

A PUBLIC POLICY PRACTICE NOTE

Asset Adequacy Analysis

For companies that file a Life, Accident and Health/Fraternal Statutory Annual Statement

September 2017
(Updated September 2024)

Developed by the American Academy of Actuaries
Life Valuation Committee



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Asset Adequacy Analysis Practice Note Work
Group and the Life Valuation Committee



The American Academy of Actuaries is a 20,000-member professional association whose mission is to serve the public and the U.S. actuarial profession. For more than 50 years, the Academy has assisted public policymakers on all levels 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.

ASSET ADEQUACY ANALYSIS PRACTICE NOTE

This practice note is not a promulgation of the Actuarial Standards Board, is not an actuarial standard of practice (ASOP), 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 after this publication of the practice note may make the practices described in this practice note irrelevant or obsolete.

This practice note was originally prepared by a work group organized by the Life Valuation Committee of the American Academy of Actuaries in 1995. It was subsequently updated in 2004 and 2017 with this version reflecting updates as of September 2024.

The practice note represents a description of practices believed by the work group to be commonly employed by actuaries in the United States for companies that file the NAIC Annual Statement Blank for Life, Accident & Health/Fraternal. The focus is primarily on asset adequacy analysis for life insurance and annuities. The purpose of the practice note is to assist actuaries who are faced with the requirement of asset adequacy analysis by supplying examples of some of the common approaches to this work. In addition, references have been made to other relevant and readily available literature. However, no representation of completeness is made, nor is there an assertion as to whether the practices discussed herein constitute best practice; other approaches may also be in common use. Throughout this practice note reference is made to responses received from surveys conducted in 2004 and 2012. Given the amount of time that has elapsed since these surveys were conducted, the reader is cautioned as to the applicability and appropriateness of the responses.

This practice note reflects practices in meeting the requirements for the actuarial opinion of reserves and supporting memoranda per Section 3 of Model #820 for companies that file the statutory Life, Accident & Health/Fraternal annual statement.

Comments are welcome as to the appropriateness of this practice note, desirability of periodic updating, validity of substantive disagreements, etc. Comments should be sent to lifeanalyst@actuary.org.

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Section A: Introduction and Background

Q1. What current practices are the basis of this practice note?

Starting in 1986, actuaries have been performing asset adequacy analysis for certain annuity and other interest-rate-sensitive lines of business under the requirements of New York Regulation 126. The types of business subject to asset adequacy analysis expanded into all other product lines with the adoption of the Actuarial Opinion and Memorandum Regulation (AOMR) and the release of several Actuarial Guidelines requiring stand-alone asset adequacy analysis. Many practices have been developed in response to these regulations and guidelines. The AOMR has since been superseded by the Valuation Manual VM-30: Actuarial Opinion and Memorandum Requirements.

To better understand current practice, the Society of Actuaries Smaller Insurance Company section sponsored a survey in 2012 (in a manner similar to the survey referenced in the 2004 version of this practice note) on the practices followed by appointed actuaries. These survey results are incorporated into this practice note. Below is a breakdown of the survey respondents by company size (level of reserves):

Level of Reserves	Responses	% of Total
More than \$25B	24	13%
\$10B–\$25B	17	9%
\$5B–\$10B	16	9%
\$1B–\$5B	39	21%
Less than \$1B	88	48%
Total	184	100%

It should be noted that, where appropriate, we have provided results from the 2004 survey.

In 2017 the Life Valuation Committee of the American Academy of Actuaries (Academy) provided updates to this practice note based on an industry survey and reviews by various members of the Academy. In 2024 it was further updated based on reviews by the Academy’s Life Valuation Committee members.

Q2. Is this practice note expected to become a standard that actuaries must follow?

No. This practice note documents what is understood to be current practice at the time of publication and is based upon the knowledge gained from surveys and supplemental discussions held by members of the work group. It is a reference guide to aid appointed actuaries and other members of the Academy. The work group assumes no responsibility for any action taken as a result of using the information contained in this practice note.

There are several reasons why an actuary could elect to use methods other than those documented within this practice note, including:

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- The actuary could be aware of special circumstances pertaining to a particular company or block of business that warrant the use of other methods.
- The economic conditions that exist at the time the actuarial opinion is to be made may warrant practices and/or methodologies not contemplated in this note.
- The actuary may have developed other acceptable testing methods.
- While the practice note was prepared and reviewed by actuaries familiar with the topic of the practice note, and these actuaries have concluded that the practice note represents approaches that fall within current practice, other approaches that could properly be termed “current practices” may not be documented here.
- Changes in practices, guidance, and requirements will continue to occur over time. Such changes include, but are not limited to, regulations, Actuarial Guidelines, and actuarial standards of practice (ASOPs).

Q3. What is the goal of asset adequacy analysis?

The goal of asset adequacy analysis is to ascertain the ability of a block of assets to support a corresponding block of liabilities, taking into account the cash flows associated with the assets and liabilities, as well as interactions among the cash flows (e.g., asset returns may impact liability crediting rates).

Some actuaries may view the value of asset adequacy analysis to be limited to the satisfaction of regulatory requirements. Other actuaries may value asset adequacy analysis additionally for its ability to inform management of actual or possible problems that may arise due to the underlying characteristics or current management of the business.

There are several regulations and guidelines that require asset adequacy analysis, including but not limited to:

- Model Law #820 (Standard Valuation Law [SVL])
- 2024 Valuation Manual VM-30
- Valuation of Life Insurance Policies Model Regulation
- New York Regulation 126
- 2001 CSO Model Regulation
- Actuarial Guideline XXXVIII (Application of the Valuation of Life Insurance Policies Model Regulation)
- Actuarial Guideline LI (Long-term care business)

Q4. How is an asset (reserve) adequacy analysis different from a solvency test?

The 2024 Valuation Manual VM-30 (Section 3A(7)(e)) asks an actuary to opine, in certain circumstances, that:

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The reserves and related actuarial items, when considered in light of the assets held by the company with respect to such reserves and related actuarial items ... make adequate provision, according to presently accepted ASOPs, or the anticipated cash flows required by the contractual obligations and related expenses of the company.

Thus, the opinion includes a section related to the ability of the assets backing reserves to meet policyholder obligations and expenses. There are two key differences between asset adequacy analysis and a solvency test:

- A solvency test is more inclusive, as all of the assets (including assets backing capital) and liabilities of the company are included in a solvency test.
- A solvency test typically requires a higher degree of certainty (e.g., 95%) than what may be necessary for asset adequacy analysis (e.g., 85th percentile, CTE 70).

There is no requirement in either the ASOPs, the model SVL, or in VM-30 to test for a company's solvency in connection with the actuarial opinion that is filed with the statutory annual statement. However, as reserves are typically the largest liability of a life insurance company, asset adequacy analysis may be one of the tools used in assessing the overall financial health of life insurance companies. Risk-based capital (RBC) ratios also serve as an indicator of overall financial health.

Q5. What other resources are available to assist the appointed actuary in understanding the requirements of asset adequacy analysis?

Actuarial firms, associations, and regulatory bodies have developed and maintained numerous resources to assist the appointed actuary in understanding the requirements of asset adequacy analysis. The primary providers of these resources include the Society of Actuaries (SOA), the Academy, the NAIC, and state regulatory bodies.

Actuarial Seminars and Webinars: For example, the SOA sponsors the Valuation Actuary Symposium, which provides the appointed actuary with practical information about anticipated regulatory changes that will impact the asset adequacy analysis process. The Academy sponsors an annual life and health qualifications seminar that is designed to provide the knowledge needed to meet the necessary basic education and continuing education requirements to issue actuarial opinions as well as to provide an education refresher for more experienced actuaries. Both the SOA and Academy provide other informative resources such as publications and research documents.

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Current ASOPs that discuss considerations for the appointed actuary performing asset adequacy analysis include, but are not limited to, the following:

- ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows*
- ASOP No. 11, *Treatment of Reinsurance or Similar Risk Transfer Programs Involving Life Insurance, Annuities, or Health Benefit Plans in Financial Reports*
- ASOP No. 22, *Statements of Actuarial Opinion Based on Asset Adequacy Analysis for Life Insurance, Annuity, or Health Insurance Reserves and Other Liabilities*
- ASOP No. 23, *Data Quality*
- ASOP No. 41, *Actuarial Communications*
- ASOP No. 56, *Modeling*

Additional ASOPs applicable to opinions on statutory reserves and related items can be found in the Academy “*Applicability Guidelines for Actuarial Standards of Practice.*”

Life and Health Valuation Manual: The Academy also publishes a Life and Health Valuation Manual each year. This publication provides a state-by-state summary of valuation standards and provides a one-stop source for model laws and Actuarial Guidelines pertaining to valuation requirements.

National Association of Insurance Commissioners: The NAIC maintains information on the Valuation Manual and model law adoption, as well as drafts of proposed legislation on its website. This information is intended to be an up-to-date source that can be used by the appointed actuary to determine whether new requirements that may impact the analysis process have been approved. The NAIC also provides educational information to state insurance department personnel regarding the work done by the appointed actuary. In addition, the Accounting Practices and Procedures Manual contains information useful for the appointed actuary.

State Regulatory Bodies: A few state regulatory bodies (New York and California, for example) currently provide the appointed actuaries of companies licensed in those states an annual letter describing specific considerations, requirements, and expectations related to asset adequacy analysis.

The remainder of this practice note is intended to be a resource to the appointed actuary by providing information regarding practices in asset adequacy analysis.

Section B: Procedures for Accepting/Resigning the Position of Appointed Actuary

Q6. What are the notification requirements when a company changes the appointed actuary?

Valuation Manual section VM-30 requires the company to notify the domiciliary commissioner within five business days of the appointment. The notice must include the name of the appointed actuary, title (and name of consulting firm if applicable), and manner of appointment or retention, and must state that the actuary meets the requirements of an appointed actuary. No further notice is required unless the actuary ceases to be appointed or fails to meet the requirements of an appointed actuary.

If the prior actuary was replaced by an action of the board of directors, then the company must notify the domiciliary insurance department of this event within five business days. The company must also provide a separate letter to the domiciliary insurance department within 10 days following the above notification stating whether there were material disagreements with the former actuary regarding the opinion within the prior 24 months. Additional requirements apply if there were material disagreements.

Q7. What requirements must an actuary satisfy to sign the statutory opinion on the reserves and related actuarial items?

To sign the Life, Accident and Health/Fraternal Annual Statement actuarial opinion on the reserves and related actuarial items the actuary must be both a “qualified actuary” and the “appointed actuary.”

A “qualified actuary” is an individual qualified to sign the applicable statement of actuarial opinion in accordance with the Academy’s qualification standards for actuaries signing such statements and who meets the requirements specified in the valuation manual section VM-01. The Academy requirements are contained in the document *“Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion in the United States.”* Within this document are “Specific Qualification Standards,” which contain educational, experience, and continuing education requirements that must be met.

An “appointed actuary” is a qualified actuary who is appointed in accordance with the valuation manual section VM-01. Section VM-01 contains numerous requirements that must be met. These include, but are not limited to, the actuary being a qualified actuary, appointed by the board or its equivalent, a member of the Academy, familiar with valuation requirements for life and health insurance, who has not been found by the insurance commissioner to be guilty of fraudulent or dishonest practice among other specified violations.

Q8. What information may the appointed actuary wish to obtain from the previous appointed actuary?

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Prior to accepting the position as appointed actuary, some actuaries believe that it is prudent to meet with the most recent appointed actuary of the company to review: (1) reasons for the appointed actuary's termination, (2) the most recent actuarial opinion and supporting memorandum and documentation, and (3) a list of the methods of analysis and assumptions specified by a state commissioner under VM-30 Section 1.A.3 that have not yet been implemented in the most recent actuarial opinion and memorandum. This may inform the appointed actuary of any items of concern to the previous appointed actuary (e.g., inadequate access to management or the board of directors, the qualifications of the persons or firms providing major reliance, or adverse scenarios in the cash flow testing [CFT] performed). Such a meeting could take place even if not required by a particular state.

Q9. What is the relationship between the appointed actuary and the board of directors?

The Valuation Manual section VM-01 requires appointment of a qualified actuary by the board of directors (BOD) or its equivalent, or by a committee of the board, by December 31 of the calendar year for which the opinion is rendered.

The annual statement instructions for the Life, Accident, and Health/Fraternal blank require the appointed actuary to report to the BOD or the Audit Committee each year on the items within the scope of the Actuarial Opinion. And the minutes of the BOD shall indicate that the appointed actuary has presented such information to the BOD or the Audit Committee. At least one state believes that the appointed actuary must present such information in person (or video conferencing) to give the BOD the opportunity to ask questions.

