included in the section A3.3)B)2)b)(iii) of the Projected Net Revenue calculation.

From the reinsurer's perspective, the reinsurance premium would also be modeled in section A3.3)B)2)b)(iii) of the Projected Net Revenue calculation.

Assuming the GMAB is 75% reinsured for a premium of 30 bp, then:

	Section A3.3)B)2)b)(ii) “Prescribed Margin”		Section A3.3)B)2)b)(iii) “Individual Reinsurance Premium”
	during SCAP	after SCAP	
<i>Ceding Company</i>	65 bp	115 bp	-30 bp
Reinsurer	0 bp	0 bp	30 bp

**Example #2: Coinsurance of the whole contract**

In this case, the reinsurance premium should be determined as the reinsurer's share of the prescribed margin based on the quota share percentage, e.g., assuming a 75% quota share on coinsurance basis, then:

	Section A3.3)B)2)b)(ii) “Prescribed Margin”		Section A3.3)B)2)b)(iii) “Individual Reinsurance Premium”*
	during SCAP	after SCAP	
Ceding Company	65 bp	115 bp	-48.75 bp during SCAP, -86.25 bp thereafter
Reinsurer	48.75 bp	86.25 bp	0 bp

\*Reinsurance premium is calculated as 75% of 65 bp during SCAP and 75% of 115 bp after SCAP

**Example #3: Coinsurance of the base contract only**

There is a wider range of practice in the case of base only coinsurance. Some actuaries believe the appropriate approach is to effectively ignore any base contract only reinsurance in the Projected Net Revenue calculation, since the Projected Net Revenue is primarily designed to determine minimum reserves for guarantees. Under this approach the outcome is:

	Section A3.3)B)2)b)(ii) “Prescribed Margin”		Section A3.3)B)2)b)(iii) “Individual Reinsurance Premium”
	during SCAP	after SCAP	
Ceding Company	65 bp	115 bp	0 bp
Reinsurer	0 bp	0 bp	0 bp

Other actuaries believe an approach based on an application similar to Example No. 2 is more appropriate. Assuming the quota share for the base contract is 75% and the quota share for the rider is 0%, then an implicit reinsurance premium equal to 75% \* 20 bps is calculated. This could be viewed as an extension of Example #2 where direct writer’s margin is calculated as (1 - 75%) of the prescribed margin except that the prescribed margin is split into income that could only be generated from the base contract and income that is generated from the riders and applying the appropriate QS% to each.

After SCAP, an implicit reinsurance premium equal to  $75\% * (20\text{bps} + 50\% * (125\text{ bp} - 20\text{ bp}))$  is determined.

	Section A3.3)B)2)b)(ii) “Prescribed Margin”		Section A3.3)B)2)b)(iii) “Individual Reinsurance Premium”
	during SCAP	after SCAP	
Ceding Company	65 bp	115 bp	-15 bp during SCAP, -54.37 bp thereafter
Reinsurer	0 bp	0 bp	0 bp

Note that in either method, the reinsurer would not calculate a Standard Scenario Amount for Example No. 3 since the reinsurer is assuming no GMDB or VAGLB risk. Instead, the reinsurer’s reserve is the Basic Reserve for its quota share.

**Hybrid Treaties:**

In practice, some treaties contain features of both coinsurance and risk premium reinsurance. Where such features exist, it may not always be completely clear how to handle the treaty under the Standard Scenario. Where the actuary is uncertain, it may be appropriate to fully document the approach that was chosen and to state the reasoning for this decision in the supporting memorandum.

**Q9.24 In the NAIC Risk-Based Capital Instructions Section III(D)(1) and AG 43 A.3.3)C) of the Standard Scenario, the surrender charge period is used as a point of reference. For a contract which has a surrender charge schedule that runs independently from the date of each gross consideration, what is an appropriate surrender charge period?**

A: Extensive guidance is given in Section A.3.3)E) of AG 43 and Section III(D)(7) of the NAIC Risk-Based Capital Instructions.

**Q9.25 Is the hedge value determined under the Standard Scenario return assumptions?**

A: Other than when the Standard Scenario amount is based on the Alternative Methodology, there is recognition for the value of approved hedges. The value of approved hedges is the difference between the discounted cash flows from the approved hedges and their statement value on the valuation date. The Standard Scenario requirements describe the conditions that must be satisfied to be an approved hedge. In certain circumstances, the commissioner may exclude any portion of the value of approved hedges.

For hedges that expire in less than one year, the cash flow projection is based on holding the hedges to their expiration. In other cases, the value is based on liquidation of the hedges one year from the valuation date. The method for determining the liquidation value is described in detail in Section III)E)2) of the NAIC Risk-Based Capital Instructions and Section A3.3)D)2) of AG43.

**Q9.26 The AG 43 Standard Scenario allows for the recognition of approved hedges and requires the use of the assumed returns in the Standard Scenario for valuing these hedges. Since the assumed returns given are fund returns, what valuation should be used for interest rate hedges?**

A: There are many approaches to the valuation of interest rate hedges. Some actuaries may state that the interest rates specified in the liquidation provision of A3.3)D)2) is the appropriate method for valuing these hedges, while others may state that this is only applicable for options since it is combined with volatility assumptions. Other actuaries may state that a 0% bond or money market fund yield implies a certain interest rate scenario. Still others may hold the current interest rate curve constant or use it to determine a forward curve for interest rates over the next year.

**Q9.27 Would a hedge usually satisfy Statement of Statutory Accounting Principles (SSAP) 86 before taking hedge credit?**

A: Section III)E)2) of the NAIC Risk-Based Capital Instructions states “To be an approved hedge, a derivative or other investment has to be an actual asset held on the valuation date, be designated as a hedge for one or more contracts subject to the Standard Scenario, and be part of a clearly defined hedging strategy as described in the Report...Approved hedges must be held in accordance with an investment policy that has been implemented for at least six months and has been approved by the Board of Directors or a subcommittee of Board members...Approved hedges must be held in accordance with a written investment strategy developed by management to implement the Board’s investment policy...Approved hedges need not satisfy SSAP No. 86.”

Section A3.3)D)2) of AG 43 states “To be an approved hedge for purposes of the Standard Scenario reserve, a derivative or other investment has to be an actual asset held by the company on the valuation date, be used as a hedge supporting the contracts falling under the scope of the guideline, and comply with any



statutes, laws, or regulations (including applicable documentation requirements) of the domiciliary state or jurisdiction related to the use of derivative instruments.”

**Q9.28 If a company is not following a Clearly Defined Hedging Strategy, is a hedge credit permitted under the Standard Scenario?**

A: To be an approved hedge under C-3 Phase II, Section III)E)2 of the NAIC Risk-Based Capital Instructions requires the hedge to be part of a clearly defined hedging strategy. AG43 does not require the hedge to be part of a clearly defined hedging strategy to be an approved hedge (see Section A3.3)D)2) for the requirements under AG43).

**Q9.29 On the AG43 Standard Scenario, given the initial 13.5% equity drop and then having remained flat over the next year (before fund fees & M&E), is it appropriate to assume that the Standard Scenario equity returns include a reinvestment of dividends typical of most equity-based mutual funds? If so, it seems reasonable that the valuation of hedges (e.g., options and futures) could assume an additional decline over the next year equal to the dividend rate on equities if the underlying basis for the hedge were an equity-based fund that did not include reinvestment of dividends (e.g., S&P 500 Index).**

A: The Standard Scenario is not entirely clear about the nature of the funds underlying the required returns other than stating that they belong to equity, bond, balanced and fixed classes. However, one reasonable view would be that the Standard Scenario equity returns represent the total returns for mutual funds that are typically used in conjunction with variable annuities.

There is no language requiring that the Standard Scenario returns must be used without adjustment in the valuation of hedges. Appendix A3.3)D)2) of AG43 states, “The cash flow projection for approved hedges that expire in less than one year from the valuation date should be based on holding the hedges to their expiration. For hedges with an expiration of more than 1 year, the value of hedges should be based on liquidation of the hedges one year from the valuation date. Where applicable, the liquidation value of hedges shall be consistent with the assumed returns in the Standard Scenario from the start of the projection to the date of liquidation, Black-Scholes pricing, a risk free rate equal to the 5-year CMT as of the valuation date and the annual volatility implicit as of the valuation date in the statement value of the hedges when the statement value of hedges are valued with Black-Scholes pricing and a risk-free rate equal to the 5-year CMT as of the valuation date.”(emphasis added).

This logic is also applicable to C-3 Phase II since similar language exists in Section III)E)2) of the NAIC Risk Based-Capital Instructions.

**Q9.30 How should margins in Section III(D)(1) of the NAIC Risk-Based Capital Instructions or Section A3.3)C)1)b) of AG43 be calculated for fixed funds after the surrender charge period?**

A: Section III(D)(1)(b) of the NAIC Risk-Based Capital Instructions and Section A3.3)C)1)b) of AG 43 state “On fixed funds after the surrender charge period, a margin of up to the amount in (a) above plus .4% may be used.”

**Q9.31 The Standard Scenario under AG 43 seems to suggest exercising the earliest guaranteed living benefit, but this may decrease or eliminate future living benefits. Should the actuary ignore waiting periods? Should the actuary assume that benefits are exercised at the earliest possible opportunity versus waiting to achieve the most valuable benefit?**

A: Section A3.3)C)3) describes the calculation of the “Current Value” for a guaranteed living benefit. Current Value is used to determine the degree to which a benefit is in the money which in turn determines dynamic lapse rates [Table II in A3.3)C)3)] and living benefit election rates [A3.3)C)7)]. Current Value is determined at the current model duration if the living benefit is currently exercisable or at the earliest future model duration that the benefit can be exercised if the living benefit is not currently exercisable.

In determining the meaning of the term “exercisable,” some actuaries would assume that a living benefit cannot be exercised until there is no penalty. Other actuaries would argue that a benefit is “exercisable” even if it has a penalty and would therefore assume that the benefit is exercisable even if some penalty (such as a reduced benefit) exists.

Section A3.3)C)7) states that the contractholder election rate for any exercisable (ITM) guaranteed living benefit should be zero if exercise would cause extinction of another guaranteed living benefit having a larger Current Value. Thus, a test of value between competing living benefits is made in determining which living benefit to exercise (or not exercise).

Some actuaries may argue that the language in A3.3)C)7) is only applicable to benefits that are a combination of different living benefit guarantees (such as a combo GMAB and GMWB), but others may argue this also applies to rollups and other features that are available within the living benefit.

**Q9.32 Section A3.2)B) of AG 43 states: “The calculation of the Basic Reserve shall assume a return on separate account assets based on the year of issue statutory valuation rate less appropriate asset based charges, including charges for any guaranteed death benefits or guaranteed living benefits.” Is this specifically limited to benefit charges that are a percentage of assets or can benefit charges that are a percentage of a benefit base also be used? Are investment management fees considered to be an appropriate asset based charge?**

A: Some actuaries would state that all guaranteed death and guaranteed living benefit charges can be used since many product designs have charges for guaranteed benefits that are keyed off of the benefit base

Some actuaries believe that AG 43 has not changed the application of AG 33 regarding the recognition of investment management fees.

For the purpose of determining whether any fees or charges are appropriate for inclusion as an asset based charge in the Basic Reserve calculation, some actuaries believe that only those charges that are retained by the insurance company are eligible.

**Q9.33 Can a company take credit under the Standard Scenario for AG43 for the minimum revenue margin (e.g., 20 basis points) for a guaranteed living benefit or a guaranteed death benefit if the contract does not contain such benefit?**

A: A3.3)C)1)a) contains a listing of the annual margins that include the following:

- (iii) For all of the guaranteed living benefits of a given contract combined, the greater of:
  - 0.20% of account value; or
  - Explicit and optional contract charges for guaranteed living benefits;plus
- (iv) For all guaranteed death benefits of a given contract combined, the greater of:
  - 0.20% of account value; or
  - Explicit and optional contract charges for guaranteed death benefits.

The 20 basis points allowance is granted in lieu of the actual explicit and optional charges for the benefits in question. Thus, for example, if the policy has a GMDB, but the charge for the GMDB is implicitly embedded in the M&E or is less than 20 basis points, then 20 basis points would be used in the annual margin. However, if there is no GMDB, then the 20 basis point margin may not be taken.

**Q9.34 Section A3.2)D) of AG43 states that when calculating the Basic Adjusted Reserve, free partial withdrawal provisions shall be disregarded when determining surrender charges in applying the statutory statement valuation requirement prior to adoption of the guideline. Is it appropriate to ignore free partial withdrawals in the Basic Adjusted Reserve calculation?**

A: Yes, but the restriction only applies when a determination of surrender charges is required under the old valuation requirement. For example, AG33 mandates a test of the cash value stream [See **Text** 2.A. of AG33]. Any partial free withdrawal provisions that normally would affect the projected cash surrender values should be ignored when performing this test in the Basic Adjusted Reserve calculation.

**Q9.35 Does the AG 43 Standard Scenario apply to variable immediate annuities?**

A: Yes. Section I states that "The guideline requires that reserves for contracts falling within its scope be based on a minimum floor determined using a Standard Scenario plus the excess over this minimum floor, if any, of a reserve calculated using a projection ...." and section II)A)2) specifically mentions variable immediate annuities as being within the scope of the Guideline.

**Q9.36 Are systematic programs for fund transfers the kind of "required" program that has to be taken into account per AG 43 Section A3.3)C)4)?**

A: Section A3.3)C)4) states that no transfers will be reflected unless required by the contract. Examples of systematic programs that are mentioned in A3.3)C)4) as potentially being required include:

- Transfers from a dollar cost averaging fund;
- Contractual rights given to the insurer to implement a contractually specified portfolio insurance management strategy; or
- A contract operating under an automatic re-balancing program.

If the systematic program for fund transfers is required as a condition of the contract without the ability of the contractholder to opt into or out of the program, then such transfers should be reflected. The treatment is less clear if the contractholder can opt into or out of the program. Some actuaries would argue that transfers wouldn't be reflected if the contractholder has opted out or can opt out in the future. Other actuaries would conclude that transfers should be reflected if the contractholder has opted in or can opt in in the future. Any decision should be documented according to the requirements of Section A8.3)E)5) or A8.3)E)6).

**Q9.37 Please elaborate on the issue/possible definitions of "guaranteed" revenue sharing within the Standard Scenario calculation.**

A: This question is one where there could be a large diversity of practice.

Some actuaries would argue that revenue sharing is guaranteed, on the following basis:

- i. There is a contract in place that does guarantee some form of revenue sharing even if it can be rescinded with notice and therefore it is contractually guaranteed during the notice period.
- ii. Some agreements may contain a provision that even after the agreement terminates the revenue sharing is still paid as long as the assets remain within the funds.
- iii. The elimination of 12b-1 fees may not eliminate all revenue sharing and that as long as a fund remains in the product, a guaranteed level of revenue sharing will occur and if the fund is pulled from the product it could be replaced with another fund that would pay some form of revenue sharing.

Conversely, some actuaries believe that the 1940 Investment Company Act seems to preclude assuming that any revenue sharing can be seen as being contractually guaranteed. Generally, revenue sharing contracts that are entered into with mutual fund companies must contain a notice of termination provision allowing the board of the mutual fund company to terminate the investment advisor and/or 12b-1 fees with notice. This framework seems to create a situation whereby it would be difficult to state that more than a small number of months of revenue sharing could be guaranteed.

**Q9.38 Are non-contractually guaranteed revenue sharing streams allowed under the Standard Scenario in AG 43?**

A: Non-contractually guaranteed revenue sharing streams cannot be reflected in the calculation of the revenue margins under the Standard Scenario in AG 43. A3.3)C)1)a)(ii) states that only net revenue sharing income that is contractually guaranteed to the insurer and its liquidator, receiver, and statutory successor can be included. There is no reference to the ability to include non-contractually guaranteed revenue sharing.

## **10) TREATMENT OF REINSURANCE**

### **Q10.1 Is the TAR calculated gross or net of reinsurance?**

A: Subsection 2 of the Modeling Methodology section of the C-3 Phase II Report states, “Federal Income Tax, insurance company expenses (including overhead and investment expense), fund expenses, contractual fees and charges, revenue sharing income received by the company (net of applicable expenses), and cash flows associated with any reinsurance or hedging instruments are to be reflected on a basis consistent with the requirements herein.”

Appendix 1 of the same report states, “Projections using stochastic market scenarios are run for the book of business (in aggregate) for all contracts falling under the scope of this requirement, reflecting product features, anticipated cash flows, the parameters associated with the funds being used, expenses, fees, Federal Income Tax, hedging, and reinsurance.”

Describing the Alternative Method (AM), Section 12 of Appendix 8 of the same report states, “The actuary must decide if existing reinsurance arrangements can be accommodated by a straightforward adjustment to the factors and formulas (e.g., quota-share reinsurance without caps, floors or sliding scales would normally be reflected by a simple pro-rata adjustment to the “gross” GC results). For more complicated forms of reinsurance, the company will need to justify any adjustments or approximations by stochastic modeling.”

In considering whether to take credit for reinsurance the actuary should also consider Principle 5 of the Life Capital Adequacy Subcommittee June 2005 Report which states “...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 Conditional Tail Expectation Amount 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.”

There are other limitations on credit for reinsurance ceded discussed elsewhere in this section. In addition, Section 9 of this practice note discusses reinsurance limits for the Standard Scenario.

There is no requirement in the C-3 Phase II instructions to calculate the Total Asset Requirement gross of reinsurance.

### **Q10.2 Is the Aggregate Reserve calculated gross or net of reinsurance ceded?**

A: Subsection IV)B) of AG 43 states, “Where reinsurance is ceded for all or a portion of the contracts, both components in the above general description (and thus the Aggregate Reserve) shall be determined net of any reinsurance treaties

that meet the statutory requirements that would allow the treaty to be accounted for as reinsurance.

“An Aggregate Reserve before reinsurance shall also be calculated if needed for regulatory reporting or other purposes, using methods described in Appendix 2.”

Therefore, the Aggregate Reserve shall be determined net of reinsurance, from treaties that meet the requirements to be accounted for as reinsurance, but an Aggregate Reserve gross of reinsurance may need to be calculated for regulatory reporting or other purposes.

In considering whether to take credit for reinsurance ceded the actuary should also consider Principle 5 of AG 43 which states “...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 Conditional Tail Expectation Amount 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.”

There are other limitations on credit for reinsurance ceded discussed elsewhere in this section. In addition, Section 9 of this practice note discusses reinsurance limitations for the Standard Scenario.

**Q10.3 How is the Aggregate Reserve net of reinsurance ceded determined using projections?**

A: For the Conditional Tail Expectation Amount, Subsection A2.1)B) of Appendix 2 of AG 43 states, “Accumulated Deficiencies, Scenario Greatest Present Values, and the resulting Conditional Tail Expectation Amount 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 the projections. This involves including, where appropriate, all anticipated reinsurance premiums or other costs and all reinsurance recoveries, where both premiums and recoveries are determined by recognizing any limitations in the reinsurance treaties, such as caps on recoveries or floors on premiums.”

Section 9 of this practice note discusses how reinsurance is handled for the Standard Scenario.

**Q10.4 How is the Aggregate Reserve gross of reinsurance ceded determined using projections?**

A: For the Conditional Tail Expectation Amount, Subsection A2.1)B) of Appendix 2 of AG 43 states, “Accumulated Deficiencies, Scenario Greatest Present Values, and the resulting Conditional Tail Expectation Amount shall be determined ignoring the effects of reinsurance within the projections. One acceptable approach involves a projection based on the same Starting Asset Amount as for the Aggregate Reserve net of reinsurance and by ignoring, where

appropriate, all anticipated reinsurance premiums or other costs and all reinsurance recoveries in the projections.”

Section 9 of this practice note discusses how reinsurance is handled for the Standard Scenario,

**Q10.5 How does the actuary incorporate hedging credit into the model when reinsurance is present?**

A: The Modeling of Hedges guidance in Appendix 10 of C-3 Phase II indicates that, provided the company is following a Clearly Defined Hedging Strategy, the model should “take into account the appropriate costs and benefits of hedge positions expected to be held in the future through the execution of that strategy.”

The Modeling of Hedges guidance in Appendix 7 of AG 43 indicates that, provided the company is following a Clearly Defined Hedging Strategy, the model should “take into account the costs and benefits of hedge positions expected to be held by the company in the future based on the operation of the hedging strategy.”

Some actuaries treat reinsurance consistently between the hedge targets used in the model to determine hedge positions expected to be held and the hedge targets actually used in support of the Clearly Defined Hedging Strategy.

For example, if a proportional reinsurance agreement exists and actual hedge positions are calculated based on the Greeks associated with the net retained liability, then the hedge positions expected to be held for the purposes of modeling would normally be based on the estimated net retained liability.

Incorporating hedging credit in the model gross of reinsurance is consistent with the practices described in Section 11 of this practice note. Some actuaries would eliminate the impact of both reinsurance premiums and reinsurance benefits from their projections, however, they would model the impact of the hedge positions expected to be held based on the estimated net retained liability.