The following is a list of questions that some actuaries might consider prior to accepting the position as appointed actuary:

- Will the actuary be permitted to meet with the BOD at such other times as the actuary believes appropriate in order to communicate problems that may emerge between the annual statements of opinion?
- Will the BOD agree to keep the actuary informed of certain transactions or conditions specified by the actuary via an agreed-upon process (e.g., attendance at board meetings, copies of board minutes and agendas)?
- Will the actuary have access to information, records, and members of company management as necessary to perform the duties of the appointed actuary?
- Will the resources required to fulfill the actuary's duties (e.g., electronic data processing, support staff) be made available?
- Will the board (or its designee) agree to make available such persons or officers identified by the actuary that the actuary may need to rely upon to form the opinion (e.g., the investment officer or the administrative officer)? If the requested persons or firms refuse to be relied upon or are found to be unqualified, will the actuary be permitted to consult with the BOD regarding alternative resources?

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In addition, VM-Appendix G, *Corporate Governance Guidance for Principle-Based Reserves* of the NAIC's Valuation Manual (VM-G), covers corporate governance guidance for valuations performed under principle-based reserves (PBR). Section 2 provides guidance for the BOD, Section 3 provides guidance for senior management, and Section 4 provides guidance for qualified actuaries, including the appointed actuary. All three parties mentioned will have responsibilities regarding corporate governance for PBR valuations, and communication among the parties will be essential.

Q10. What documentation is required and/or recommended regarding the appointed actuary's personal qualifications?

Qualification requirements are addressed in the Academy's *Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion in the United States*. The Qualification Standards include basic education requirements, experience requirements, and continuing education (CE) requirements; Section 6 of the Qualification Standards includes requirements to keep timely records of CE. Appendix 5 of this document provides a sample form for use in recording CE credits. Additionally, the Academy provides access to TRACE[®], hosted by a third-party vendor, which can be used to electronically track CE credits. And finally, the actuary may wish to document his or her personal breadth and depth of knowledge regarding the products, markets, sales strategies, asset mix, and investment strategy of the particular company and, in doing so, identify areas where support or reliance may be needed to allow the actuary to perform his or her duties as appointed actuary.

The Academy also provides an Attestation Form, which was developed to help actuaries voluntarily demonstrate how they meet the U.S. Qualification Standards specific requirements for signing NAIC statements of actuarial opinion.

Section C: General Considerations for Performing Asset Adequacy Analysis

Q11. How does the actuary decide what to test?

According to the Valuation Manual VM-30 Section 2, the opinion “must apply to all in force business on the annual statement date, whether directly issued or assumed, regardless of when or where issued.” So, it follows that asset adequacy analysis applies on a “gross” basis (versus only reserves and related items net of reinsurance ceded). Note that the opinion also considers reserves net of reinsurance ceded as the opinion covers minimum standards, which includes reinsurance reserve calculations and the applicability of reinsurance reserve credit.

According to ASOP No. 22 (Section 3.1.11), “The actuary should confirm that the total amount of any reserves and other liabilities reported as ‘not analyzed’ is immaterial.” Guidance on materiality is provided in the Preamble to Statutory Accounting Principles.

A possible measure of materiality is a percentage of total reserves. Five percent is mentioned in a letter to appointed actuaries dated Nov. 3, 1994, from the Illinois Department of Insurance. Another possible measure is a fixed dollar limit in determining materiality, considering other financial information of the company. In addition, the actuary may want to do a closer inspection of any product with an immaterial reserve to confirm that the reserve properly reflects the significant risks of the product, if any. Actuaries could evaluate materiality at a product level and/or in aggregate. In the final analysis, the actuary may exercise professional judgment to confirm that inclusion of “immaterial” amounts that have been excluded from the analysis would not result in different findings in his or her actuarial opinion, report, or recommendation.

In the 2012 survey of appointed actuaries, approximately 80% of the respondents indicated that they exclude 5% or less of the general account liabilities from testing. For separate account liabilities, about 67% of the respondents that have separate account liabilities exclude 1% or less of those liabilities. Specific lines that have been excluded by survey respondents are listed below, mostly due to the relative immateriality in the context of the respondent’s book of business:

- Group business
- Accident and health
- Supplementary contracts
- Accidental death benefit
- Waiver of premium and disability riders
- Other supplemental benefits
- Claim reserves

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Q12. What methods are used when performing asset adequacy testing?

As indicated by the responses to the 2012 survey of appointed actuaries, the most used method in asset adequacy analysis is CFT (see ASOP No. 7).

The survey responses exhibited the following percentage breakdown of average tested reserves by asset adequacy method:

CFT	86%
Gross premium valuation	6%
Demonstration of conservatism	2%
Risk theory techniques	1%
Loss ratio	1%
Other	4%

Although asset adequacy analysis does not necessarily imply CFT, the actuary, exercising professional judgment, may decide that CFT is the most appropriate methodology for certain lines of business. For instance, the product design of universal life and deferred annuity lines of business generally renders their reserves sensitive to fluctuations in interest rates. According to ASOP No. 22, Section 3.1.1, “Cash flow testing is generally appropriate where cash flows vary under different economic scenarios.” For certain purposes, such as to aggregate results of several lines of business, it may be useful to cash flow test certain non-interest-sensitive lines of business, such as term life insurance, in a manner consistent with interest-sensitive lines. There could also be a desire for consistency under X-factor testing (e.g., sensitivity test mortality on a consistent basis for universal life and traditional life). If the appointed actuary aims to treat results in aggregate, such as using positive cash flow from a non-interest-sensitive line of business to offset a deficit in an interest-sensitive line of business or incorporating overhead expenses at a company level, a consistent CFT approach across all lines may be the preferred method to determine asset adequacy.

However, as is indicated in the above table, CFT is not the only acceptable method for testing the adequacy of reserves. ASOP No. 22, *Statements of Actuarial Opinion Based on Asset Adequacy Analysis for Life Insurance, Annuity, or Health Insurance Reserves and Other Liabilities*, Section 3.1.1, goes on to say that “The actuary may consider using analysis methods other than cash flow testing to evaluate the adequacy of the assets to support the reserves and other liabilities being tested.” The actuary may also wish to consider ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows*, which addresses the relative appropriateness of CFT in various situations.

Section 3.1.1 of ASOP No. 22 lists several alternative approaches that may be appropriate methods, depending on the circumstance. These include the following:

Gross Premium Reserve Test. A gross premium reserve test (historically called a gross premium valuation or GPV) involves a projection of the liability premiums, benefits, and expenses. It determines the value of a book of business based on the present value of the benefits and expenses, less gross premiums. A liability model is necessary, along with a

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projection based on that model and reasonable assumptions, but an asset projection is not needed. The appointed actuary may have already developed liability models or may have access to models that others in the company have developed for pricing or other internal purpose. A gross premium reserve test may be appropriate where the policy and other liability cash flows are sensitive to moderately adverse deviations in the actuarial assumptions underlying these cash flows but are not sensitive to changes in interest rates.

Demonstration of Conservatism. Some actuaries demonstrate asset adequacy through the conservatism found in some reserves, that is, where the actuary considers the degree of conservatism in the reserves to be so great that moderately adverse deviations in the actuarial assumptions underlying the policy cash flows are covered. For example, this type of method may be appropriate for a block of older life insurance if that block is reserved using conservative valuation interest rates and mortality/morbidity tables. In this case, demonstration of conservatism could be observed as the valuation rate being moderately lower than the ultimate reinvestment rate in any scenarios that might be considered. Another example that may be appropriate for this type of method is with respect to policies reserved for using a principle-based approach (PBA). In this case, the assumptions used in the valuation (including interest rate paths of a stochastic scenario path) or the method (e.g., CTE70) used to determine the reserve may be judged by the actuary to meet a moderately adverse degree of conservatism. Nevertheless, if there is any doubt about the level of conservatism not being at least moderately adverse, most actuaries may prefer to use one of the other methods described herein.

Risk Theory Techniques. If the liability under consideration is short term in nature, risk theory techniques may be sufficient to demonstrate asset adequacy. For instance, risk theory might be appropriate for a short-term disability coverage that is supported by short-term assets. Probabilities of continuance of disability claims can be calculated based on a distribution developed from historical claim experience. The parameters of the function associated with this probability distribution can be varied to develop the sensitivities under moderately adverse deviations. Given the short-term nature of the assets assigned to back their liabilities, it may be appropriate to ignore the effect of interest.

Loss Ratio Methods. Loss ratio methods may be appropriate for short-term health insurance business, assuming that the supporting assets are also short term. Aggregate incurred health claims could be estimated by applying estimated loss ratios to earned premiums. Again, various moderately adverse deviation sensitivity tests can be developed to ascertain asset adequacy.

Q13. What are the primary differences between cash flow testing (CFT) and gross premium reserve test?

A gross premium reserve test is described in Q12. In such a test, the value of the liability is calculated as the present value of the projected benefits and expenses, less gross premiums. The projection of these liability cash flows is generally the same as in CFT, with the complexity of modeling depending on the material risks in the liability. However,

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unlike CFT, a projection of asset cash flows is not developed. As the asset cash flows are implicitly provided for through the use of discount rates in the calculation of present values, gross premium reserve test models tend to be somewhat simpler than those used for CFT. So, they may be set up and managed on a less structured platform, such as a simple spreadsheet model.

A gross premium reserve test may be appropriate when the liabilities are not interest sensitive and when the asset cash flows are either not interest sensitive or can be reasonably represented by varying the discount rate. Term life, whole life, disability income, major medical, Medicare supplement, and accidental death and dismemberment are examples of insurance products for which such a test has been used to test asset adequacy. CFT may be more appropriate where cash flows vary significantly under different economic or interest rate scenarios. A simple gross premium reserve test typically cannot indicate when there are interim cash flow or duration mismatches in the portfolio.

A gross premium reserve test is generally validated in the same manner as is CFT. The 2004 survey of appointed actuaries indicated that most appointed actuaries do a static validation of a gross premium reserve test, where opening balances of the models are checked against actual inforce. About half also conduct certain dynamic validations (refer to Q20 for further information), where projections from the model are compared against financial forecasts.

Approaches taken to reflect reinsurance generally apply to gross premium reserve tests as they would for CFT.

Q14. Are different lines of business aggregated for purposes of asset adequacy analysis?

The BOD for each company generally names one appointed actuary for that company. In general, the appointed actuary opines on the adequacy of the company's reserves in the aggregate. The regulatory asset adequacy issues summary (RAAIS) requirements in VM-30, for example, require companies to disclose the amount of additional reserve needed to eliminate negative ending surplus results in the aggregate for scenarios tested. Thus, lines of business, such as life insurance, annuities, and health, may be combined. As a practical matter, actuaries commonly perform tests by groupings, such as major product lines or business units. These product or business units may not necessarily correspond with annual statement lines of business.

Some states have different requirements related to aggregation across major lines of business, some of which require approval for aggregation, or do not permit aggregation in certain circumstances.

Stand-alone testing is required for certain products, subsets of products, or lines of business in many states. Examples of products that may require stand-alone testing include long-term care, universal life products with secondary guarantees, guaranteed

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separate accounts, and some health insurance products. When reviewing interim (year-by-year) results, 80% of the 2012 survey respondents indicated that they aggregate reserves in the same manner as they do when reviewing terminal (end of projection horizon) results. Among those who aggregate differently, 14% aggregate at the major line of business level, 4% aggregate at the total company level, and 2% aggregate at the block of business level.

When aggregating the results of asset adequacy analysis of various lines of business, many actuaries believe it is usually desirable to have consistency among the economic scenarios used for each of the lines of business. If different projection periods are used for the lines being combined, then the results typically can be aggregated at a common valuation point. For this aggregation approach, some actuaries project each line separately and discount the excess of the ending market value of assets less liabilities back to the projection date, in order to get results that may be combined on a consistent, scenario-by-scenario basis.

If different analysis methods are used to determine the asset adequacy for various lines of business (e.g., gross premium reserve test for some and CFT for others), it may be inappropriate to combine results unless consistent economic scenarios are used. Gross premium reserve test results usually can be aggregated with CFT results when consistent economic scenarios are used for each of the lines of business, even if different projection periods are used.

Q15. How are assets allocated among lines if CFT is done separately for each line?

Many states require that any assets contractually allocated to a specific line for a special purpose (such as by reinsurance treaty or separate account) be allocated to that line for CFT. Beyond that, if the company has segmented assets by line of business (formally or notionally), then the allocation of assets to these segments may represent one good place to start.

Some actuaries take a pro-rata slice of each asset in proportion to the reserves of each line, although this method may not be preferred if the characteristics (e.g., effective duration) of the liabilities differs materially between lines.

Actuaries may also use different methods of asset allocation at different levels of modeling or testing. For example, while a company may have a single formal asset segment for interest-sensitive business, the actuary may choose to refine the allocation within the segment by duration for universal life, deferred annuities, and payout annuities.

Some states require that “pledged” or “encumbered” assets be excluded from the assets available to support reserves or that they be considered illiquid assets in the testing.

The 2012 survey of appointed actuaries allowed respondents to specify more than one method for allocating assets by line of business:

Formal segmentation	67%
Pro-rata of all assets	37%
Other	15%

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The most common “other” method is to allocate assets specifically to achieve a better matching of asset and liability cash flows. Also, many companies use some combination of these three methods at different levels.

Many actuaries maintain reasonable consistency from year to year in the method of allocating the assets to product lines. If a significant change in allocation method is made, the appointed actuary may consider documentation of the change and related impact on the asset adequacy results.

See Question # 38 for additional information on choosing assets for CFT.

Q16. Can the actuary use a testing date prior to Dec. 31 for the purpose of the year-end actuarial opinion?

Because it can be difficult to complete an asset adequacy analysis in time for the end of February, beginning of March deadline (varies by state) using year-end data, it may be common to use data from a prior date. ASOP No. 22 (Section 3.1.8) gives guidance for using data prior to year-end in an asset adequacy analysis, and states that “If appropriate, the actuary may use data or analyses predating the valuation date. When using data or analyses prior to the valuation date, the actuary should consider the reasonableness of such prior period data, studies, analyses, or methods; whether key assumptions are still appropriate; and whether any material events have occurred prior to the valuation date that would invalidate the asset adequacy analysis on which the statement of actuarial opinion is based.”

Approximately 60% of the respondents to the 2012 survey of appointed actuaries indicated they base their testing on a liability as-of date earlier than Dec. 31, with 93% of those using a date of Sept. 30 and the remainder using a later date. Comparable responses were provided regarding the as-of date for assets, and there is evidence of occasional differences between the valuation dates of inforce assets versus liabilities.

When an actuary chooses a testing date earlier than the valuation date, the actuary may wish to provide a demonstration that there have been no material changes between the two dates. To make this demonstration, an actuary may compare assets by asset category for the testing date versus year-end, considering the mix of assets and the nature of assets (e.g., duration, yield, type). Similarly, an actuary may compare the size of the liabilities by type and the nature of the liabilities (e.g., average size, policy counts, mix) as of the two dates. Some actuaries consider changes in the interest rate curve, equity movements, and the level of investment reserves between the testing date and year-end. Also, some may use additional sensitivity scenarios where the Dec. 31 yield curve is applied to earlier data.

The following chart is a summary from the 2012 survey of appointed actuaries of the metrics used by the respondents to demonstrate whether there have been material changes between the testing date and the valuation date:

Change in liability volume	73%
Change in liability mix of business	69%

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Change in asset volume	56%
Change in asset mix	79%
Changes in AVR, IMR, or DTA	27%
Change in yield curve	87%
Other (including spreads)	12%

With respect to the issue of changes in the yield curve, about one-third of the respondents indicated they use the year-end yield curve, while most of the rest use the yield curve for an earlier date. However, 40% of the respondents said they “look at yield curves as of the annual statement date,” while 30% of the respondents said they “look at yield curves as of the opinion signing date.” Of that 70% of the respondents, most indicated that they use some combination of interpolation, sample testing, sensitivity testing, or full retesting to calculate the impact of the change in yield curve, depending on the materiality of the change and other circumstances.

At least one state allows data and assumptions as of an earlier date for their March 1 submission requirements but require data and assumptions as of Dec. 31 be submitted by a later date (June 1).

Q17. How do actuaries interpret “moderately adverse conditions” in asset adequacy analysis for purposes of compliance with ASOP No. 22?

Section 2.9 of ASOP No. 22, *Statements of Actuarial Opinion Based on Asset Adequacy Analysis for Life Insurance, Annuity, or Health Insurance Reserves and Other Liabilities*, defines “moderately adverse conditions” as follows:

“Conditions that include one or more unfavorable, but not extreme, events that have a reasonable probability of occurring during the testing period.”

Section 3.3.3 of ASOP No. 22 states the following:

“The actuary should determine whether the reserves and other liabilities being tested are adequate under moderately adverse conditions, in light of the assets supporting such reserves and other liabilities. The actuary should recognize that holding reserves or other liabilities so great as to withstand any conceivable circumstance, no matter how adverse, may imply an excessive level of reserves or other liabilities.”

Some actuaries believe that asset adequacy analysis would ordinarily be performed with at least one scenario or set of conditions that are more adverse than current conditions. Although ASOP No. 22 does not call for reserves to be adequate under extreme or worst-case conditions, some actuaries would say that reserves have not been adequately tested if testing conditions assume that all situations will get less adverse, and no situation will be more adverse than the present. Many actuaries consider moderately adverse conditions applicable to several assumptions within a scenario, not just one assumption.

Also, some actuaries consider the current economic environment when determining what constitutes “moderately adverse conditions.” For example, in a period of very low interest rates, some actuaries would view several of the decreasing scenarios required by New

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York Regulation 126 (such as the falling scenario and the pop-down scenario) as going beyond the definition of “moderately adverse conditions.” This is particularly true when

considering a long projection period, such as 20 years or more. But in times of high interest rates, some actuaries might view these decreasing scenarios as an appropriate level of moderately adverse conditions.

Finally, some actuaries interpret moderately adverse conditions by looking at the conditions and assumptions used for each scenario, rather than by looking at the financial results coming out of the scenarios. The same conditions can produce adverse results for one type of business or risk profile and favorable results for another, and two types of business might offset each other to some extent.

Section D: Modeling Considerations—General

Q18. What modeling platforms are used to model liabilities?

Based on the results of the 2012 survey, there were 15 commercial software packages used by the respondents for the liability projections. The 2012 survey responses also indicate that internally developed systems or internally developed spreadsheets are commonly used by companies to model a portion of the liability cash flows.

Q19. How long are the projection periods used by actuaries?

ASOP No. 22, *Statements of Actuarial Opinion Based on Asset Adequacy Analysis for Life Insurance, Annuity, or Health Insurance Reserves and Other Liabilities*, Section 3.1.9, states the following: “The actuary should perform an asset adequacy analysis over a period that extends to a point at which, in the actuary’s professional judgment, the use of a longer period would not materially affect the results of the analysis.”

Approximately 52% of the respondents in the 2012 survey indicated that they do not establish a projection period using criteria based solely on the extent of the original liabilities that are expected to mature. Of the 48% who responded that they do use a materiality level to determine the length of the projection period, 75% use a materiality level of 90%.

Approximately 45% of the 2012 survey respondents indicated they use the same projection period for all products. Relative to these respondents, 50% use a projection period of 21–30 years, 12% use a projection period of 31–40 years, and 23% use a projection period of more than 40 years.

The 55% of 2012 survey respondents who use different periods by product offered additional usage details, summarized in the following. Percentages noted are based on the responses that indicated different projection periods by product:

- The most common period for individual traditional life products is 21–30 years, including term insurance and permanent insurance, whether par or nonpar (39%). However, 28% of the respondents used a period longer than 40 years.
- For individual fixed deferred annuities, 41% use between 21 and 30 years, while 32% use 11–20 years. Of group annuities, 50% use 20 years or less, but about one-third use greater than 40 years. Fixed payout annuities and structured settlements had longer periods. Of payout annuities, 39% use more than 40 years, although 33% use 21–30 years. Of structured settlements, 73% use more than 40 years. In the 2004 survey, in contrast, 70 years was the most common projection period for structured settlements.

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- For universal life with secondary guarantees, 46% of companies use more than 40 years.
- For other universal life, 85% use 21 years or more, but were fairly evenly divided among the 21–30-, 31–40-, and greater-than-40-year groupings.
- Long-term care had longer periods as well, with 63% of respondents using more than 40 years.
- Health products other than long-term care and disability tend to use shorter periods, with 75% being 30 years or less and fairly evenly divided among the less than 20, 11–20, and 21–30 time periods for other health. Disability insurance is somewhat longer, with 41% using greater than 40 years and 27% using 21–30 years.

Q20. What types of model validation do appointed actuaries perform?

In the 2012 survey of appointed actuaries, 88% of the respondents stated that they perform static validations, such as comparing opening balances, policy counts, and other key metrics against actual amounts.

Dynamic validations are performed by 51% of the respondents. In a dynamic validation, the actuary compares projections coming from current models against recent actual results (retrospective) or company financial forecasts. Furthermore, some actuaries compare actual results with the prior year's models in order to improve current models.

In addition to static and dynamic validations, some actuaries perform attribution analysis, during which the actuary performs a step-by-step analysis of the change from the prior year's models to the current year to confirm that the model appropriately reacts to changes in inforce, actuarial assumptions, and/or macroeconomic conditions. Depending on the use, attribution analysis is performed using either deterministic or stochastic scenarios.

ASOP No. 56, *Modeling*, Section 3.6.2, provides guidance on model output validation.

Q21. How is the discount rate determined that is used to calculate the present value of ending surplus at the valuation date?

There are currently several methods used to determine a discount rate. One is to use the pre- or after-tax earnings rate (i.e., the average investment earnings rate) over the projection period used in each scenario, either including or excluding the impact of policy loan interest. Another method is to rerun the scenario adding \$1,000 (or 1%) to the initial assets. The change in the ending difference can be used to determine the discount rate for that scenario. Another alternative is to use the pre- or after-tax Treasury spot rates for the length of the projection period — e.g., 20 years — which is generated under each scenario. Although outlier discount rates may distort the present values, only 22% of actuaries use floors, caps, or other methods to minimize such distortions.

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From the 2012 survey of appointed actuaries, approximately 15% of the respondents indicated they do not calculate a present value of ending surplus. Of those who do, below is a summary of the methods used to determine the discount rate:

After-tax earnings rate, including policy loan interest	36%
After-tax earnings rate, excluding policy loan interest	24%
After-tax Treasury spot rates for the length of projection period	4%
Pre-tax earnings rate, including policy loan interest	6%
Pre-tax earnings rate, excluding policy loan interest	4%
Pre-tax Treasury spot rates for the length of projection period	6%
Rerun the scenario with additional initial assets, determine discount factor based on change in surplus	4%
Other	16%

In the above table, “other” methods include such items as:

- A single specified rate
- Pre- or after-tax new money rates

Some actuaries avoid discounting the ending surplus amount by iterating the starting asset amount until the ending surplus is immaterial. The difference in the market value of starting assets (starting assets backing reserves and related amounts versus amount of starting assets needed to pay future claims and expenses determined by iteration) is then equivalent to the discounted value of ending market value of surplus. This approach is much like the direct iteration approach used in VM-20 and VM-21 reserve determination.

Q22. How does the actuary set the discount rates for a gross premium reserve test?

The discount rate used in determining the present values of a given scenario is generally consistent with the expected earned rate on the assets backing the liabilities for that scenario. Some actuaries use a level net earned rate based on a recent average portfolio yield of the assets (use of pre-tax or after-tax rates may relate to treatment of taxes within the model). Another method in use is to derive the discount rate curve from the projected after-tax net earned rate of the actual assets in the portfolio and purchased based on the investment strategy. For conservatism, some actuaries set the earned rate used for discounting purposes lower than the rate earned by the company’s assets.

Sometimes a single-level discount rate will be used for a given scenario. However, if new money rates have recently moved or are expected to change going forward within the scenario being tested, some actuaries consider a change in the discount rate over time. If future new money rates are expected to be lower than the rate currently earned on the current assets, then the discount rate generally could be assumed to decline over time as the liabilities increase or as assets roll over and earn future new money rates due to maturities, calls, or prepayments. The discount rate may also be subject to a floor (e.g., 0%) determined by the actuary. If the scenario has new money rates rising, the discount rate might be increased over time. If changes in asset yield for a material block of

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business cannot be adequately modeled using discount factors, some actuaries consider using CFT instead of a gross premium reserve test.

Some actuaries test the option risk in assets (e.g., calls) by assuming an immediate drop in the discount rate used in the gross premium reserve test. The drop test is often set as severe as needed to represent a drop in earned rate that would occur if all options were exercised.

Q23. VM-30 states that the interest maintenance reserve (IMR) should be used in asset adequacy analysis. Why, what is the impact, and what sources provide additional information?

The IMR defers recognition of the after-tax portion of realized capital gains and losses resulting from changes in the general level of interest rates. These gains and losses are amortized into investment income over the expected remaining life of the investments sold, rather than being recognized immediately. The gains and losses are grouped by calendar year. IMR, in aggregate (i.e., across all calendar years), is posted to the statutory balance sheet, and such amount may be positive (shown as a liability on page 3 of the statutory annual statement) or negative (shown as a write-in asset on page 2, subject to admissibility requirements).

The purpose of the IMR is to maintain the original matching between assets and liabilities. Originally, it was anticipated that the IMR would be allowed to become negative, as long as the asset adequacy analysis showed that the total statutory reserves, including the negative IMR, were sufficient to cover the liabilities. However, a negative IMR was not an admitted asset in the annual statement until beginning in the latter part of 2023 under which an “interim solution” was adopted. Under this interim solution, a negative IMR amount, subject to specified limitations, is allowed to be admitted. This interim solution is set to expire after 2025 with the expectation that a final solution will be adopted by then.