**Q10.6 Could either the Total Asset Requirement or the reserves under AG 43 for the reinsurer be different than the reduction in TAR or reserve credit taken by the direct writing company?**

A: It is possible that the Total Asset Requirement and the AG 43 reserve held by the assuming company for reinsurance coverage of a particular block of business will be different than the reduction in TAR or the reserve credit obtained by the ceding company for many reasons including, but not limited to:

- The risk to the reinsurer may be different than the risk to the ceding company. For example, reinsurance premiums may not be equal to the direct fees charged for the guarantee, or the reinsurer’s expenses may be



different from the direct company's expenses. In addition, to the extent the "base contract" is not ceded (e.g., only the living benefit rider is ceded), the ceding company receives revenue from the underlying contract that the reinsurer does not receive.

- Reinsurance may involve a subset of the direct company's block of business such that the experience of the reinsured portion is different from that of the block as a whole. Even if the experience is the same, the model may use the same assumption for a group of contracts involving different blocks of business.
- Typically, the reserve or TAR calculation involves an aggregate calculation of an entire portfolio of which the reinsured business is only a part. Since the reinsurer and the ceding company are valuing different total liability portfolios, the impact of the reinsured block of business will be different for each company.
- The ceding company and the assuming company may have different projected general account earned rates and, thus, would discount their liabilities at different rates.
- The ceding company may be computing its gross reserve without the benefit of a hedge program (since it cedes all or most of the risk to the reinsurer) while the reinsurer computes its gross reserve with the benefit of a hedge program.

**Q10.7 Suppose there is a 100% quota share coinsurance arrangement between a ceding company and a reinsurer. The ceding company calculates its gross CTE reserve for a subgroup containing only the reinsured block and allocates the excess to individual contracts. The reinsurer calculates its gross CTE reserve for the entire company and, allocates the excess to individual contracts. Therefore, even if the two companies use the same assumptions, the ceding company's gross reserve for a particular contract may not be equal to the reinsurer's reserve for the same contract. Is this acceptable?**

A. Yes, this is acceptable. The ceding company and the reinsurer may have different reserves for many reasons including the manner in which policies are grouped.

**Q10.8 In calculating the C-3 Phase II TAR and the AG 43 reserve, would an assuming company typically use data for an earlier time period aged forward?**

A: Ideally, reserves and risk-based capital should be calculated using in force data for contracts in force on the valuation date. However, in practice, actuaries may need to incorporate approximation techniques such as delays in obtaining fresh ("valuation date") data on assumed business. Such approximations must be discussed in the required supporting memorandum. In addition, where the valuation was based on a prior in force with adjustment or

projection to the valuation date, then additional Standard Scenario runs using fresh in force data are required by Section III(A) of the NAIC RBC Instructions and Section A3.1 of AG 43 to validate the reasonableness of those approximations.

**Q10.9 Could an assuming company use reinsurance cash flows and amounts provided by the ceding company?**

A: Yes, but the assuming company is ultimately responsible for the calculations. The assuming company actuary may find it prudent to review the ceding company's calculation in order to provide the necessary certification for the assuming company.

**Q10.10 Let's say that the before-reinsurance AG 43 reserve is less than the after-reinsurance AG 43 reserve (i.e., having reinsurance causes an increase in the reserve). Should a company report a \$0 ceded reserve in Exhibit 5 (i.e., report the net reserve in the gross reserve section), or should it report a negative ceded reserve in Exhibit 5?**

A: There will probably be differing opinions about which way is more appropriate. The Company might want to research the annual statement instructions for Exhibit 5, for Schedule S, and for any crosschecks between Exhibit 5 and Schedule S before reaching a decision.

**Q10.11 An insurance company has a block of VA business and has ceded a subset of its business (i.e., not all of it) to multiple reinsurers. The company must calculate its AG 43 reserves, and in particular, the ceded reserves for the business that has been reinsured, for each assuming company. Assume all contracts are modeled as one grouping for purposes of determining the CTE Amount. How does the direct insurer calculate the ceded reserves under the following circumstances?**

A: Define the following:

SSR = Standard Scenario Reserve

SSA = Standard Scenario Amount (equals sum of SSR for each contract)

CTEA = CTE Amount (Stochastic)

AR = Aggregate Reserve

AR(Direct) = Aggregate Reserve Before Deducting Reinsurance Ceded

AR(Net) = Aggregate Reserve After Deducting Reinsurance Ceded

AG 43 outlines how to calculate both AR(Direct) and AR(Net). The total reserve ceded is simply the difference between these two amounts. However, no detailed guidance is offered on how to allocate the total reserve ceded amongst multiple reinsurers.

Some alternative approaches have been shown below. The most appropriate approach may depend on the individual circumstances of the company, including the amount of business ceded, the nature of the reinsurance arrangements and the mix of business, among others.

There are four possible cases to be considered:

**Case 1: Direct reserve based on SSA, Net reserve based on SSA**

**Case 2: Direct reserve based on CTEA, Net reserve based on CTEA**

**Case 3: Direct reserve based on SSA, Net reserve based on CTEA**

**Case 4: Direct reserve based on CTEA, Net reserve based on SSA**

**Case 1: Direct based on SSA, Net based on SSA**

1. Calculate AR(Direct) and AR(Net) (and thus AR(Ceded)) for the reinsured contracts.
2. Calculate AR(Net) for each reinsurer stand-alone. Thus, AR(Direct) less each AR(Net) for each reinsurer stand-alone gives AR(Ceded) for each reinsurer stand-alone.
3. If necessary, adjust each reinsurer's AR(Ceded) such that the sum adds up to the AR(Ceded) in Step 1.

**Case 2: Direct Reserve based on CTEA, Net Reserve based on CTEA**

**Method 1: Based on CTEA methodology**

1. Using the stochastic projections, calculate the reinsurance ceded credit for each reinsurance treaty separately by assuming that it is the only reinsurance treaty in force, i.e.,

Preliminary AR(ceded\*) = CTEA(Direct) – CTEA(Net\*), where \* indicates amounts calculated in respect of a single reinsurance treaty

2. Add the preliminary AR credits determined in step 1 for all reinsurance contracts and then increase or decrease the sum of the credits to equal the total AR(ceded).

**Method 2: Based on SSA methodology**

1. Allocate the excess CTEA over SSA to individual contract following the AG 43 prescribed methodology for both the gross and net reserves
2. Calculate AR(ceded) by contract as the difference between the allocated CTEA(Direct) and CTEA(Net). Make adjustments as required to account for contracts not subject to any reinsurance, for example, set the direct reserve equal to the net reserve

3. Make adjustments as required to make sure the reserve credit by contract sums to the total AR(ceded), for example, reallocate the excess CTEA over SSA to reinsured policies based on the difference between SSR and CSV for those policies.
4. Calculate the AR(ceded) by reinsurance treaty by summing across contracts covered by the same reinsurance treaty.

**Case 3 - Direct based on SSA, Net based on CTEA**

Use principles similar to those shown in Case 1 and Case 2 above.

**Case 4 – Direct based on CTEA, Net based on SSA**

Use principles similar to those shown in Case 1 and Case 2 above.

## 11) TREATMENT OF HEDGING

**Q11.1 To the degree the hedge position introduces basis, gap, price, or assumption risk, a suitable reduction for effectiveness of hedges shall be made. How is this accomplished?**

A: Contractholder behavior assumptions such as mortality, persistency, withdrawal, annuitization, and sub-account transfer can be analyzed by sensitivity testing in hedging simulation or liability valuation work. Each assumption can be increased and decreased by reasonable variations from what is expected to determine the impact on the hedge costs. Basis risk can be analyzed historically and then projected accordingly in asset returns and option payoffs. Gap risk can be analyzed by comparing option costs before and after a large drop in the equity market, and assuming hedge underperformance will be approximately equal to the change in modeled option costs.

**Q11.2 If an insurer intended to reflect the effect of a hedging program in the calculations required by AG 43 and C-3 Phase II, would the insurer use a “stochastic within stochastic” model?**

A: It's important to project asset and liability cash flows and statutory balance sheet amounts as accurately as possible. While ideally a “stochastic within stochastic” approach may be the best approach, some actuaries believe it may be possible to estimate the impact of such an approach and that this may be necessary due to system or other limitations. In such circumstances, an estimated approach may not be able to capture or reflect all of the intricacies of the approach required by AG 43 and C3P2.

The following is one suggested potential approach to estimate a stochastic within stochastic approach, which may work in certain situations. The discussion below is in the context of C-3 Phase II and an analogous approach could be used for AG 43. Other approaches may also be appropriate. As always, the actuary is encouraged to test the results for reasonableness and should verify that any approach used in this regard is an appropriate estimate of the requirements within AG43 and/or C3P2.

- a. Let PVP = the average of the present value of hedged minimum guarantee related claims across all scenarios used in the calculations.
- b. Let PVQ = the average of the present value of hedged minimum guarantee related claims based on risk-neutral principles.
- c. For purposes of calculating PVP and PVQ under this approach, the minimum guarantee-related claims for a scenario are based on the present value of GMxB-Account Value or appropriate proportion thereof if a partial hedging strategy is employed. Similarly, in the case of a hedged and non-hedged guaranteed minimum benefit in the same policy, the present value of hedged minimum guarantee-related claims would reflect only the hedged benefit. Both the hedged and unhedged benefit can be handled in the same

projection.

- d. HE = hedge effectiveness error factor between 0 and 1. HE should not be confused with E factor in AG 43, which is a model effectiveness factor, or with the E factor in C-3 Phase II, which is an error factor (refer to the response to Q11.7 for further explanation).
- e. Let CTE(90)' be equal to a CTE(90) calculation where all hedged minimum guarantee claim payments are multiplied by HE during the projection process. CTE(90)' is based on a greatest present value calculation just as CTE(90) is. Profitable scenarios may be reflected in CTE(90)' as long as each such profitable present value is capped at  $\max(\text{PVP}, \text{PVQ})$ .
- f. Then  $\text{TAR} = \text{CTE}(90)' + \max(\text{PVP}, \text{PVQ})$

Additional items that the actuary may wish to consider regarding the approach discussed above, as well as other approaches that may be used in this context:

The approach is an estimate of the required treatment of hedges in AG 43 and/or C3P2 rather than an alternative to the requirements. As such, the actuary should consider the accuracy of the approach discussed above versus the required approach under all economic conditions. For example, Section A7.3) of AG 43 states that “[i]f cash flows are not modeled directly, E will be no greater than 0.30”. This means that if the CDHS reduces the CTE Amount, no more than 30% of that reduction may be reflected in the reserve. The actuary may need to consider whether the approach discussed above reflects such a limitation and whether an adjustment is needed if it doesn't.

Similarly, it's important to note that the worst scenarios for CTE(90)' may be different than for CTE(90), just as the worst scenarios for CTE(best efforts) may be different than for CTE(adjusted). This is sometimes referred to as “reordering.” However, the actuary may need to consider whether the effect of reordering between CTE(90)' and CTE(90) is different than that for CTE(best efforts) and CTE(adjusted) and whether further adjustments are needed to the reserves and/or TAR to reflect this.

The approach removes the hedged claims from the projections and replaces them via the addition of an option cost. This is what hedging is all about and, as such, is consistent with Black-Scholes theory, etc.

Stochastic within stochastic modeling is not necessary for the approach, although the derivation of HE may be based in part on stochastic-on-stochastic analysis. Even then, a large number of base paths may not be required since this will only be measuring hedge effectiveness, not trying to get a stochastic based price or CTE. Also HE can be based on analysis done prior to the valuation date. This can have huge practical implications as far as reducing required

computations and moving work outside the quarter/year end crunch time.

HE may vary by time (probably reducing) and scenario (for example, hedge effectiveness could be much lower in poor economic scenarios than it is in better economic scenarios). The actuary should verify whether this variation is significant and whether multiple values of HE should be used in the model.

The max (PVP, PVQ) term means that a company cannot reduce the average claims in the model by switching from a p measure to a q measure.

Since PVP and PVQ are based on hedged minimum guarantee related claims rather than total minimum guarantee related claims, partial hedging strategies may be accommodated.

PVP and PVQ are based only on the liability. They do not take into account any actual hedge positions, current or future as anticipated under a CDHS. However, under capital market assumptions, the cost of hedging theoretically corresponds to PVQ (with allowances for differences reflected in HE). The value of any hedges currently held will be reflected in the insurer's current balance sheet. This is consistent with how liabilities are hedged: 1) Evaluate the liability including risk-neutral present value, Greeks, and sensitivities to large moves. 2) Construct a hedge portfolio to match the Greeks and/or sensitivities to large moves. 3) Monitor 1) and 2) overtime and adjust 2) as needed. This approach also avoids issues of circularity.

An insurer may also choose to hedge the fees collected for the guaranteed minimum benefit. These would normally be treated in a manner consistent with the treatment of the benefit under the approach discussed above.

The actuary may need to consider whether the approach discussed above is appropriate for inforce hedges (that are not part of a CDHS) and whether it may need to be adjusted for use with macro hedges, especially where there is not a long-term linkage between the macro hedging strategy and the Greeks of the liability.

Use of this approach or some other alternative approach still must comply with other requirements of AG 43 and C-3 Phase II. For example, the actuary should consider whether all the risks, associated costs, imperfections in the hedging and hedging mismatch tolerances associated with the hedging strategy, as required by AG 43 and C3P2, are reflected or whether additional adjustments are needed.

For further details, the reader is encouraged to review Appendix 7 of AG 43 and Appendix 10 of the C-3 Phase II Report.

**Q11.3 If an insurer uses the Alternative Methodology (AM) for determining the TAR and/or the Conditional Tail Expectation (CTE) Amount, is it appropriate for the insurer to reduce the otherwise calculated TAR and/or the CTE Amount for the effects of a hedging program?**

A: A reduction for hedges is not allowed under the AM.

**Q11.4 How are unhedged Greeks reflected in the impact of hedging?**

A: Appendix 7 of AG 43 and Appendix 10 of the C-3 Phase II Report discuss two potential methods for the analysis of the impact of hedging strategies on cash flows. (e.g., Section A7.2 in AG 43 states “The analysis of the impact of the hedging strategy on cash flows is typically performed using either one of two methods as described below.”) The fundamental characteristic of the first method is that all hedging positions, both the currently held positions and those expected to be held in the future, are included in the stochastic cash flow model used to determine the Scenario Greatest Present Value for each scenario. With this approach, any unhedged risks would automatically be included in the model (subject to modeling error). For example, if a hedge program hedged delta, but not rho, then the scenarios used in the stochastic model would impact the claims and cause them to differ from the hedging cash flows due to unhedged interest rate changes.

In the second method, the hedge strategy effectiveness is modeled in part or in whole outside of the stochastic cash flow model. For example, if a hedge strategy did not hedge rho, this would be explicitly reflected by increasing E, increasing hedge costs assumed, or some other method. Some actuaries believe unhedged first order Greeks (delta and rho) may be addressed by increasing E and second order unhedged Greeks (gamma, interest rate convexity, vega) tend to increase risk in proportion to option costs as opposed to in proportion to tail claims as appearing in CTE measures.

The following is an example of estimating the cost of not hedging convexity when using the second method. Calculate option costs at the valuation date based on A) the swap curve, and B) arbitrage-free stochastic risk-neutral scenarios based on the current swap curve.

Then the difference between B and A is usually a good estimate of the cost of not hedging convexity and would usually increase the CTE amount or TAR otherwise held.

**Q11.5 How are risk-neutral scenarios developed for evaluating hedge competitiveness?**

A: As described in Question 11.4, there are essentially two methods to develop risk-neutral scenarios. Analysis based on the first method involves the use of risk-neutral scenarios at future points in time that are consistent with the other assumptions for a given scenario. In particular, risk-neutral scenarios and real-world scenarios should be consistent. If the pre-generated real-world scenarios are used, one approach to generating risk-neutral rates is to use the Treasury rates plus a swap spread based on reasonable



historical results. Interpolation and extrapolation may be appropriate for other points on the curve, but once again this can be based on historical relationships. If company-generated scenario sets are used, the scenario may explicitly include development of risk-neutral scenarios. Analysis based on the second method may be based only on knowledge of the swap curve at the valuation date.

**Q11.5(a) Can you expand more on what you mean by consistency between risk-neutral scenarios and real-world scenarios?**

A: The risk-neutral scenarios are often driven by three assumptions. (1) risk-free rates (or swap rates), (2) fund correlations, and (3) implied volatility.

The risk-free rates (for which swap rates may be considered a reasonable estimate) for a particular scenario at a particular point in time are based on the real-world yield curve at that point in time.

Fund correlations would normally be the same for the real-world and risk-neutral scenarios.

The implied volatility is arbitrage free at time zero and should evolve in arbitrage-free fashion. For example, at any time frame the implied volatility surface would not slope down too quickly in terms of maturity or in terms of strike to avoid arbitrage opportunities. If historical volatilities at each point in time are known for the real-world scenarios, these can be used to estimate the implied volatility surface at each point. An example here would be where a company uses real-world scenarios that are driven by a stochastic volatility process. If historical volatilities are not known they can be estimated.

One method of estimation would be to base historical volatilities on prior movements for the particular fund index.

One method of calculating implied volatilities would be to add a premium to historical volatilities. Another method would be to base implied volatilities on a regression of historical volatilities.

**Q11.5(b) What about consistency in other assumptions when modeling hedging?**

A: Hedging is an investment strategy. It's usually preferable to model the actual hedging strategy used in practice as closely as possible in the model, including the assumptions used therein to determine hedging targets.

This means that the assumptions used to determine those targets in the hedging portion of the model may differ from the prudent estimate assumptions assumed elsewhere in the model. For example, a company may have a hedging strategy which targets liability "Greeks" based on expected mortality rates which may differ from the prudent estimate assumptions used in the model. When determining the hedging targets in the model, the mortality rates actually used to determine the "Greeks" would

be used (if they differ, one needs to reflect this disjoint in the “E” factor). However, the mortality rates used in other portions of the model, when determining projected claims in the accumulated surplus results for example, would be based on a prudent estimate basis, which may differ.

**Q11.5(c) Does one always use risk-neutral valuation when incorporating the impact of hedging?**

A: No. The risk-neutral scenarios are used to value derivative assets at future valuation points in time. They may also be used if the hedge strategy depends on a risk-neutral valuation (e.g. targeting “Greeks”).

Here’s an example where risk-neutral valuations would not necessarily be used: A company has one-year put options on the balance sheet as of the valuation date and the investment strategy is to exercise these if the market drops x% or more. Since the options will expire at the next valuation date and the investment strategy does not depend on risk-neutral valuations, there is no reason to incorporate risk-neutral logic into the AG 43 reserve model or C3 Phase II model.

**Q11.6 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 calculating C-3 Phase II RBC, the actuary should review actual historical hedging effectiveness. When reviewing the actual historical hedging effectiveness, what factors (including the frequency of measuring effectiveness) would the actuary consider for evaluating the effectiveness of the hedging program?**

A: The factors the actuary may wish to consider include, but are not limited to: tracking error between fund values and mapped index exposures, basis risk between derivative contracts and underlying index exposures, market gap risk, price risk, parameter estimation risk expenses, and variation in assumptions (mortality, persistency, withdrawal, annuitization, etc.).

A key area to focus on is the difference between a) and b) where a) is the change in the value of the guaranteed contractholder options embedded in the variable annuities and other in-scope products and b) is the change in the value of the hedge assets. In calculating a), cash flows generated by the guarantees would normally be included. In calculating b), cash flows generated by the hedge assets would usually be included. If revenue is hedged as well, then that typically would be reflected in a). Tracking error and basis error is usually evaluated on a time series of differences between two sample returns on a monthly or more frequent basis and is typically quoted as an annualized sample standard deviation figure. Tracking error should be measured in both low and high volatility environments. Other assumptions, if material, are normally evaluated annually

Expenses encompass both explicit and implicit costs and include, but are not limited to: transaction, margin (opportunity costs associated with

margin requirements), market impact (bid-ask spreads and the opportunity costs of working a trade order) and administration. These factors have an impact on hedge costs and will not always be as expected and will therefore impact the effectiveness of the hedge program. Further guidance is provided in Appendix 10 of C-3 Phase II.

In addition, the actuary may wish to consider whether to limit the reduction to the CTE amount attributable to the hedging strategy, based on the uncertainty associated with the company’s ability to implement the hedging strategy in a timely and effective manner. The actuary may also wish to consider whether the level of operational uncertainty varies indirectly with the amount of time that the new or revised strategy has been in effect or mock tested.

**Q11.7 Are the E factors in AG 43 and C-3 Phase II different?**

A: Yes, the E factor in Appendix 7 of AG 43 and Appendix 10 of the C-3 Phase II Report are different. The E factor in AG 43 is an “effectiveness factor” while in C-3 Phase II it is an “error factor”. Conceptually one may be considered the complement of the other. As the sophistication of the cash flow model (incorporating the hedge strategy) increases, the “effectiveness factor”, E, in AG 43 increases while the “error factor”, E, in C-3 Phase II decreases.