Unlike invested assets such as bonds, and reserves such as CRVM and PBR, there are no cash flows associated with IMR. Thus, if IMR is positive, this increases the amount of assets that can be reflected in CFT and serves to enhance the results. When IMR is negative, the allocated portion of the admitted amount is an asset that when included in CFT, serves to worsen the results.

The NAIC adopted INT 23-01 in 2023. This document contains the statutory guidance for the accounting of a net negative IMR (e.g., limits on admissibility) for year-ends 2023 through 2025. This document is for the interim period before a long-term solution is adopted and is automatically nullified on January 1, 2026.

Also adopted in 2023 was APF 2023-08 which modified VM-20 and VM-30 (VM-21 references VM-30 for IMR guidance) to incorporate non-admitted IMR amounts. VM - 30, Section 3.B.5, provides the following with respect to IMR:

“An appropriate allocation of assets in the amount of the IMR, whether positive or

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negative, shall be used in any asset adequacy analysis. In performing the allocation, any portion of the total company IMR balance that is not admitted under statutory accounting procedures shall first be removed.”

In the latter part of 2023, NAIC Staff provided the Life Actuarial Task Force (LATF) a memo containing guidance on allocating negative IMR in VM-20, VM-21, and VM-30 for year-end 2023 and 2024. This document provides the following:

“Companies are not required to allocate any non-admitted portion of IMR (or PIMR, as applicable) for purposes of VM-20, VM-21, and VM-30, as being consistent with the asset handling for the non-admitted portion of IMR would be part of a principle-based, reasonable and appropriate allocation. However, any portion of negative IMR that is an admitted asset, should be allocated for purposes of VM-20, VM-21, and VM-30, as again a principle-based, reasonable and appropriate IMR allocation would be consistent with the handling of the IMR asset.”

NAIC staff also provided an Excel “IMR Template” to assist actuaries and other parties in determining and validating the proper determination and reporting of admitted negative IMR amounts.

At the 2024 NAIC Summer Meeting, LATF presented a summary of potential issues with year-end 2023 Actuarial Opinions for some of the companies that reported an admitted negative IMR amount. The IMR amount reported in the Opinions did not always match the amount on the balance sheet, and it was unclear as to why. LATF recommended that regulators may want to request, and companies proactively provide, a reconciliation of reported negative IMR amounts, perhaps by use of the IMR Template.

Actuaries should continue to track negative IMR treatment as a long-term solution had yet to be adopted at the time this practice note was updated.

Q24. How does the actuary determine which portion of the IMR can be used to support certain products?

If the company allocates the assets and IMR by line, then one possible approach is to use such allocation. Another possible approach is the allocation of company-level IMR proportionately to starting assets. An advantage of this second approach is that it is generally simpler, while a disadvantage is that longer liabilities probably have longer assets, which usually produce higher capital gains when sold, after a given drop in interest rates, than shorter assets do, leading to an overallocation of IMR to the shorter liabilities. Another approach may be to allocate based upon reserve balance and effective duration within each segment.

If the actuary has software that can be used to model the IMR, then he or she could start with assets equal to reserves plus the allocated IMR and model the amortization of the IMR as well as future changes to IMR as assets are sold during the projection.

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Q25. How is the default component of the asset valuation reserve (AVR) treated in CFT?

Per VM-30, “Analysis of risks regarding asset default may include an appropriate allocation of assets supporting the asset valuation reserve; these AVR assets may not be applied for any other risks with respect to reserve adequacy. Analysis of these and other risks may include assets supporting other mandatory or voluntary reserves available to the extent not used for risk analysis and reserve support.” And “The amount of the assets used for the AVR shall be disclosed in the table of reserves and liabilities of the opinion and in the memorandum. The method used for selecting assets or allocated portions of assets shall be disclosed in the memorandum.”

Many actuaries (in the 2012 survey of the appointed actuaries, 51% of those who model the initial AVR) believe that it is preferable for the beginning assets supporting the AVR to be no more than the present value of defaults. There are several choices in using beginning AVR assets, including the following.

1. For each scenario, develop two sets of projections: (1) without defaults, and (2) with defaults. Discount the difference in ending surplus back to the projection date at an appropriate sequence of interest rates for the scenario. The maximum present value of this difference for all specified scenarios is the present value of defaults. If it is less than the pro-rata portion of the AVR described in Q25, then the actuary may run the projections without the AVR assets and without defaults (under the assumption that the AVR covers the cost of defaults).
2. If the pro-rata share of AVR is not sufficient to cover the present value of the cost of defaults for all scenarios, then for each scenario the actuary typically adds assets equal to the pro-rata AVR and runs the projections with defaults modeled.
3. A conservative, simple choice is to model defaults but exclude the AVR.

The actuary may need to allocate the AVR to various business segments that are being tested. Allocation methods vary and may range from a simple allocation based on asset levels to more complex methods that might reflect, for example, various underlying characteristics of the assets for a business segment.

Effective in April 2014, the NAIC adopted a proposal to limit the inclusion of AVR in the calculation of total adjusted capital to the amount not used in asset adequacy analysis in support of the actuarial opinion. As such, the appointed actuary may consider consultation with others in the company to ensure appropriate treatment in the actuarial opinion and the company’s annual statement.

In addition to the above choices concerning beginning assets, if the actuary can model the development of the AVR itself, then the actuary usually can start with assets equal to the liability reserves, plus the full pro-rata AVR (limited to the amount of present value of defaults), and model the contributions to AVR, as well as projected defaults. While some actuaries prefer more complex models that use defaults and AVR, others prefer the simpler models without AVR.

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Q26. How is the equity component of the AVR treated in CFT?

Although VM-30 does not refer to the equity component of the AVR, some actuaries include this component (or a portion thereof) in cash flow testing. The actuary may need to allocate this reserve to the amounts being cash flow tested and determine how to model the increases and decreases of such reserve amount in the projections.

Q27. If products with relatively short remaining durations are cashed out at the end of the projection period, and the IMR and AVR are being modeled, what happens to the IMR and AVR at the end of the period?

The IMR may be positive (or negative) when there are no policies left in force that need to have interest maintained. When the IMR is included in testing, some actuaries believe it is preferable to include the value of the ending IMR in the value of ending surplus.

If there are still assets left at the end of the projection period, the AVR could be considered when determining the value of those assets. Some actuaries believe that only method 1 below is appropriate. Others believe that methods 2 and 3 below are more conservative and are therefore also appropriate.

1. Reflect value of ending AVR in determining ending surplus.
2. Exclude value of ending AVR in determining ending surplus, or
3. Add value of ending AVR only to the extent that assets are sold at a loss at the end; otherwise, exclude ending AVR.

Some actuaries consider it appropriate to reflect ending AVR only in the calculation of book surplus, with market surplus calculated by subtracting ending AVR from the otherwise ending market surplus.

Q28. How might the starting amount of assets in CFT be adjusted when a net deferred tax asset (DTA) or net deferred tax liability (DTL) is present on the statutory balance sheet?

A DTA results from differences between statutory and tax accounting, where tax accounting would result in lower projected taxes. Alternatively, if tax accounting would result in higher projected taxes, then this would give rise to a deferred tax liability.

Some actuaries use CFT models that do not specifically project taxable income (e.g., taxable income is assumed to equal statutory income). In the most common situation where there is a net DTA reported on page 2 of the statutory annual statement, this approach is generally conservative regarding the projection of total taxes paid, so it would generally be acceptable to ignore the DTA. However, in situations where there is a net DTL reported on page 3 of the statutory annual statement, projections usually would be understating future taxes, and some actuaries consider it appropriate to include a provision for additional taxes.

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Alternatively, some actuaries use CFT models that specifically project taxable income based on one or more of the components of the DTA or DTL (e.g., tax reserves different from statutory reserves, deferred acquisition cost amortization). Some actuaries believe that the modeled portion of the admitted DTA and the modeled portion of the DTL should have an impact on the starting assets. In the case of admitted DTAs, the DTA would be part of the assets backing the reserves. In the case of a DTL, additional assets may be assigned to back the DTL. In the case of a DTL, one conservative alternative would be to exclude its impact on assets by not reflecting it in asset modeling.

It should be noted that at least one state specifies that if some of the projected future taxes are based on income or expenses determined according to tax accounting rules, then the corresponding portion of the DTA should be included as part of the starting assets; with the DTA starting asset amount reflecting not only the amount admitted according to statutory realization rules but also an allocation of the amount that is admitted due to offsetting the DTL.

Q29. How are shareholder dividends treated?

ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows*, Section 3.10.4, External Requirements, states the following:

“The actuary should consider how applicable law, and other external requirements relating to such things as financial statements and operating ratios, federal income taxes, insurer capitalization, and distribution of an insurer’s earnings to policyholders or shareholders are likely to affect future cash flows or constrain the range of possible scenarios. These factors should be appropriately reflected in the analysis.”

Based on the results of the 2012 survey, 51% of the respondents indicated that shareholder dividends are excluded because shareholder dividends are not applicable. Of the remaining 49%, about 10% explicitly include shareholder dividends in their model. The actuaries who do model shareholder dividends typically do so based on company expectations.

Q30. How are policyholder dividends treated?

ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows*, Section 3.5.4, Management Policy, states the following:

“The actuary should consider management policy concerning the settlement or payment of liabilities, and the effect that this management policy may be reasonably expected to have on the projection of policy cash flows. Considerations that might affect the projection include claim settlement and benefit payment practices, expense-control strategies, company philosophy relative to the determination of policyholder dividends, and charges or benefits that vary at the discretion of the company, as well as significant relationships between management policy and the scenarios analyzed.”

Some actuaries treat policyholder dividends as fixed over all scenarios when modeling future cash flows, using the projected dividends under the current dividend scale. Other

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actuaries model policyholder dividends dynamically over the projection period, varying them by scenario based on changes in interest rates, expenses, or other parameters during the projection periods. Because companies declare dividends for a year at a time, some actuaries build in a lag factor between experience changes and the time it takes to recognize and reflect those experience changes through changes in dividends.

Based on the 2012 survey of appointed actuaries, below is a summary of how policyholder dividends are modeled for those companies with policyholder dividends:

Modeled to approximate actual dividend policy	71%
Modeled in a simplified way	15%
Ignored as not material	12%
Other	2%

If the current dividend scale provides for an allocation of surplus to be paid out as dividends, some actuaries include the expected future allocation of surplus in the testing, clearly disclosing this in the actuarial memorandum. Others use dividends lower than their current dividend scale, reducing the dividends for the amount contributed from surplus.

Q31. Do actuaries reflect reinsurance in modeling?

According to the Valuation Manual, VM-30 Section 2, the opinion “must apply to all inforce business on the annual statement date, whether directly issued or assumed, regardless of when or where issued.”

ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows*, Section 3.8, Reinsurance, states the following:

“The actuary should consider whether reinsurance receivables will be collectible when due, and any terms, conditions, or other aspects that may be reasonably expected to have a material impact on the cash flow analysis.”

ASOP No. 11, *Treatment of Reinsurance or Similar Risk Transfer Programs Involving Life Insurance, Annuities, or Health Benefit Plans in Financial Reports*, Section 3.2, Impact of Risks Reinsured, states that the actuary should take into account “how the terms and conditions of the reinsurance program, including nonguaranteed reinsurance elements, impact the expected cash flows.”

“When preparing, reviewing, or analyzing financial statement items that reflect reinsurance ceded or reinsurance assumed, the actuary should consider potential cash flows that may, in the actuary’s professional judgment, have a material impact under the reinsurance agreement.”

ASOP No. 7, Section 4.3.g.(8), also states that the characteristics of any reinsurance agreements and how they were reflected in the analysis should be documented in the memorandum.

In the case of modified coinsurance (“ModCo”), the risks and the potential profits and losses may not accrue to the same statutory entity that holds the reserves on its balance

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sheet. Many actuaries believe asset adequacy analysis incorporates risks present in the statutory entity even when the associated reserves reside on the balance sheet of another entity. This is consistent with VM-30, Section 2, which states that the opinion includes business assumed. Thus, even though the reserves and assets for business assumed on a ModCo basis are not on the assuming company balance sheet, such business is subject to asset adequacy analysis. Conversely, performing CFT on ceded modified coinsurance may not be required even though the reserves and assets are reported on the ceding company's balance sheet. Nevertheless, this does not necessarily mean that those ceded reserves are excluded from asset adequacy analysis. They might be reported in the opinion as being included in the analysis but as representing minimal risk (because the risks have been ceded to another company).