The value for E for both AG 43 and C3P2 reflects the actuary’s view as to 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. Appendix 7 of AG 43 specifies that the value of E will be no greater than 0.70. Some actuaries believe that the derivation of “E” may be based in part on stochastic-on-stochastic analysis and can be performed prior to the valuation date without including a large number of base paths since the calculation is not involving either a stochastic-based price or a CTE.

Example Adjustments to the ‘E’ Effectiveness factor:

Targeting liability “Greeks” using expected mortality while Prudent Estimate mortality is used elsewhere in the model. This difference in assumptions should be reflected in the “E” factor.

A hedging strategy that hedges rho but is not reflected in the modeling can explicitly be reflected by decreasing E.

Appendix 7 of AG 43 specifies the following limits on “E”:

Model Type	Level of E
Hedge cash flows not directly or simplistically modeled (or for a company that does not have 12 months of experience to date)	Low (less than 0.30)
Modeled hedge cash flows and ‘Greeks’	High (up to 0.70)

are close to the expected actual hedge cash flows  
and 'Greeks'

Hedge cash flows, 'Greeks' not effectively modeled (between 0.30 and 0.70)

**Q11.8 Can the AG 43 "E" factor be less than 1.0 if the "best efforts" CTE amount exceeds the "adjusted"**

A. Some actuaries believe that if a company is following a CDHS and the "best efforts" result exceeds the "adjusted," it is unreasonable to use a factor of less than one. However, other actuaries interpret the requirements as specifically prohibiting "E" in excess of .70 (or .30 when hedge flows are not modeled directly)

**Q11.9 Which scenarios should be included, under AG 43, in the determination of the CTE Amount (reported) when blending CTE Amount (best efforts) with CTE Amount (adjusted) as per Appendix 7? Should the "same" worst 30% of the scenarios be used in the CTE calculation?**

A. Some actuaries believe that the "best effort" and "adjusted" CTE Amounts should be independently calculated without using the "same" scenarios. Therefore, the CTE Amount (reported) is likely to be more conservative than would be produced if the effectiveness were captured on a scenario-by-scenario basis.

I.e.,  $\text{CTE Amount (reported)} = \text{CTE Amount}\{E \times \text{Scenario GPV}(\text{best efforts}) + (1-E) \times \text{Scenario GPV}(\text{adjusted})\}$ .

Where:

E is the "effectiveness factor" as per Appendix 7.

CTE Amount (best efforts) as per Appendix 7:

"... based on incorporating the hedging strategy (including currently held hedge positions) into the stochastic cash flow model."

CTE Amount (adjusted) as per Appendix 7:

"... assuming the company has no dynamic hedging strategy (i.e., reflect only hedge positions held by the company on the valuation date)."

**Q11.10 What is the difference between the TAR(adjusted) and CTE(adjusted) from a hedging point of view?**

A: In concept, both TAR (adjusted) and CTE (adjusted) are computed to compensate for potential overstatement of the impact of the hedging strategy. In C-3 Phase II, the adjusted TAR reflects impacts of risk not reduced, eliminated, contemplated by the hedging strategy, imperfections and uncertainty of the effectiveness of the program. In AG 43, the adjusted CTE assumes the company has no dynamic hedging strategy. AG 43 further

clarifies that this means that it only reflects the hedge positions held by the company at the valuation date. Some actuaries may, for practical purposes, model this as if the company has no hedging at all for both TAR (adjusted) and CTE (adjusted) if it can be demonstrated that this does not materially misstate the results. Some actuaries may compute TAR (adjusted) and CTE (adjusted), putting more refined considerations in the computation of the former as compared to the latter, if it can be demonstrated that this does not materially misstate the results.

**Q11.11 Is there any restriction of having to use hedging in AG 43 if hedging is used in calculating C-3 Phase II?**

A: A1.1)D) of AG 43 states the following and is irrespective of what was assumed in calculating the results under C-3 Phase II: "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 the guideline shall be included in the projections. If the company is following a Clearly Defined Hedging Strategy and the hedging strategy meets the requirements of Appendix 7, 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 that strategy".

**Q11.12 Suppose a company does not have a CDHS, but is modeling the income associated with hedge assets in place as of the valuation date. Further suppose that some of those assets in place are S&P Futures that expire three months from the valuation date. Would this company, under AG 43, be allowed to roll those S&P futures contracts into the next set of front month contracts upon expiry (keeping the number of contracts the same)?**

A: It is true that a company, following AG 43, with a CDHS in place can rebalance its position based on its dynamic hedging strategy per Section A7.1) of AG 43. Some actuaries believe that to allow "rolling the expiring contracts into new contracts," a company would need to follow its investment policy, and more specifically, the definition of that company's particular CDHS per Section A7.1) under AG 43. The recommended approach, according to AG43 Paragraph one of Section A7.1) and Paragraph two of Section A7.2), for a company without a CDHS, would be to simply let those S&P Futures contracts expire and not allow them to roll into new contracts.

**Q11.13 Are there circumstances in which hedging risk can lead to an increase in reserves or capital?**

A. Although hedging is meant to mitigate or minimize risks, it does so with an associated cost. Hedging may cause projected gains in some scenarios, as well as projected losses in others. It may be dependent upon the circumstances of the inforce. This in turn could translate into higher reserves and/or TAR. Hedging substitutes a risk neutral return for an unknown return, but to the extent that the AG 43 scenarios have significantly higher drift rates and/or significantly lower volatility assumptions, the option values associated with risk neutral hedging scenarios may be larger than the reserves produced by CTE calculations even though the CTE calculations only consider the tail scenarios.

Another way to look at this is that it depends on the returns of the hedge assets in the CTE scenarios versus other assets that would be used in place of hedge assets, such as general account bonds. If the hedge assets have lower returns than bonds in the CTE 70 calculation for reserves, then hedging may lead to an increase in reserves. One may find that in such a situation the reverse happens in the CTE 90 calculation and hedging lowers TAR.

**Q11.14 Am I required to reflect hedging in the CTE calculations if it increases reserves or TAR?**

A. (i) For currently held hedges (i.e. hedges in place as of the valuation date) the answer is “yes.” AG 43 Appendix 7 and Appendix 10 of the C-3 Phase II report both say that the costs and benefits of hedging instruments that are currently held by the company on the valuation date must be reflected.

(ii) As for future hedges that the company would enter into under a hedging strategy, some actuaries believe that if a Clearly Defined Hedging Strategy (CDHS) is in place and hedging increases the CTE results, it must be reflected. This is based on AG 43 Appendix 7 – “If a company is following a CDHS, the model shall take into account the cost and benefits of hedge positions expected to be held by the company in the future based on the operation of the hedging strategy.” and Appendix 10 of the C-3 Phase II report – “Provided the company is following a CDHS, the model shall take into account the cost and benefits of hedge positions expected to be held by the company in the future based on the operation of the hedging strategy.”

If a CDHS is not in place some actuaries believe hedging should not be reflected as there is a very specific definition of a CDHS and associated requirements. On the other hand, some actuaries believe hedging should be reflected and point to the principles in AG 43 and C-3 Phase II as well as the following:

AG 43 Appendix 7 states:

“Although a hedging strategy would normally 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 Conditional Tail Expectation Amount otherwise calculated. The fundamental characteristic of the first method is that all hedge positions, both currently held positions and those expected to be held in the future, are included in the stochastic cash flow model used to determine the Scenario Greatest Present Value.....” and

“Regardless of the methodology used by the company, the ultimate effect of the current hedging strategy (including currently held positions) on the Conditional Tail Expectation Amount 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...”

Appendix 10 of the C-3 Phase report states:

“Although a hedging strategy would normally 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 TAR otherwise calculated. The fundamental characteristic of the first method is that all hedge positions, both currently held positions and those expected to be held in the future, are included in the stochastic cash flow model used to determine the greatest present value of accumulated deficiencies for each scenario,” and

“Regardless of the methodology used by the company, the ultimate effect of the current hedging strategy (currently held positions) on the TAR amount 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...”

## **12) DETAILS ON CERTIFICATION & REQUIRED DOCUMENTATION**

### **Q12.1 Who provides the certification and what are the qualification standards applicable to the certifying actuary?**

A: Appendix 11 of the Recommended Approach for Setting Regulatory Risk-Based Capital Requirements for Variable Annuities and Similar Products (the C-3 Phase II report) states that “the certification shall be provided by a qualified actuary.” Similarly, Section A8.2)A) of AG 43 states that the AG 43 actuarial certification “shall be provided by a qualified actuary.” The appointed actuary would normally provide the statement of actuarial opinion on the adequacy for the reserves and may be the one who provides these certifications. However, the appointed actuary does not need to be the qualified actuary providing the certifications for C-3 Phase II and AG 43. Any qualified actuary meeting the qualification standards for actuaries issuing statements of actuarial opinion in the United States (the “US Qualification Standards”) can provide the certification. These standards include satisfying basic education, experience and continuing education requirements. The certifying actuary may also find it helpful to review the Applicability Guidelines on the ASB website at <http://www.actuarialstandardsboard.org/appguide.asp> to determine which Actuarial Standards of Practice (ASOP) may apply to such certification.

### **Q12.2 What is a suggested format of the required certification (i.e., sample wording)?**

A: There is no suggested format. However, the required components of the certification are outlined in Appendix 11 of the C-3 Phase II report and Appendix 8 of AG 43.

### **Q12.3 How does the AG 43 Actuarial Certification differ from the Statement of Actuarial Opinion?**

A: The AG 43 Actuarial Certification differs from the Statement of Actuarial Opinion in a few ways, which include:

- i. The appointed actuary would provide the Statement of Actuarial Opinion, but any qualified actuary may provide the Actuarial Certification. In many cases this will be the same individual, but AG 43 allows a broader range of certifying actuaries.
- ii. The scope of AG 43 is different in that it only addresses specific products.
- iii. The certifying statement for AG 43 is that the reserve was calculated in accordance with the principles and requirements of AG 43. The Statement of Actuarial Opinion is opining on the adequacy of reserves under moderately adverse conditions, in light of the assets supporting them.



iv. The AG 43 certification includes a paragraph certifying that the assumptions used for the calculations are Prudent Estimate assumptions for the products, scenarios, and purpose being tested.

v. If hedging was incorporated, additional disclosures are required under AG 43 as to the incorporation of a Clearly Defined Hedging Strategy and values for the CTE amount (adjusted) and the CTE amount (best efforts). Specific details on the requirements are discussed in the answer to question 12.6.

**Q12.4 What are the differences between the certification requirements for C-3 Phase II and AG 43?**

A: In general, the requirements are similar. Some differences are outlined below.

**Management Certification**

Section A8.1) of AG 43 requires a management certification. In this certification, “management must provide signed and dated written representations as part of the valuation documentation that the valuation appropriately reflects management’s intent and ability to carry out specific courses of actions on behalf of the entity where such is relevant to the valuation.” C-3 Phase II does not have such a management certification requirement.

**Actuarial Certifications**

The certifications for AG 43 and C-3 Phase II are similar and include paragraphs on the actuary; the scope; reliance if any, that the calculations are in accordance with the guideline (AG 43) or NAIC instructions (C-3 Phase II); and that it is not an opinion on adequacy. In addition, C-3 Phase II requires a disclosure of all material changes in the model or assumptions from that used previously and the estimated impact of such changes.

If the company has a CDHS, an actuary must provide a certification as to whether the CDHS is fully incorporated into the stochastic cash flow model and any supplementary analysis of the impact of the hedging strategy.

**Certification of Financial Officer**

A financial officer of the company (e.g., chief financial officer, treasurer or chief investment officer) or a person designated by the them who has direct or indirect supervisory authority over the actual trading of assets and derivatives, must certify that the hedging strategy meets the definition of a Clearly Defined Hedging Strategy and that the Clearly Defined Hedging Strategy is the hedging strategy being used by the company in its actual day-to day-risk mitigation efforts.

**Supporting Memorandum**

Supporting these certifications should be a memorandum. The memorandum requirements of AG 43 and C-3 Phase II are similar.

Some additional disclosures required by AG43 include:

- Section A8.3)D)6) of AG43 requires “a description of the methods used to validate the model and a summary of the results of the validation testing.”
- Section A8.3)E) of AG 43 requires additional specific disclosure items for the Standard Scenario.
- Section A9.7) of AG43 requires certain disclosures related to guaranteed living benefit lapse and utilization assumptions.
- Section A10.2)E) of AG43 requires specific documentation related to setting prudent estimate mortality assumptions.

An additional disclosure required by C-3 Phase II is disclosure related to taxes which is not relevant for AG43.

**Q12.5 Are there any distinctions in the certification required from a direct writer, vs. what would be required from a VA reinsurer (i.e., no actual VA assets)?**

A: There are no required distinctions between the certifications required from a direct writer and a reinsurer. However, some actuaries believe additional clarification in the scope may be beneficial and there may be implicit differences in the reliance statements provided. Some sources for guidance on the contents of certifications can be found in ASOPs 7, 22, and 41.

**Q12.6 What additional certification and documentation is required if hedging is reflected?**

A: The certification and documentation requirements related to the modeling of hedges are included in Appendix 10 of the C-3 Phase II Report and Appendix 7 of AG43.

A: Under C-3 Phase II [AG43], the qualified actuary is required to certify that the values for “E”, TAR [CTE amount] (adjusted) and TAR [CTE amount] (best efforts) were calculated using the prescribed process and that the assumptions used in the calculations were reasonable for the purpose of determining RBC [Conditional Tail Expectation Amount]. The actuary is also required to document the method(s) and assumptions used to determine TAR [CTE Amount] (adjusted) and TAR [CTE Amount] (best efforts) and maintain adequate documentation as to the methods, procedures and assumptions used to determine “E.”

Under both requirements, the actuary is required to provide a certification as to whether the Clearly Defined Hedging Strategy is fully incorporated into the stochastic cash flow model and any supplementary analysis of the impact of the hedging strategy on the TAR (CTE amount), and document the extent to which elements of the hedging strategy (e.g., time between portfolio rebalancing) are not fully incorporated into the stochastic cash flow model and any supplementary analysis to determine the impact, if any.

Under both requirements, the actuary is also required to provide a certification and maintain documentation to support the certification that the hedging strategy designated as the Clearly Defined Hedging Strategy meets the requirements of a Clearly Defined Hedging Strategy including that the implementation of the hedging strategy in the stochastic cash flow model and any supplementary analysis does not include knowledge of events that occur after any action dictated by the hedging strategy (i.e., the model cannot use information about the future that would not be known in actual practice).

A financial officer of the company (e.g., chief financial officer, treasurer or chief investment officer) or a person designated by them who has direct or indirect supervisory authority over the actual trading of assets and derivatives is also required to certify that the Clearly Defined Hedging Strategy is the hedging strategy being used by the company in its actual day-to-day risk mitigation efforts. In addition, AG 43 requires this individual to certify that the hedging strategy meets the definition of a Clearly Defined Hedging Strategy.

Section A7.4 of AG 43 states “Additionally, the company shall demonstrate that, based on an analysis of at least the most recent 12 months, the model is able to replicate the hedging strategy in a way that justifies the value used for E. A company that does not have 12 months of experience to date shall set E to a value no greater than 0.30.”

**Q12.7 What does the certifying actuary do at the time of filing to confirm that the Clearly Defined Hedging Strategy is fully incorporated in the stochastic cash flow model? Are there other items the actuary should consider?**

A: Both Section A7.5) of AG 43 and Appendix 9 of C-3 Phase II require that the actuary certify as to whether the Clearly Defined Hedging Strategy is fully incorporated into the stochastic cash flow model. However, the actuary is not the individual who certifies that the Clearly Defined Hedging Strategy is the hedging strategy being used by the company. Both requirements (refer to Section A7.5) of AG 43 or Appendix 9 of C-3 Phase II) specify that this certification is to be provided by “a financial officer of the company (e.g., chief financial officer, treasurer, or chief investment officer) or a person designated by them who has direct or indirect supervisory authority over the actual trading of assets and derivatives...” Some actuaries believe it may be prudent for the actuary to confirm with the individual who certifies the Clearly Defined Hedging Strategy that the hedging strategy incorporated into the stochastic model is a reasonable representation of the actual hedging strategy being implemented based on the information available at the time of filing, and is consistent with the underlying principles of AG 43 and the C-3 Phase II report.

In addition, Appendix 10 of the C-3 Phase II report and Appendix 7 of AG43 suggest the following specific considerations:

As part of the process of choosing a methodology and assumptions for estimating the future effectiveness of the current hedging strategy, the actuary may review the actual historical hedging effectiveness.

The actuary may evaluate the appropriateness of the assumptions on future trading, transaction costs, and other elements of the model, the strategy, the mix of business, and other items that are likely to result in materially adverse results.

The combination of elements of the stochastic cash flow model should be analyzed by the actuary 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. If the model allows for such situations, the actuary should disclose the situations and provide supporting documentation as to why the actuary believes the situations are not material for determining the TAR [CTE Amount].

The actuary may compare the method used to determine prices of financial instruments for trading in scenarios to the actual initial market prices. If there are substantial discrepancies, the actuary should disclose the discrepancies and provide supporting documentation as to why the model-based prices are appropriate. There should also be testing of the pricing models that are used to determine subsequent prices when scenarios involve trading of financial instruments.

**Q12.8 What are the certification requirements if the hedging has actually been outsourced to a third party, or is conducted by another company within the reporting company's group?**

A: The certification requirements do not change if hedging has been outsourced to a third party or is conducted by another company. The qualified actuary is still responsible for the certification.

To the extent the actuary relies on others, including those providing hedging calculations and processes for the company, the actuary may wish to consider reflecting such reliance in the reliance statements included in the certification and to make any appropriate further reliance disclosures in the supporting memorandum(a). The actuary may wish to consider whether it is necessary to perform his or her own analysis of the third party calculations in sufficient detail to be comfortable with the results. Guidance regarding statements of reliance can be found in paragraphs 4.1 of ASOP No. 7, 4.3 of ASOP No. 22, 3.3 and 3.4 of ASOP No. 23 and ASOP No. 41.

**Q12.9 How often do the Certifications and Supporting Memorandum need to be updated?**

A: Some actuaries believe that the certification submission is required to be made once per year at the time that the Appointed Actuary submits the Statement of Actuarial Opinion on the entire company, in light of:

1. Paragraph 8.1 of Appendix 8 in AG 43, which notes that the certification is to be provided "as part of the valuation documentation that the valuation appropriately reflects management's intent and ability to carry out specific courses of actions on behalf of the entity where such is relevant to the valuation," and

2. Appendix 11 of C-3 Phase II guidelines requiring compliance with NAIC RBC instructions, which apply to only the year-end RBC submission.

Some actuaries also believe that the supporting memorandum is required to be updated annually since there are specific requirements for reporting the Standard Scenario amount as of the valuation date and results of sensitivity tests performed.

More frequent submissions, for example, to obtain regulatory reviewer feedback on updated assumptions or methods in advance of the year-end submission, can be made at the discretion of the actuary.

### **13) ALLOCATION OF THE AGGREGATE RESERVES TO THE CONTRACT LEVEL**

#### **Q13.1 AG 43 states that the Aggregate Reserve shall be allocated to the contracts falling within the scope of the guideline. What is included in the contract level reserves?**

A: The contract reserve is the sum of two parts: the seriatim Standard Scenario reserve (SSR) and the allocation of any excess of the Aggregate Reserve (AR) over the Standard Scenario Amount (SSA) to the contract.

When AR equals SSA, the reserve for a contract is simply the seriatim reserve calculated for the contract under the Standard Scenario method.

When AR is greater than SSA, AR is given by the Conditional Tail Expectation Amount (CTEA). The allocation of the excess of AR over SSA is illustrated in the next two questions.

Refer to Appendix 6 – Allocation of the Aggregate Reserves to the Contract Level, in AG 43 for additional guidance and examples.

#### **Q13.2 How is the excess of Aggregate Reserve over the Standard Scenario amount allocated to the contracts when the Conditional Tail Expectation amount is determined using a single grouping?**

A: According to Appendix 6 of AG 43, the excess of AR over SSA is allocated to each contract on the basis of the difference between the SSR and the cash surrender value (CSV) on the valuation date for the contract. If CSV is not defined or not available, Section A6.1)A) includes the following guidance:

“If the cash surrender value is not defined or not available, the Standard Scenario Amount will be the basis of allocation”.

The members of the VAPN Work Group believe that the reference to SSA in the above sentence should be replaced with SSR.”

For example, consider a block of two contracts A and B with the following data:

- SSR = \$100 for each contract and thus SSA = \$200 for the block,
- CTEA = \$240,
- CSV(A) = \$40, but CSV(B) is not defined/available.

The allocation basis for A is \$60 (=SSR – CSV) and for B is \$100 (=SSR).