The decision of whether CFT includes business ceded on a ModCo basis may be based on several factors, including the following:

- Are the projected expense allowances provided by the reinsurer to the ceding company adequate to cover the projected allocated expenses of the ceded business? If they are not, then the shortfall would generally be reflected in CFT by the ceding company. The CFT should also take into account any liability set up by the ceding company for the shortfall as described in Accounting Requirement 2a of Appendix A-791 of the Accounting Practices and Procedures. Note that the expenses used to determine the shortfall for purposes of A-791 may differ from the shortfall projected in CFT.
- Is there significant counterparty risk? If there is, then the ceding company actuary may want the CFT to reflect the ceded business in some manner that the actuary views as reasonable so that the counterparty risk can be considered as required by ASOP No. 7 and ASOP No. 11. Even though the reserves are held by the ceding company, the CFT model may project settlements involving payments by the reinsurer to the ceding company.

Are the ModCo reserves based on an allocation of reserves calculated in the aggregate? If so, then the ModCo reserve may not be a good indicator of the impact of non-performance by the reinsurer (they may not be sufficient due to aggregation benefits).

Section E: Modeling Considerations—Economic Scenarios

Q32. What are the requirements regarding the selection of economic scenarios for CFT?

The choice of economic scenarios for CFT typically involves actuarial judgment. While most states do not mandate specific scenarios, a few do require the inclusion of certain deterministic scenarios in the testing process. For instance, New York mandates the testing of scenarios outlined in Regulation 126 as well as those detailed in the annually released New York Special Considerations Letter.

General scenario guidance can be found in ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows*, Section 3.10.1, which provides the following:

“The scenario is a key element in the analysis of cash flows. Depending on the purpose of the analysis, more than one scenario may be used. Scenarios may be generated by either deterministic or stochastic methods.

- a. Range of Scenarios Consistent with Purpose of Analysis — The scenario(s) to be analyzed may be specified by the client or employer, by applicable law, or by the actuary. The actuary should determine whether the scenarios analyzed reflect a range of conditions consistent with the purpose of the analysis of cash flows. If not, the actuary should disclose any material inconsistency in any actuarial report prepared pursuant to Section 4.2, or in any other communication of the actuary’s findings.
- b. Number of Scenarios — Consistent with the purpose of the analysis, the actuary should consider a sufficient number of scenarios to reasonably represent the underlying variability of the asset, policy, or other liability cash flows.”

APF 2023-12 was adopted in 2024 (effective in 2025) and modifies VM-30, Section 3, with the following: “When the form of asset adequacy analysis is CFT, the actuary should reflect how the volatility of investment returns for equity-like instruments may affect the asset adequacy results under moderately adverse conditions and shall not solely project the anticipated long- term average return (e.g., a single level assumption set to the long-term average).”

Q33. What economic scenarios are used by appointed actuaries in CFT asset adequacy analysis?

Economic scenarios used in asset adequacy analysis typically include interest rates and equity returns as key variables, as these are crucial economic factors for many lines of business. Other variables that may be included, if they have a significant impact on the results, are fund returns, inflation rates, asset spreads, and asset default rates.

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Approaches currently used to represent interest rate and equity return scenarios in actuarial models may be categorized broadly as deterministic and stochastic. Deterministic scenarios are scenarios where the attributes are set in advance, while with stochastic scenarios the attributes are subject to some level of randomness.

In deterministic scenario modeling, one or more carefully selected scenarios of future rates and returns are utilized. An example of this approach are the seven required interest rate scenarios outlined in New York Regulation 126, commonly known as the New York 7 scenarios. Other examples of deterministic scenarios that actuaries might use include the VM 20 Stochastic Exclusion Ratio Test (SERT) scenarios, the SOA Modern Deterministic Scenarios, and scenarios used by companies for risk management and other purposes, as well as historical scenarios.

Stochastic scenario modeling approaches can be divided into two main categories: realistic (real-world) scenario models and market-consistent (risk-neutral) models.

- Real-world scenario models use probability distributions based on historical data, current economic conditions, and future forecasts (such as predictions from economists) to simulate future scenarios. These models can be used to project claims, for example, and to assess the impact of market changes on investment strategies.
- Market-consistent scenario models, on the other hand, calibrate scenario probabilities and rates to match existing asset values. These probabilities may not reflect realistic future expectations. Risk-neutral models are often used for projecting/pricing cash flows that depend upon stochastic financial variables, such as derivatives.

Both real-world and market-consistent scenarios are often essential in CFT. For instance, when a company is hedging variable annuity guarantees, real-world scenarios can be employed to forecast future claims, while market-consistent scenarios can be used to determine cash flows associated with the hedging program (e.g., cash flows from entering and closing hedging positions).

Actuaries who base their conclusions on the results of stochastic scenarios may also review deterministic scenario results. Deterministic scenarios can be useful in supporting the stochastic analysis and in performing model validation. The New York 7 scenarios, for example, have clear movements (e.g., pop-up and pop-down) that allow the user to inspect whether the results of the model are reasonable, given such rate changes. For example, the pop-down scenario would generally be expected to show larger asset prepayments; the pop-up scenario, to show larger cash surrenders (assuming the existence of such interest-sensitive assets and liabilities).

Additional information on scenarios can be found the July 2016 SOA guide “Economic Scenario Generators” and the September 2017 SOA paper “Modern Deterministic Scenarios for Interest Rates.”

Q34. Is there any time when a single interest rate scenario path may be appropriate?

For products that have little or no exposure to interest rate and/or equity market risk, such

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as short-term health insurance backed by short-term assets, some actuaries believe it may be appropriate to use a single interest rate path across all scenarios that vary other assumptions.

Q35. How would one ascertain the appropriateness of a “real-world” stochastic generator?

One approach involves developing qualitative stylized facts and quantitative acceptance criteria to evaluate whether an economic scenario generator meets an actuaries' needs.

Stylized facts describe the properties that economic scenarios strive to exhibit, such as Treasury yield curves being inverted approximately 10% of the time and equity return volatility fluctuating but quickly reverting to normal levels. These facts are typically established based on economic theory and historical data and are defined according to the intended use or purpose of the model. Stylized facts help in selecting the appropriate economic scenario generator and are a prerequisite for developing acceptance criteria.

Acceptance criteria consist of quantitative target values or metrics produced by the generator. For instance, the monthly standard deviation of 10-year Treasury rates across all scenarios for the first X projection years must be within $\pm 10\%$ of the historical standard deviation from the period 19XX through 20YY. Additionally, equity gross wealth ratios at the 15th percentile and 85th percentile across all scenarios at the X-year projection point should be within Y% of the 15th and 85th percentiles of actual gross wealth ratios over the period 19AA through 20BB. Acceptance criteria are compared against stylized facts to ensure alignment.

Section F: Modeling Considerations — Assets

Q36. What types of assets are used in asset adequacy analysis?

Types of assets used in asset adequacy analysis can be categorized, at a high level, into three groups: fixed or floating rate income, equity, and cash.

Fixed and floating rate income assets include bonds, bank loans, and mortgages. Bonds may be issued by a single obligor, such as a government or corporation. Bonds can also be asset-backed securities that are collateralized by pooled assets, such as mortgages, consumer loans, bank loans, and the like. Asset-backed securities generally have a set of payment rules, called a “waterfall,” that direct the cash flows of the collateral pool to the bond holders.

Bonds may be public or private. Public bonds in which they are registered with the Securities Exchange Commission and traded on public exchanges. Private bonds are not listed on the exchanges.

Two key characteristics of fixed and floating rate income assets are that they have an interest cost that is contractually defined (fixed rate or floating rate) and have a maturity date by which they must be repaid. Much of the U.S. life insurance company invested assets are held in fixed-income assets due to their stable and predictable income. Floating rate income assets are held for various reasons such as their automatic adjustment to changing economic conditions and their lower sensitivity to interest rate movements.

Equity-like assets represent ownership interests in companies, real estate properties, etc. Common stocks, equity mutual funds and exchange-traded funds, real estate, and limited partnerships such as private equity funds are all equity-like assets. Equity-like assets may be public or private. Public equity-like assets are traded through public exchanges. Equity-like assets do not have a contractually obligated interest cost, but many do pay a dividend. Also, most do not have a maturity date but some, especially limited partnership funds, have an expectation to fully liquidate the partnership over a finite time. Equity-like assets do not have a principal amount that is contractually obligated to be repaid. One difference between private and public equity-like assets is that private investors are generally paid through distributions rather than dividends and stock accumulation. The value of equity-like assets can be volatile, with potentially both large upsides and downsides over time.

Cash includes cash and short-term investments such as money market funds, commercial paper, and Treasury bills. Cash is held to meet both expected and unexpected company liquidity needs. The value of most cash assets is very stable.

Actuaries may choose to consider using derivatives in their analysis if the company holds such instruments to hedge risk arising from certain product designs, such as fixed-indexed annuities, guaranteed benefits associated with variable annuities, payout annuities with embedded guaranteed interest rates, or other products with long-term guarantees. This can be especially appropriate where such derivatives are integral to managing the risks for these products. Derivatives can either be forward-based (futures, forwards, swaps) or option-based (puts, calls, caps, floors, swaptions).

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With forward-based derivatives the parties have the obligation to make a transaction at a set point in time in the future while with options one party has the right, but not the obligation, to transact (e.g., buy or sell the underlying asset) in the future. Derivatives can be used to synthetically create assets. An example of this is to pair a floating rate asset with an interest rate swap that pays a floating rate and receives a fixed rate. This creates a synthetic fixed rate asset. Derivatives can be exchange traded (public) or over-the-counter (private negotiations between the two parties).

Q37. What types of asset cash flows might one consider in modeling?

Modeled cash flows may reflect the contractual, behavioral, and potentially extra-contractual (e.g., extensions) characteristics of the assets. The degree of rigor utilized in asset modeling will vary by company and depend on the key characteristics of a company's assets as well as the materiality of different asset class exposures. All material risks and characteristics of assets are typically considered and, to the extent possible, incorporated into the models. If material risks are not incorporated, then an appropriate degree of conservatism is typically added. It is important not to consider just the assets in isolation, but to consider them in the broader context of the purpose of the analysis.

Fixed-income assets have contractually obligated cash flows. For fixed-income assets both principal and interest cash flows are generally modeled. Principal could be paid as a lump sum at the maturity date of the asset or could be paid across the life of the asset on an amortizing basis. An asset may have one or more options embedded in how the principal may be repaid. The asset could be callable by the issuer or puttable by the lender. An asset could also be prepayable or extendable.

Interest payments of fixed-income assets can be on a fixed or floating rate basis. Interest can also be currently paying or deferred and paid on an accumulated basis. Interest can also be paid with additional securities or equities instead of cash (which is referred to as "payment in kind" or PIK). Floating interest rates are usually set relative to a market index, such as the Secured Overnight Financing Rate (SOFR) or Treasuries, plus a fixed rate margin.

The amount and timing of fixed-income asset cash flows can also be impacted by credit losses. Expected credit losses are related to the creditworthiness of the issuer as well as the degree and quality of collateral or security, if any. Credit losses are generally correlated with business cycles.

For equity-like assets, the two material characteristics for asset adequacy testing are cash flow distributions and change in market value. Most equity-like assets pay a periodic income distribution generally considered a dividend. The market value of equity-like assets may be easy to observe if an asset is part of a liquid, transparent market or may be difficult to observe in the case of private markets. Most private equity-related assets are fairly illiquid and may have lock-up periods where the asset cannot be sold. Pricing of and the ability to transact these assets is less developed. There are secondary markets where private equity-like assets can be sold, but these are still developing.

Since most equities do not have a maturity date like fixed-income assets, equities are potentially perpetual unless the asset is sold. Some equity-like assets, particularly limited partnerships,

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periodically distribute sales proceeds of assets held within the partnership, as those underlying assets are sold. Appropriate consideration is generally given to the structure and nature of the equity-like asset when it is modeled, including projections of prospective asset purchases and sales.

Cash and cash-equivalent assets may be modeled simplistically. Each cash-related holding may not be modeled individually; rather cash is modeled in an aggregated or pooled manner. Cash-like assets usually earn a rate consistent with short-term Treasury yields, sometimes with an additional margin.

Cash flows on derivatives are mathematically related to the value of the underlying instrument or index and the terms of the derivative contract.

When projecting the cash flows, ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows* Section 3.4, Projection of Asset Cash Flows, provides the following guidance:

“In projecting an insurer’s asset cash flows for a given scenario, the actuary should consider the assets of the insurer and the insurer’s investment strategy.”

Modeling the insurer’s investment strategy may produce cash flows from the sale of assets, for example, to meet various portfolio constraints (e.g., limits by asset class/category, quality, tenor, duration) and/or pay claims, commissions, and expenses. ASOP No. 7 Section 3.4.1 summarizes asset characteristics and other considerations that may impact the projection of cash flows.

Q38. How are assets selected for asset adequacy analysis?

Asset adequacy testing is an evaluation of adequacy of assets supporting reserves and related actuarial items, so the initial amount of assets selected is usually equal to the amount of reserves and related actuarial items being tested.

How a company internally manages its assets may influence how assets are selected. It is important to note that, in most cases, assets in an insurer’s general account are not legally supporting only a subset of general account liabilities, rather all of the general account assets support all of the general account liabilities. However, for internal management and reporting purposes, companies may segment their general account into portfolios that notionally back the various groupings of products and their associated reserves and liabilities. Separate account reserves and related actuarial items are also subject to asset adequacy analysis.