Therefore, the excess of \$40 (= \$240 – \$200) is allocated \$15 (=  $40 * 60 / (60 + 100)$ ) to A and \$25 (=  $40 * 100 / (60 + 100)$ ) to B. The reserves for A and B are \$115 and \$125, respectively.

Since it is theoretically possible to have no contracts with an excess of SSR over CSV, some actuaries deal with that situation by allocating the excess of the AR over SSA using the SSR as a basis.

**Q13.3 How is the excess of Aggregate Reserve over the Standard Scenario Amount allocated to the contracts when the Conditional Tail Expectation Amount is determined using sub-grouping?**

A: According to Appendix 6 of AG 43, the allocation is done in two steps. The first step is to allocate the aggregate excess to the sub-grouping level. The excess of the aggregate CTEA over the SSA is allocated, in proportion to the difference between CTEA and SSA, only to the sub-groupings whose CTEA is greater than SSA.

For example, for a company with three sub-groupings with the following results, the total excess of \$75 is allocated to sub-grouping A and C only:

Sub-grouping	A	B	C	Total
Conditional Tail Expectation Amount	84	120	156	360
Standard Scenario Amount	60	135	90	285
Aggregate Reserve				360
(CTEA) – (SSA)	24	-15	66	75
Allocation of Excess*	20	0	55	75
Aggregate Reserve	80	135	145	360

\* Allocation to A =  $75 * 24/(24+66)$  and allocation to B =  $75 * 66/(24+66)$ .

The second step is to allocate the allocated amount of each sub-grouping to the contract level. This is done in the manner illustrated in Q13.2.

## **14) PEER REVIEW AND WORKING WITH A PEER REVIEWER**

### **Q14.1 Is peer review required for actuarial procedures carried out in connection with the establishment of AG 43 or C-3 Phase II?**

A: Peer review is not currently required by the NAIC model laws and regulations, nor by current actuarial guidelines that govern the establishment of reserves for variable annuities in the US, nor by the instructions that establish risk-based capital in the US. Moreover, it is not required under current US regulatory or professional guidance. However, state insurance departments have the authority to require an independent review of reserves and risk-based capital. In Canada, starting in 2003, independent reviews have been required in connection with all life and health insurance public actuarial opinions given by actuaries. Beginning in 2005, independent reviews have been required for annual statement certifications in Mexico.

The use of peer review is gaining wider usage in the US as a prudent or internally required practice for companies relying on stochastic modeling of risks for management and/or reporting purposes. The Academy's Committee on Professional Responsibility updated its 1997 paper on peer review in 2005.

### **Q14.2 What are the advantages of a peer review?**

A: A comprehensive peer review can provide greater confidence that the work performed meets professional standards and is consistent with the principles underlying the AG 43 and C-3 Phase II Instructions. When appropriate and practicable, an independent third party is usually preferable to fulfill the peer review role. The role of the peer reviewing actuary is to provide an independent opinion to the user of the peer review. This does not preclude the peer reviewer from discussing the acceptability of practices and procedures with the actuary whose work he or she is reviewing, as would be the case in a financial audit. However, in the end, the peer reviewing actuary may provide an independent opinion regarding the work, whether or not it confirms the work as originally done.

Peer review can be used to give an additional assurance and perspective to management. Both AG 43 and C-3 Phase II include complex new concepts and methods. Independent peer review may well be recommended and desired by company management or mandated by a company's ERM requirements in order to benefit from the additional insights and assurance offered from such a process.

### **Q14.3 In what situations could peer review of the actuarial work be requested in connection with AG 43 or C-3 Phase II occur?**

A: Peer review of the actuarial work required in connection with AG 43 and C-3 Phase II could occur in several instances, including:

1. Engagement by the certifying actuary to provide a second look on his or her work.



2. Engagement by management, the audit committee or the board of an insurer writing variable annuities. While some organizations may have an independent corporate or ERM process to do this, the level of independence desired may require the use of a qualified third party for the peer review role. The peer review is prudently performed in accordance with Actuarial Standards of Practice. Typically, the peer review engagement usually would have an agreed upon scope which may include a checklist provided prior to the work being performed. The scope typically would state the reviewer's responsibilities, which might include:
  - i. Determining that the assumptions made are clearly documented, are appropriate for the purpose intended, and fall within reasonable ranges.
  - ii. Reviewing the processes which use the assumptions to develop the measurement or projected values at both a macro and micro level in order to determine that the output produced is reasonable.
  - iii. Determining if flow charts (or similar documentation), worksheets, system narratives, and data definitions are consistent with the processes.
  - iv. Verifying that processes are being executed in a manner that is consistent with flow charts, documentation, etc.
  - v. Testing whether or not the processes produce expected results through the use of simplified input or sample checks.
  - vi. Commenting on whether the sensitivity testing results communicate an appropriate range of possible divergences from the final numbers.
  - vii. Verifying that the necessary internal controls are both in place and being executed correctly.
  - viii. Validating the results of a newly implemented model relative to those of a previously used model, including an appropriate level of sensitivity testing.
  - ix. Validating any supplemental spreadsheets that have been used as part of the modeling process.
  - x. Assuring that prior identified weaknesses have been remediated.
  - xi. Determining that the company has an effective model governance structure in place.
3. Engagement by or on behalf of an insurance department or other

regulatory authority.

It is assumed that the peer reviewing actuary will usually provide background on his or her qualifications for peer review to the engaging party.

**Q14.4 What formats for a peer review have proven useful?**

A: Several formats are in common use. One format that has proved useful is the input, process, output format. In using this format, the peer reviewer prepares a checklist which is then provided to the person whose work will be reviewed prior to the work itself being carried out. The checklist is generally in the form of statements with responses of “yes,” “no,” or “not applicable.” The level of detail for documentation would normally be consistent with ASOP 21, *The Actuary's Responsibility to the Auditor* (Doc. No. 041; April 1993), ASOP 23, *Data Quality* (Doc. No. 044; July 1993), and ASOP 41, *Actuarial Communications* (Doc. No. 086; March 2002).

As an example of how such a checklist could be constructed, consider the following statement taken from Methodology Note C3- 02: (Recommended Approach for Setting Regulatory Risk-Based Capital Requirements for Variable Annuities and Similar Products):

“It is important that adequate testing be done to validate models on both a static and dynamic basis. The model used must fit the purpose. The input data, assumptions, and formulas/calculations should all be validated”.

In light of this statement, the checklist described above might include questions such as the following:

1. Does the documentation describe a static basis for validating the model? (Yes/No)
2. Does the documentation describe a dynamic basis for validating the model? (Yes/No)
3. Have any changes been made to the assumptions since the previous measurement or projection which may have a material impact on the results being discussed in the report? (Yes/No)

**Q14.5 What tools are available to reviewing actuaries and regulators to get them comfortable with the model validation and process?**

A: A reviewer might consider asking the responsible actuary to supply a detailed income statement and balance sheet from a single scenario model run. The reviewer could then perform a cross check of aggregate cash flows such as death benefits, withdrawal benefits etc. to the company's annual statement for the underlying product line. This would be a reasonableness test. The reviewer could also ask to see the most recent company studies of mortality, lapse, partial withdrawal, expenses, etc. These studies could be used to cross check the model assumptions.

If a company calibrated its own scenario set, a reviewer could ask the company to run a set of calibrated scenarios determined by the regulator using the Life Capital Adequacy Subcommittee's C-3 Phase II pre-packaged scenarios as a cross check of the calibration. In addition, the following checks could be performed:

- Review what management actions and reports are based on the modeled results.
- Review of the discussion and results of the AG 43 or C-3 Phase II required sensitivity disclosure to company management (or review of the internal sensitivity testing done in the model building process).
- If a newly implemented model is being used, the reviewer could request documentation of the process used to develop, test, validate, and bring that model into production. Including sign-offs by the appropriate responsible parties.

**Q14.6 Which items could be included in a checklist to be used by reviewing actuaries and regulators during the review process?**

A: A reviewer might include, among others, checklist items such as the following:

1. Review Product Types and Benefits Covered

- (a) Variable Annuities
- (b) VUL Contracts containing guaranteed living benefits
- (c) Group Life Contracts containing guaranteed living or death benefits
- (d) Group Annuities containing guaranteed living or death benefits
- (e) Variable Immediate Annuities containing guaranteed payout annuity floor benefits.

2. Review Types of Models or Methodologies Used and Determine if Appropriate for Product Type:

- (a) Alternative Factor Methodology
- (b) Calibrated Stochastic Model
- (c) Standard Scenario Model

3. Review and validation of the model assumptions, especially review of the documentation and reasons for the choice of the prudent estimate assumptions for AG 43 or the prudent best estimate assumptions for C-3 Phase 2:

- (a) Mortality Rates
- (b) Lapse Rates
- (c) Partial Withdrawal Rates
- (d) Annuitization Rates

- (e) Expenses (general and investment)
- (f) Tax Rate
- (g) Discount Rate(s)
- (h) Fund Return Rate(s)
- (i) Other Policyholder Utilization Rates
- (j) Fund Transfers
- (k) Starting Assets
- (l) Allocated Amounts of IMR and AVR
- (m) Appropriate Treatment of Reinsurance

4. Appropriate Review of any Hedging Program

5. Review of the discussion and results of the required sensitivity disclosure in AG 43 or C-3 Phase II to company management (or review of the internal sensitivity testing done in the model building process).

6. Review of internal controls being applied to model input and output

**Q14.7 What other references concerning peer review and required regulatory reviews are available?**

A: 1. In Canada, a formal peer review process became effective for 2003 public opinions, requiring an external, independent party to review all regulatory filings done by the appointed actuary on a triennial basis. References to the guidance provided by the Canadian Insurance Supervisory Authority (OSFI) can be obtained from the following websites:

[http://www.osfi-  
bsif.gc.ca/app/DocRepository/1/eng/guidelines/sound/guidelines/e15\\_final\\_e.pdf](http://www.osfi-bsif.gc.ca/app/DocRepository/1/eng/guidelines/sound/guidelines/e15_final_e.pdf)

<http://www.actuaries.ca/members/publications/2003/203066e.pdf>

2. Peer review can assist an actuary in complying with applicable ASOPs and, thereby, producing a work product that meets the profession's standards. Some actuaries have established peer review programs within their organizations or have arranged for outside actuaries to peer review their work. For assistance in understanding the various types and levels of peer review and how to put a peer review program into place, actuaries may read the discussion papers on peer review published by the Committee on Professional Responsibility in 2005 and available on the Academy's website:

<http://www.actuary.org/pdf/prof/peerrevi.pdf>

[Peer Review - Concepts on Improving Professionalism; Discussion Paper Prepared by Committee on Professional Responsibility; Professionalism Series; 1997 \* No. 1; American Academy of Actuaries]

<http://www.actuary.org/pdf/prof/whitepaper.pdf>

[American Academy of Actuaries Council on Professionalism - The Actuary's Relationships with Users of a Work Product]

3. Effective for 2010, US statutory reporting will need to comply with a new Model Audit Rule.

[http://www.naic.org/documents/committees\\_e\\_naic\\_aicpa\\_implementation\\_guide\\_exposed-Final\\_0314.pdf](http://www.naic.org/documents/committees_e_naic_aicpa_implementation_guide_exposed-Final_0314.pdf)

## 15 Revenue Sharing

### **Q15.1 Would revenue sharing from an agreement where either party could terminate the agreement with proper notification qualify as “contractually guaranteed” Net Revenue Sharing Income under the stochastic requirements of AG 43 in A1.1)E)6)a)?**

A. There are at least two interpretations of the “contractually guaranteed” requirement.

A strict interpretation would require that the guarantee must be absolute into the future. Thus, if the agreement can be terminated or changed by either party, then the Net Revenue Sharing Income would be considered to be non-guaranteed.

In contrast, some actuaries believe that in this example, the Net Revenue Sharing Income would only be guaranteed during the proper notification period, but not beyond.

In addition, some agreements may contain a provision that even after the revenue sharing agreement terminates the revenue sharing is still paid as long as the assets remain with the insurance company. Some actuaries would argue that, in this case, the revenue sharing is contractually guaranteed.

Whatever position the company takes, the actuary must document the rationale for any source of Net Revenue Sharing Income used in the projections.

### **Q15.2 Section A1.1)E)6) of AG 43 explicitly limits non-contractually guaranteed Net Revenue Sharing Income to 25 bps. Does this extend to C-3 Phase II? Given that C-3 Phase II TAR should be more conservative than the reserve does this imply C-3 Phase II should have a lower upper bound on such Revenue Sharing?**

A. C-3 Phase II doesn't limit non-contractual guarantees for Net Revenue Sharing Income as is done in AG43. During the development of AG43, some state regulators became uncomfortable with the potential for over-estimation of this revenue source in models. In order to gain greater comfort, Net Revenue Sharing Income was artificially limited. Thus, some actuaries believe that it is acceptable to use a different Net Revenue Sharing Income assumption for C-3 Phase II than for AG 43. In addition, since C-3 Phase II and AG43 measure different CTE levels and have a somewhat different set of instructions for estimating Net Revenue Sharing Income (and other) assumptions (in the absence of the artificial limits), some actuaries believe that it is appropriate to use different assumptions for Net Revenue Sharing Income even in the absence of the artificial limits. Another consideration is whether the Net Revenue Sharing Income in TAR could be less than the amount reflected in the reserve and that conservatism applies to the total requirement, not necessarily each and every assumption.

**Q15.3 When including Net Revenue Sharing Income into either C-3 Phase II or AG 43 projections, how is the definition of "controlled" interpreted in the context of a parent and subsidiary company situation when no guarantee language exists (or when no formal contract exists)? The specific situation is that the parent company is the fund manager, but the subsidiary has written the contracts.**

A: A necessary condition for the Net Revenue Sharing Income to be included in the determination of the TAR in C-3 Phase II is that such revenue be received and controlled by the company. Another necessary condition is that there be a signed agreement in place on the valuation date, which supports the current payment of the Net Revenue Sharing Income. These necessary conditions make no distinction as to whether the entity providing the payment is an affiliate or whether the amount is guaranteed for a specific period of time.

Some actuaries would additionally consider the contractual commitments to the customer, representations and other statements in filings with security regulators, the contractual arrangement with entities providing investment or other services, and the degree to which the insurer was an active participant to the contractual arrangement, either directly or indirectly.

The requirement that the revenue be controlled was removed from AG 43 but is specified in the C-3 Phase II Section on Modeling Methodology 6) Revenue Sharing. In setting the Net Revenue Sharing Income assumption and considering whether a company has control on the Net Revenue Sharing Income, the concept of setting prudent best estimate and Prudent Estimate assumptions should be considered. Some actuaries view control over the Net Revenue Sharing Income as having contracts showing the company as the owner and/or receiver of the income.

**Q15.4 Would there usually be any connection between the assumptions for Net Revenue Sharing Income and the deduction for fund level expenses when reaching a net return on the funds?**

A: In modeling future separate account fund performance, gross returns are developed typically through some type of stochastic process. Where these returns are on a gross basis, fund level expenses, M&E charges and other appropriate charges must be deducted from these gross returns to arrive at the net returns passed along to the contractholder.

On the other hand, the definition of Net Revenue Sharing Income could include an arrangement under which the entity providing investment services makes payments to the insurance company (or an affiliate) in exchange for administrative services provided by the insurance company (or an affiliate). Thus, there is not necessarily any connection between the deduction for fund level expenses in developing net returns and the assumptions for Net Revenue Sharing Income --- other than the practical constraint that a fund manager would seldom desire to take a net operating loss by paying more in the Revenue Sharing than they received in fund level charges.

It should be noted that only those payments that are attributable to charges or fees taken from the underlying funds supporting the contracts are included in the definition of revenue sharing.

Some actuaries would interpret this requirement in the context of the arrangement and the prevalent business practices within the insurance and mutual fund industries. Below are some examples of common business practices/arrangements where the charge for revenue sharing may not match up with the fund level charges:

- the revenue sharing arrangement uses a common numerical value across all funds, even though fund level charges vary by type of mutual fund (money market, bond, domestic equity, etc.).
- the revenue sharing payment to the insurance company may be structured in terms other than as a percent of assets even though the mutual fund charges are made as a percent of assets. This situation is similar to the structure prevalent in the mutual fund industry under which maintenance charges are covered by asset-based charges.
- the use of expense caps on smaller mutual funds and the banding of investment advisory fees by asset size.

**Q15.5 What might the actuary consider when projecting applicable expenses in the context of Net Revenue Sharing Income?**

A: The actuary may wish to consider examining the nature of the expenses incurred as part of a revenue sharing agreement. Expenses that bear no relationship to the funds invested (e.g., accounting expenses) may be tracked as part of the company's maintenance expenses for variable annuities and, thus, included in model's general maintenance expense assumption rather than reducing Net Revenue Sharing Income. In addition, it may be preferable for expenses that are related to the funds under management (e.g., sub-advisor fees) to be tracked and projected separately.

**Q15.6 In order to include Net Revenue Sharing Income in projections, three requirements must be met. The third of these is that "the Net Revenue Sharing Income is not already accounted for directly or indirectly as a company asset." What does this mean?**

A: An example where this limitation may prevent Net Revenue Sharing Income from being included (in whole or in part) in the projections is where the entity providing the revenue sharing to the insurance company is also a subsidiary of the insurance company and the subsidiary's stock is carried on the books of the insurance company at an estimation of market value equal to present value of future profits. If the profit estimate does not fully recognize the revenue sharing payments as a subsidiary expense, then some or all of the Net Revenue Sharing income may need to be eliminated in the projections.



**Q15.7 The rules providing for the amount of Net Revenue Sharing Income that may be included in projections include the two provisions below. What is the purpose of these provisions?**

**“The amount of Net Revenue Sharing Income to be used shall reflect the actuary's assessment factors that include but are not limited to the following (not all of these factors will necessarily be present in all situations):**

**(e) the ability of the company to replace the services provided to it by the entity providing the Net Revenue Sharing Income or to provide the services itself, along with the likelihood that the replaced or provided services will cost more to provide; and**

**(f) the ability of the entity providing the Net Revenue Sharing Income to replace the services provided to it by the company or to provide the services itself, along with the likelihood that the replaced or provided services will cost more to provide.”**

A: Revenue Sharing arises as the result of two entities being involved in the sale or servicing of variable annuities. Two common types of revenue sharing are:

1. Payment of 12b-1 fees from the asset manager or the investment fund to the insurance company, as a method of recompensing the insurance company for marketing expenses. 12b-1 fees are typically paid on new sales, the inclusion of these fees in either the C-3 Phase II or AG 43 calculations should only be related to projected future premiums paid into the contracts.
2. Payment of administrative expenses from the investment fund to the insurance company. Typically the insurance company maintains all of the individual participant records. The investment fund receives only bulk purchase and sale information and not detailed participant data. However, the expense charges of the investment fund are determined assuming that the fund must maintain detailed participant records. The payment of administrative expenses is intended as a way to compensate the party actually doing the work (the insurance company) by the person who charges for the work to be done (the investment fund).

The two provisions cited apparently require the actuary to consider the likelihood of continuation of the Revenue Sharing agreements and what would be the financial effect of their termination.

In the first type of Revenue Sharing above, 12b-1 fees have been criticized for the alleged lack of transparency associated with their amount and use. Critics have also questioned the appropriateness of continuing to charge investors 12b-1 fees long after they have purchased their shares. In July 2010, the SEC voted to propose new rules governing the payment of 12b-1 fees including a limitation on the cumulative 12b-1 fees that can be charged. Thus, the actuary may have

reason to believe that this form of revenue sharing may be limited by government regulation in the future.

In the second type of Revenue Sharing above, the investment fund cannot do the work itself. If it were to unilaterally terminate the agreement with the insurance company, the latter would likely move the funds to some other investment fund. Thus the relevant consideration isn't whether the insurance company will lose all of the revenue sharing, but rather whether it will obtain as good an arrangement with the hypothetical replacement investment fund.

The Net Revenue Sharing Income assumption needs to include a margin (reducing the projected net revenue sharing income) to reflect uncertainty of the revenue. This margin is consistent with the setting of prudent best estimate assumptions for C-3 Phase II and Prudent Estimate assumptions for AG 43.

**Q15.8 What is the meaning of “... expenses incurred by either the entity providing the Net Revenue Sharing Income or an affiliate of the company shall be included in the applicable expenses that reduce the Net Revenue Sharing Income.”**

A: The expenses to be considered are those associated with the fees charged to the variable annuities contract owners and the revenue sharing arising from those fees. The point of this requirement appears to be to consider the likelihood that the revenue sharing agreement will be continued and the likely economic ramifications if it is not. If the actuary is including revenue sharing, all expenses which the company incurs in providing the services for which it is getting the revenue sharing would be included.

This assumption needs to include a margin (reducing the projected net revenue sharing income) to reflect uncertainty of the revenue. This margin is consistent with the setting of prudent best estimate assumptions for C-3 Phase II and Prudent Estimate assumptions for AG 43.