If a company does segment its general account into product portfolios, this may serve as a natural first step in selecting assets. If these portfolios include some degree of surplus, then some assets in the portfolio may need to be excluded from the asset adequacy testing work.

If a company does not segment its general account into portfolios, then an asset selection process may utilize one or more factors such as:

- Length of investment: Longer assets may be assigned to longer liabilities and vice versa.
- Asset type: Liabilities with certain cash flow characteristics (no subsequent premiums vs.

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- recurring premium, lump sum surrender vs. periodic payments, fully guaranteed vs. subject to change with nonguaranteed elements) may have a more natural fit with some assets than others.
- Liquidity: Liabilities that cannot be surrendered or are less likely to be surrendered liabilities may be allocated a higher proportion of illiquid assets.

Non-invested assets that should be considered include, but are not limited to, deferred tax assets, admitted amounts of negative IMR, and deferred and uncollected premiums.

Q39. What asset-related risks might typically be considered in asset adequacy analysis?

While asset adequacy analysis has historically been focused on interest rate risk, all significant asset-related risk exposures are generally considered, including but not limited to default, market, illiquidity, call/prepayment, complexity, currency, interest rate, volatility, and structure.

Q40. How are embedded options in assets modeled?

The impact of embedded options on the amount and timing of fixed-income cash flows generally depends on the conditions under which it is attractive for the borrower to exercise the options and the behavioral characteristics of the borrower with respect to the exercise.

For example, a callable bond allows the issuer of the bond to prepay the bond under certain conditions by paying a call premium to the company. The likelihood of exercise generally depends on the relationship of the call price (and associated expenses to execute the call) to the present value of remaining coupon and principal payments, based upon the characteristics of the bond and other economic factors.

Generally, a call option “at the money” is not exercised due to the cost that an issuer might incur to refinance the debt. Some actuaries model calls only if the option is “in the money” by a certain amount. This level may be based on internal studies or other criteria.

The efficiency of embedded fixed-income option utilization will vary by characteristics of the borrower. Generally larger, more sophisticated, and higher credit quality borrowers are more efficient in their option execution. One could think of these types of borrowers as exhibiting a more systemic behavior while borrowers on the other side of the spectrum exhibit more idiosyncratic option execution behavior.

If assets with embedded optionality are an insignificant part of the portfolio, the impact of the options might be excluded from consideration. What constitutes “insignificant” usually depends on the size of the assets with optionality in relation to the total portfolio, the characteristics of the embedded options, and the size of the potential gain or loss if options are utilized.

Some assets such as private placements and commercial mortgages may be callable at a “make-whole” premium, which means the issuer will pay the holder an amount to

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compensate for any loss when the bond is called. Some companies may ignore the premium and model these assets as noncallable bonds. Note that these “make-whole” provisions may go by alternate names, such as a “yield-maintenance agreement.”

For assets such as convertible bonds and convertible preferred stock, it may be difficult to model conversions, and it is usually conservative to treat a bond as if it were not convertible. Some companies assume a return above the coupon rate or an assumed total return rate. In doing so, the actuary may consider the impact of the adjusted return performance on the projected cash flow profile and the materiality to modeling outcomes. For example, modeling a higher return through a higher coupon may overstate interest cash flows.

Bonds with put options are not very common. Puttable bonds give the bondholder the right to put the bond back at a fixed value (usually par) to the issuer for cash. Some actuaries take the conservative approach of not modeling put options.

Q41. What are some common methods for determining the market value of assets at a future point in time?

For fixed-income securities, the market value is based on discounted cash flows. For assets with fixed cash flows, that is, no embedded options like calls or prepayments, the cash flows are discounted at a rate based on risk-free rate(s) plus a spread reflecting the risks of the asset. This derives a market or fair value.

For assets with embedded options, a few different approaches could be taken:

- Determine a fair value based on the cash flows without regard to the embedded option, then adjust for the value of the embedded option.
- Project the cash flows of the asset under a large number of market-consistent stochastic interest rate paths and discount at an appropriate interest rate vector based on the short rates of each interest rate path as well as a spread. This spread is considered an option-adjusted spread (OAS) as the evaluation of the asset cash flows under a set of stochastic paths “adjusts” for the optionality.
- Determine a fair value of the cash flows without regard to the embedded option and discount using an interest rate that includes a spread adjusted for the option embedded in the asset.

The OAS method can result in significant model run times, which may be a consideration when choosing a market valuation approach. Approaches can be taken to mitigate this run time such as applying this calculation only to assets that may be sold in the projections, calculate market values only at chosen model time steps instead of all time steps (monthly), or calculating market values using OAS only for chosen scenarios.

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Q42. How are policy loans treated?

Based on a 2012 survey, approximately 70% of the survey respondents indicated they model policy loans by assuming the loan balances remain proportional to the cash value throughout the projection. Approximately 10% assume policy loan balances reflect the interest rate scenario dynamics, and approximately 10% do not include policy loans in their testing. The remaining 10% use other approaches.

Q43. What are the sources of guidance on how to select assumptions for asset modeling?

The ASOPs provide guidance on general considerations to take into account for selecting assumptions. Practice notes are also helpful, especially from the perspective of providing information on what other actuaries facing similar issues are doing. Other investment and actuarial papers on asset-liability management and life insurance company investments may also be useful references.

Rules and requirements set by regulators may provide more specific guidance and, due to their binding legal nature, may supersede guidance derived from other sources. VM-30, for example, requires volatility of investment returns to be reflected for equity-like assets under moderately adverse conditions (versus a single-level assumption equal to the long-term average). The New York annual “Special Considerations Letter,” New York Regulation 126, and the California annual letter on the Actuarial Memorandum and RAAIS are other examples of regulatory requirements.

Where the data appears to be credible and it can be reasonably expected that the experience will continue in the future, many actuaries rely upon internal company experience in selecting assumptions. The historical patterns might be adjusted for anticipated economic conditions (e.g., the economy is heading for a downturn) and expected future changes in company practices. It may also be appropriate to grade company experience into industry- or economy-wide experience, particularly in those cases where the company experience has been substantially better than industry average, unless the actuary has determined that the reasons for the superior experience are expected to continue.

In those cases where the company’s own data are not credible or are unavailable, actuaries may use an industry- or economy-level assumption. Data from credit rating agencies may be used. Credit loss experience is frequently studied in academic literature and findings can be obtained from a literature search. Credit spreads, historical interest rates and yield curves, and other economic data (inflation, employment, gross domestic product) are widely available data series. Some actuaries select their modeling assumptions based on these data.

In the case of highly complex instruments like structured assets (collateralized loan obligations [CLOs], asset-backed securities [ABS], mortgage-backed securities [MBS], commercial mortgage-backed securities [CMBS], etc.), actuaries may rely on models and assumptions constructed by vendors. Investment professionals with expert knowledge of assets construct vendor models that are generally proprietary (i.e., the

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details are not available to the user). Many actuaries believe it is appropriate to examine the characteristics, purpose, and results of these models to evaluate their reasonableness for asset adequacy testing.

Some insurers have increased allocations to securities that may be privately originated and feature non-traditional structures, collateral types, and mechanics. A potential starting point may be the analytics used in the asset/deal origination process. Note that these asset types may have limited or no credible historical experience across credit cycles and economic environments to support assumption setting for asset performance. Some actuaries use similar public or more traditional assets as reference points and may rely on investment experts for guidance. When setting assumptions for these assets, actuaries may consider the lack of direct experience, bespoke features of the assets, and materiality to asset adequacy testing outcomes.

Q44. What spread assumptions (i.e., spreads to Treasuries) are used to model reinvestments of fixed-income securities?

Spreads represent an economic risk premium relative to a risk-free investment, and so spreads should generally correlate with the risk inherent in an asset. When considering reinvestment spread assumptions, the actuary generally considers whether the spread is consistent with the assumed riskiness of the asset class. This is consistent with the intent of Actuarial Guideline 53, which requires actuaries to attribute the sources of risk for excess spreads.

Historical data are a frequent source for long-term spread assumptions; however, many asset classes held by insurers do not have robust historical data across one or more credit cycles. The actuary may consider whether available historical data or current experience is a reasonable indication of future spread levels. The NAIC provides both current and long-term spread assumptions for use in principle-based reserving for statutory quarterly reporting dates.

Reinvestment modeling may require some compromise on asset class depth, and many actuaries model simpler reinvestment strategies incorporating fewer asset classes than reflected in their current holdings. This often requires mapping non-modeled asset classes, which are typically smaller and more esoteric allocations, to a modeled asset class, which is typically more traditional. Actuaries generally consider whether the assumed reinvestment strategy and spread assumptions accurately reflect future portfolios and whether directly reflecting new asset classes in the reinvestment strategy would materially improve the quality of the modeling.

Q45. How are expected credit loss assumptions developed?

Sources of data for default assumptions vary. There are several external sources available for historical default experience across many asset classes, such as rating agency experience studies (Moody's S&P, etc.), data from investment advisors, AVR contributions, and the Altman Z-score. Insurers may also include their own internal experience for default losses as a component to assumption development.

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Certain asset classes may lack credible or relevant historical or internal experience. For example, privately originated asset classes may not have industry-wide experience data available publicly. Additionally, many structured finance asset classes experienced fundamental changes to their design following the 2008 crisis such that some actuaries feel prior experience may not be comparable. Asset classes that are relatively new or have grown significantly in recent years may not have strong historical data or experience that captures a full credit cycle. In these situations, actuaries often reference the default assumptions used for similar public assets, any internal experience they may have, and input from investment experts in order to form an assumption.

When considering industry data and historical experience in developing default assumptions, it is important to understand if the data capture all relevant economic losses. For example, privately originated assets may experience fewer “technical defaults” as the lender (or small group of lenders) is able to restructure the loan to accommodate the borrower’s current difficulties. Such a restructuring, and any subsequent economic loss, may not be captured as a default, and could cause an understatement of credit-related losses in historical data. However, this ability to negotiate and restructure loans is regarded by some as a positive feature of private lending relative to public markets.

Some actuaries take business cycles into account by increasing the assumed default loss for the next few years if it appears that the economy is about to enter a recession or is in the middle of one and grading down to a long-term average thereafter. Similarly, near-term default risk may be determined to be lower than average, in which case some actuaries model lower near-term defaults that increase over time. These adjustments may also only apply to specific asset classes where more specific risk is emerging.

Some actuaries also reflect quality rating movements over time, using default loss assumptions that change with these changes in rating. These “rating transitions” are studied extensively by rating agencies, with the results generally published annually. For high-quality bonds, this transition effect will increase default losses over time. For low-quality bonds, default loss rates may decrease over time for the remaining bonds that survived the higher default rates of the earlier years of a projection.

While directly modeling transition probabilities is difficult, one method to capture their effect is to use a term structure to default rates depending on the asset lifetime. These cumulative default rates by horizon are also generally included in rating agency studies. In the example above, a high-quality long-term bond will have a higher annualized default rate than a short-term bond because of credit degradation over time.

With respect to private placement bonds, credit loss analysis is available from SOA studies, with the most recent being the 2003–2015 study, which was published in 2019. This particular study incorporates experience during the 2002–2007 expansion economic environment period, the 2008 financial crisis, and the ensuing low-rate environment up through 2015.

With respect to mortgage loans, default losses by rating are available from published

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studies. Research done during the development of mortgage RBC factors found default experience typically to be most closely related to a contemporaneous loan-to-value ratio.

Debt-service-coverage ratios are also usually a significant factor in estimating mortgage losses. An actuary who uses these types of ratios in projecting default losses may also choose to develop and use a mortgage quality rating system.

The Mortgage Loan Portfolio Profile, published quarterly by the American Council of Life Insurers (ACLI), has extensive information on a high percentage of the life insurance industry's mortgage loans, including commercial, one- to four-family, and agricultural loans. Property type and geographical distributions are shown, as are delinquencies, loans in process of foreclosure, restructured loans, and completed foreclosures. The actuary may choose to refer to this profile to evaluate industry experience and as a basis for comparison to company experience.

Q46. Do asset credit losses vary by interest rate scenario?

It is a common practice to assume that default rates and recoveries do not vary by interest rate scenario, because studies have not established a strong link between the shape or level of yield curves and credit losses. There is usually a stronger link between yield spreads, defaults, and economic conditions, which is the reason some actuaries model higher default losses when weaker economic conditions are expected.

Q47. What are the considerations for investment expenses?

Investment expenses impact portfolio cash flows and are typically captured as part of the cash flow projection. Similar to other assumptions, the granularity and complexity of modeling investment expenses will be driven by their materiality to modeling outcomes.

Investment expenses can vary by asset class depending on the asset class's market structure, management strategy, complexity, liquidity, idiosyncrasy, scalability, and other factors. For example, investment grade public corporate bonds generally have lower investment expenses than privately originated structured assets, as the latter are more complex to originate, analyze, and manage. Passive investment strategies will incur lower expenses than active investment strategies. Allowing expenses to vary by asset class may result in improved expense accuracy in projections where portfolio composition changes over time. Conversely, spreading all investment expenses equally across all asset classes with a single assumption may not accurately reflect the cost associated with more complex assets.

Investment expense assumptions generally reflect expenses associated with managing the portfolio, including any additional overhead expenses, consistent with other expense modeling included in asset adequacy testing. If the assets are managed externally, the investment management agreement is useful for determining the base expense. If assets are managed internally, internal expense studies for the investment office are helpful to support an assumption. Actuaries may also use external data points to inform an absolute or relative expense level, such as expense ratios observed on mutual funds and ETFs.

Actuarial Guideline 53, Section 4.E. requires the following with respect to investment expenses:

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“Assumed investment expenses, whether paid to an external asset manager or to internal investment management staff, as well as additional expenses that are directly attributable to the specific investments, should be commensurate with the expected expenses in light of the complexity of the assets.”

Q48. What sensitivity tests might be considered?

Sensitivity tests are an important tool for understanding exposure to key risks that may not be fully assessed in the primary modeling exercise, and they provide valuable insight into analyzing asset adequacy. Asset performance and risk is driven by several factors beyond just major market variables such as interest rates, spreads, and equity market behavior, which is increasingly true as insurers grow allocations to more complex asset classes.

Below are various factors that may be impactful to asset adequacy results and therefore may warrant sensitivity testing. The decision to include sensitivity tests on these factors, and the method by which to perform them, will be impacted by both the expected materiality to the portfolio as well as modeling capabilities.

- Credit losses – Default losses are a key driver of fixed-income performance. Bonds that default are expected to repay an amount less than the full par amount, and recovered principal may be received earlier or later than expected maturity. Some actuaries model this by increasing loss expectations over a short period to reflect an acute market stress, over a longer horizon to reflect broader underperformance, or for specific asset classes where there may be less confidence in the best estimate assumptions.
- Credit transitions – An extension of the above is the impact of credit transitions on asset performance. Many bonds experience rating migration over their lifetime, which will change their expected default loss. Insurers that explicitly model transitions in the projection could consider stronger downgrade behavior, while those that do not could consider an instantaneous downgrade of the portfolio.
- Prepayment/extension – Many fixed-income assets feature some potential for prepayment (i.e., early repayment of principal) or extension (i.e., later repayment of principal) that modifies the cash flow profile. This often happens at economically adverse times, such as increased prepayments as interest rates fall, causing reinvestment into lower-yielding assets. Actuaries who model prepayments explicitly may adjust the prepayment speeds to behave more adversely. Some actuaries may sensitivity test the maturity date of bonds instead, to mimic prepayment or extension.
- Reinvestment strategy/spreads – Projecting asset adequacy often depends on some reinvestment of excess cash flows, and so the assumed reinvestment strategy and spreads can be critical assumptions. Many actuaries’ sensitivity test their reinvestment assumptions, such as lower reinvestment spreads or more basic reinvestment strategies. This type of sensitivity testing is particularly important for reinvestment strategies that include relatively new, complex, and/or high-spread assets, since their future availability or level of spread may be more uncertain. Note that spreads will also impact the cash flows from the divestment of assets.

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- Transaction costs – Asset adequacy projections will often assume future purchases or sales of assets. These transactions will generally have some cost associated with them, where the sale price is below “market value” and the purchase price is above “market value.” Transaction costs can vary significantly depending on several factors such as asset type, credit quality, market depth, and market conditions. For example, selling private assets may require a large discount, and transaction costs can increase materially when economic conditions deteriorate, and the portfolio has already lost value. Some actuaries will increase transaction costs to better understand the impact of this assumption on asset adequacy.

ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows*, Section 3.10.2 Sensitivity Testing, provides the following guidance:

“The actuary should consider and appropriately address the sensitivity of the model to the effect of variations in key assumptions. For example, the further into the future that asset and policy cash flows are projected, the more potential there is for variability in the future cash flows. In determining whether sensitivity has been appropriately addressed, the actuary should consider the intended purpose and use of the analysis and whether the results reflect a reasonable range of variation in the key assumptions, consistent with that intended purpose and use.”

Regulatory sensitivity testing requirements include Actuarial Guideline 53, Section 5, which requires capping equity-like reinvestment total returns and for certain non-equity-like reinvestment assets, spreads. New York also requires various sensitivity tests with respect to asset-related assumptions.

Q49. What software platforms are used to model assets?

Actuaries may use a combination of software purchased from multiple vendors and/or purchased software plus internally developed spreadsheet systems to project assets depending on the type of asset being projected.

Often specialized vendor-based software is used to model the intricacies of complex assets and structured securities. The vendors in this case maintain extensive deal libraries providing complete coverage of most existing deals. For deals not currently in their database, they work with insurers to obtain the prospectus and other critical information describing their unique deals, so they can model the unique characteristics within their deal library. These systems are typically available as application programming interfaces (APIs) or can provide externally projected cashflows under various scenarios and payment frequencies.

Some specialized software may include support for all types of assets that insurers may prefer due to the consistency and ease of integration into the asset-liability management (ALM) model. These alternative asset-only systems can model all assets including the structured finance market where they forge partnerships with the modeling firms that specialize in this complex and dynamic market.

Alternatively, some actuarial modeling systems offer native asset modeling for common

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types of assets like bonds, stocks, real estate, and mortgages. This provides flexibility for the majority of traditional assets to be modeled within the actuarial system. Then specialized external systems are used only for more complex structured asset deals. Many of these specialized systems offer advisory services covering system training, stress testing, benchmarking, sensitivity testing, and model validation of results.

When using purchased software to project asset cash flows, actuaries often check the parameters set by the vendor to ascertain whether the parameters are reasonable relative to the company's experience and asset characteristics, which can vary materially by company. Sensitivity testing of the parameters can be conducted to evaluate the reasonability of the parameters. If the actuary determines that the default software parameters are not appropriate for the company, for example, the actuary should exercise professional judgment and make discretionary adjustments to them.

Q50. How might model risk management be reflected?

ASOP No. 56, *Modeling*, provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. ASOP No. 56 recommends that the actuary should understand the model's intended purpose and assess whether the structure of the model (including judgments reflected in the model) is appropriate for the intended purpose. Among other things, the actuary generally considers whether the model appropriately represents options, if any, that could be reasonably expected to have a material effect on the output of the model.

For models that use assumptions as input, the actuary should use, or confirm use of, assumptions that are appropriate given the model's intended purpose.

Given the use of purchased software by many actuaries to project asset cash flows, the actuary should understand the capabilities of the model and the following:

- Important aspects of the model being used, including but not limited to, basic operations, important dependencies, and major sensitivities.
- Known weaknesses in assumptions used as input, known weaknesses in methods, or other known limitations of the model that have material implications; and
- Limitations of data or information, time constraints, or other practical considerations that could materially impact the model's ability to meet its intended purpose. The actuary should evaluate model risk and, if appropriate, take reasonable steps to mitigate model risk.
- Perform sufficient testing to ensure that the model reasonably represents that which is intended to be modeled. The following is from ASOP No. 56, Section 3.6.1:
 - Reconciling relevant input values to the relevant system, study, or other source of information, addressing and documenting the differences appearing in the reconciliation, if material.
 - Checking formulas, logic, and table references.
 - Running tests of variations on key assumptions used as input to test that changes in the output are consistent with expectations given the changes in the input (i.e., sensitivity testing); and

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- Reconciling the output of a model run to prior model runs, given changes in data, assumptions, formulas, or other aspects of the model since the prior model run.
- Validate that the model output reasonably represents that which is being modeled.
- Obtain a review by another qualified professional.
- Use reasonable governance and controls.

Q51. How is the asset management strategy modeled?

The asset management strategy varies significantly from one company to another. Some companies use a fairly passive strategy, holding securities they purchase for lengthy periods of time, often to maturity. Others may employ an active portfolio management to take advantage, for example, of relative value opportunities in an effort to earn additional returns, at least in the short term. The actuary generally determines whether and to what extent to reflect the company's asset management strategy in the cash flow model. Considerations may include identifying how consistently the stated strategy has been followed in the past and how recently the strategy has been reviewed and approved by senior management, coupled with actuarial judgment as to the likelihood that the strategy will be followed under the scenarios being projected. In particular, the actuary should consider whether new asset classes have been added to the portfolio and should be included in the modeled asset management strategy.

Some insurers may adhere to a specified investment strategy, stated in terms of allocation to various classes of assets, quality rating of securities purchased, sector allocations, and duration of the portfolio. If the overall strategy is followed consistently and the liability structure remains the same, securities maturing or sold will generally be replaced by instruments of similar characteristics, except for temporary deviations to take advantage of market opportunities. However, if the future asset management strategy is expected to vary significantly from the past and the portfolio composition is likely to be affected significantly as a result, many actuaries believe it is necessary to reflect this in the model.

Some actuarial software permits the modeling of specific investment strategies, such as duration matching. In this case, the allocation of assets to various instruments within the generic reinvestment portfolio usually is determined dynamically, based on the durations of the assets and liabilities. Dynamic allocations may be made to achieve a desired mix of assets after the period's purchases are made.

Where static allocations are used, the actuary typically considers certain potential resultant problems. For example, the regular purchase of a constant mix of short and long assets may result in holding what would appear to be an excessive percentage of long assets, as maturing short assets are replaced with this constant mix of short and long assets while the long assets held have not yet matured. AG 53 requires disclosure of the asset allocation at various future projection points. This is helpful in ascertaining whether or not the cash flow model is projecting future asset allocations consistent with expectations.

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Q52. How is the reinvestment strategy modeled?

Net positive cash flows arise from future premiums and deposits, interest earnings, asset maturities and sales, and other cash inflows, net of policy or contract benefits, expenses, taxes, and other cash outflows.

Net positive cash flows are generally reinvested in the model. While some actuaries may construct a simple reinvestment portfolio consisting of a small number of assets, it is important that the assets collectively represent the quality, duration, and asset class characteristics reflecting the company's investment strategy.

The yields on these instruments generally are determined dynamically based on the interest rate scenario, using yield spreads reflecting the credit quality and embedded options of these instruments, with the intention that yields produced reflect the economic conditions within the scenarios tested.

Q53. How is disinvestment modeled?

When negative cash flow arises in the model, actuaries use a number of different approaches. Many actuaries model a disinvestment strategy that is largely consistent with company practice, as modeling limitations or the requirement to exclude new business in asset adequacy analysis may make an exact replication of the company's policy difficult to implement.

For small shortfalls, actuaries may assume the shortfall can be covered by short-term borrowing at the prevailing short-term rate applicable to the company, based on its credit standing. The actuary might then assume that all subsequent positive cash flows would be used first to repay the loans. Some actuaries may assume no borrowing at all and divest assets to cover shortfalls.

In reviewing results that combine reinvestment and disinvestment strategies, many actuaries believe it is appropriate to examine any distortion of results due to unrealistically large amounts of borrowing or unrealistically large concentrations in certain asset categories.

In instances where there is a large amount of borrowing, the actuary would typically consider estimating the impact of any unintended arbitrage advantage on margins or adjusting the reinvestment or disinvestment assumption to reduce the borrowing. For example, the actuary may want to check that the rates are consistent with the market scenarios so that the projections are not benefiting from an unintended arbitrage advantage. For instance, when separate projections are run for two lines of business and one generates positive cash flows while the other generates negative cash flows, it may make sense to borrow at the average reinvestment rate (which implicitly assumes that the loan is being made from one line to the other and reduces arbitrage advantage). Another alternative is to presume "internal borrowing," in the case where cash flows are computed separately for several lines of business, and one line forecasts negative cash flows but the rest show consistently positive cash flows.

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Both VM-20 and VM-21 require that any disinvestment shall be modeled in a manner that is consistent with the company's investment policy and that reflects the company's cost of borrowing where applicable, provided that the assumed cost of borrowing is not lower than the rate at which positive cash flows are reinvested in the same time period, taking into account duration, ratings, and other attributes of the borrowing mechanism. The is to prevent excessively optimistic borrowing assumptions. If such borrowing restrictions cannot be fully applied or flowed precisely in the cash flow model, then the company shall not allow borrowing to materially reduce the reserve.

Some actuaries believe that large shortfalls are best modeled by selling assets. One common assumption is that sales will occur from liquid investments with low bid-ask spreads, consistent with the actual practice of most investors. If no consistent pattern of liquidation practices exists at the company, a pro-rata liquidation of all liquid investments might be assumed. Some companies use a pro-rata approach on asset sales because it is difficult to predict specific assets that will be sold, and a pro-rata portion would leave the asset makeup (duration, etc.) consistent with the makeup prior to sale. Another approach is a prioritized liquidation: For example, one possible order of priority might be money market investments and T-bills first, followed by Treasury notes, Treasury bonds, agency issues, high-quality corporate bonds, high-yield issues, and real estate. Consideration may also be given to realized capital gains or losses of assets being considered for sale.

Q54. How can liquidity and cash management strategies be modeled?

Reflecting actual company practice to hold some level of cash to meet operating and benefit cash flow needs, some actuaries include a target level of cash to be held in the model such that when the model generates cash above the target level in a given period, the excess cash is reinvested according to the modeled reinvestment strategy.

The actuary generally considers the liquidity of investments when assuming asset sales in the model. Assets that are considered unsellable might be restricted in the model such that they cannot be sold to meet cashflow shortfalls. If sellable, assets might be sold in the model at a discounted market value reflecting the liquidity of such assets. Furthermore, the spread assumed for reinvested assets should account for the expected liquidity of the reinvested assets and include an appropriate liquidity premium.

Q55. How can projected portfolios be ensured that they evolve in reasonable ways over the projection horizon?

Consistent with ASOP No. 56, the actuary should validate that the model reasonably represents that which is intended to be modeled. Furthermore, the actuary should validate that the model output reasonably represents that which is being modeled. This can be accomplished by comparing current and projected key asset (or ALM) metrics including the following:

- Asset class allocations relative to tactical and strategic asset allocations
- Credit quality mix
- Liquidity
- Duration mismatch

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In all cases, the actuary should confirm that asset portfolio projections remain consistent with the company's investment guidelines. Note that AG 53 requires disclosure of the allocation of assets at various future points in the cash flow projection.

Q56. How should extra-contractual (e.g., extensions, workouts) investment management actions be considered?

It is generally important that the status of assets in the portfolio be reflected at the model start date.

In cases where the original terms of an asset have been modified through a workout process, consideration of the revised terms in the model may be considered. Such terms could include a combination of extending the maturity of an asset and reducing the interest rate.

Additionally, the actuary could consult the investment manager to evaluate impaired assets and assets on a watch list for impairment to understand potential actions that may be taken to alter the terms of such assets. Such potential actions could either be reflected in the model base run or as a sensitivity test. Regardless of potential actions, it may be prudent for the actuary to ensure that the model reflects the current impairment status, particularly if the asset is in a default status and not paying interest.

Q57. How might floating or variable rate bonds be modeled?

In practice, most variable rates are based on an index other than Treasury yield rates (on which CFT is often based). Historically the most popular index was the London Interbank Offered Rate (LIBOR); however, this was phased out in 2023 and has since been replaced by rates such as the SOFR. If variable rate bonds are material to the portfolio, it may be appropriate to devise a method to determine the reset coupons based on Treasury yields. Some actuaries will model a constant spread between Treasuries and reference rates reflecting current market conditions, while others may employ more sophisticated techniques such as grading to a long-term assumption or using linear regression to establish a modeling relationship.

Variable rate bonds may have coupons that reset with different frequencies, such as every three months or every few years. Bonds with a longer period between coupon resets have market values that are more exposed to interest rate fluctuations than those with shorter coupon reset periods. Additionally, their cash flow profile will be different, as the cash flows may be fixed for different periods of time.

While variable rate bonds generally have cash flows that vary with interest rates, the contractual cash flows generally do not vary with credit spreads—that is, the credit spread over the reference rate that determines the coupon is typically fixed. This exposes market values of variable rate bonds to changes in credit spreads.

Variable rate bonds may have different prepayment dynamics than fixed rate bonds that are worth considering. For example, prepayments may be more closely related to absolute interest rate levels than relative interest rates. In addition, bond issuers may be looking to refinance at fixed rates for a longer term than that of the variable rate bond.

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Q58. What are the general characteristics of structured securities that are important for CFT?

A structured security combines multiple assets together to create an investment that pays out interest and principal under defined terms and based on the performance of those underlying assets. The underlying assets may perform based on movements in interest rates or derivatives. Common examples of structured securities include CLOs, in which loans are packaged together into a new investment, and collateralized mortgage obligations (CMOs), in which mortgages are packaged together. Many other examples exist, and theoretically any pool of assets could be combined to create a structured security.

The size of the collateral pool is usually greater than the total of the debt of the structured assets. This is called overcollateralization and allows the deal to be structured with a certain degree of non-performance of the collateral pool.

While the risks of the structured security mimic the risk of the underlying assets, there is additional risk that is created based on the structure itself. Structured securities typically have payment “tranches,” and each investor invests in a defined tranche. A tranche defines the priority of the payments to the investor. Using a CMO as an example, all the cash flows from the underlying mortgages would be used to make payments to the CMO tranches. Investors in higher priority tranches typically earn a lower rate of return but have a high degree of certainty that they will receive their principal payments because the cash flows from the underlying mortgages are first used to pay the higher priority tranches. Subordinated tranches typically earn a higher return but have a higher risk of not receiving all the principal back. If some of the mortgages in the pool default and therefore there are no payments, those non-payments will impact the most subordinated tranche (called the residual or equity tranche) first, then the next most subordinated, etc. This risk of cash flow non-payment, or slower/delayed payment, are important to consider in CFT. Tranche structures can include things like interest only and principal only strips, Z tranches, sequentials, planned amortization classes, and support bonds.

Most structured securities involve underlying collateral which provides some protection against payment/default risk. For example, the mortgages underlying a CMO are collateralized by the buildings associated with the mortgages. The lower the loan-to-value ratio of the underlying mortgages, the greater the chance that the collateral could ultimately protect against complete loss of principal payments. For modeling purposes, the additional risk associated with payment uncertainty is important to model. Modeling of such payment uncertainty will depend on the type of structured security, the nature of the underlying collateral, the quality of the investment, and the security tranche. Sensitivity testing of the payment pattern is also important to assess the risk. There are some commercially available software packages that can support modeling of structured securities.

As with MBSs and CMOs, some companies with material holdings of ABSs use a vendor package to project cash flows. While certain types of ABSs do not have the interest rate sensitivity of other ABSs, the data needed to track and project the underlying collateral often makes vendor packages a practical option to use.

Even the best vendor packages may not cover 100% of a company’s invested assets. The actuary

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may choose to build functionality into their existing software to project a range of cash flow patterns (including patterns that vary with interest rates), map those assets to a similar asset, or use other approximation techniques. Many actuaries prefer that the percentage of non-modeled assets be small.

Q59. What are general characteristics of residential mortgages and securities collateralized by them?

While direct ownership of individual residential mortgage loans by insurance companies does exist, companies more commonly hold such assets in the form of a securitized

structure. These structures pool multiple loans, the cash flows of which collateralize the security. The two main types of securitized structures are MBSs and CMOs.

The holder of an MBS investment receives the principal and interest payments from the underlying residential loans in the pool as a direct pass-through (net of servicing and other similar deductions). Some MBSs (e.g., the Government National Mortgage Association or Ginnie Mae [GNMA], Federal National Mortgage Association or Fannie Mae [FNMA], and Federal Home Loan Mortgage Corporation or Freddie Mac [FHLMC] pools) contain guarantees on the principal and interest payments, backed by the respective government agency. Losses are generally more significant on nonagency issues and may warrant incorporation into the model so as to reflect the potential impact of such credit losses in the analysis. While agency issues are very highly rated and less subject to losses, it is still common to assume a nominal basis point reduction to account for default costs.

CMOs are structured securities that divide the total principal and interest payments from the pooled loans into components, or “tranches,” with each tranche sold as a separate investment. Each tranche of a CMO is paid principal and interest according to a “waterfall” of cash flows from the CMO to each individual tranche. There are many types of CMO tranches, with various levels of risk. Types of tranches include, but are not limited to, sequential pay, accrual, floater, planned amortization class (PAC), PAC support, target amortization class (TAC), principal-only, and interest-only. Modeling of CMOs should account for the material characteristics of each tranche that could impact the cash flows received.

Q60. What are key risks associated with mortgage-backed securities (MBSs) and collateralized mortgage obligations (CMOs)?

MBS and CMO investments exhibit cash flow uncertainty due to both defaults and cash flow variation, as payments to investors are directly impacted by the prepayment activity of the underlying pool of mortgages.

- Prepayment and Extension Risk

In general, prepayment risk occurs as interest rates decline resulting in principal payments occurring earlier than expected, future interest payments being foregone, and reinvestment of proceeds in lower-yielding assets.

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Conversely, extension risk occurs as interest rates rise resulting in principal payments occurring later than expected (due to fewer prepayments) preventing investors from reinvesting cash flows to take advantage of the higher rate environment. Offsetting this effect, more than expected interest payments are received.

Prepayment speeds for an MBS depend on many factors including the differential between the coupon rate of the underlying mortgages and current market rates and seasoning of the mortgage pool, among others. CMO cash flow variations can be impacted by these same factors, as the prepayment activity of a particular tranche depends upon the effect of prepayments in the underlying

mortgages on the higher priority tranches. While all MBS investors are impacted equally by prepayments, CMO investors can receive prepayment protection from principal payments being allocated to higher priority tranches or potentially by taking increased prepayment risk if owning a lower-priority tranche. Future cash flows on MBSs and CMOs typically are affected not only by the interest rate paths in the future but also by the entire history of interest rates and cash flows since initiation of the underlying pool of mortgages.

- **Default Risk/Credit Losses**

As a result of the 2008 financial crisis, loss of principal became a more significant concern, even for residential mortgages that were adequately collateralized, due to widespread foreclosures. Historically, for GNMA, FNMA, and FHLMC issues, a common practice was to assume a zero default rate due to the guarantee of principal and interest by these agencies, which are considered to have direct or indirect government support. The same logic applied for structured securities such as CMOs, which generally have AAA ratings and may also be supported by credit enhancements. The 2008 financial crisis brought plausibility to the notion of default of these assets, and as such, some actuaries have included nonzero default rates in base asset adequacy projections and/or for sensitivity testing purposes.

Market values of underlying properties can be negatively impacted by broad economic scenarios as well as location specific factors. To the extent an insurance company's disinvestment strategy involves asset sales, such market value effects should be reflected.

Q61. What are the general characteristics of commercial mortgage loans?

Commercial mortgages are loans collateralized by income-producing commercial properties, such as apartment buildings, shopping centers, hotels, or office buildings. These mortgages can be very heterogeneous and warrant highly bespoke underwriting due to the large size of an individual loan and the unique features of the properties, such as the location, property type, vacancy and rent levels, and tenant types. Despite loan-level idiosyncrasies, some actuaries aggregate mortgage exposures along key features such as property type and term for CFT.

There are three important features that drive the contractual cash flows of commercial

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mortgages. First, commercial mortgages usually have some level of call protection or “make-whole” provisions. These can take the form of prepayment lockout periods, defeasance provisions, prepayment penalty points, or yield-maintenance charges, and these penalties prevent early prepayment of the loan. The second major feature is that commercial loans are usually not fully amortized over the duration of the loan term, they are usually partially or non-amortized. As a result, there typically is a significant balloon payment at the end of the term, and borrowers will generally make that payment with proceeds from a new loan. Lastly, commercial mortgages could have adjustable-rate features that cause cash flows to vary with interest rates.

In the event of a mortgage default, the mortgage lender will generally take ownership of the underlying property, since that property collateralized the loan. Therefore, mortgages can turn into real estate equity exposures if a borrower defaults. Lenders will then often look to sell the property to recoup the principal from the loan.

Q62. What are the key risks associated with commercial mortgage loans?

As with most types of fixed-income securities, many actuaries believe that the key risks can be categorized in the following ways:

- Credit quality (tenant quality, occupancy rates)

Given the case-by-case nature of commercial mortgages, often the actuary may examine trends in cash flow and occupancy, lease terms, and profitability of underlying tenants prepared by the company’s investment department to gain better understanding.

- Reinvestment risk or extension risk

While there is usually more prepayment protection for commercial mortgages than for residential mortgages (due to prepayment lockout periods and make-whole provisions), there might be extension risk to be considered, with restructuring at below-market-yield rates. Evaluating restructuring risk based upon company and overall experience may help to ascertain reinvestment risk.

- Concentration risk (location, number of properties, use)

Actuaries may evaluate documentation provided by the company’s investment department.

- Interest rate risk

Because many commercial mortgages are adjustable rate, companies run the risk of loss of coupon income because of falling interest rates.

- Liquidity risk

Although commercial mortgage loans have historically been considered “buy-and-hold” investments, there is a secondary market that has materially improved since the financial

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2008 crisis due, in part, to technology (electronic documents, online auctions, etc.). Liquidity can depend on many factors, which include, but are not limited to, the economic environment, property type, location, and unique features of the property and/or loan.

Q63. What are the general characteristics of securities collateralized by commercial mortgage loans (CMBS)?

CMBS involve the pooling of mortgages on commercial property. The commercial properties can be wide-ranging, and may include properties such as office buildings, retail buildings and malls, apartment buildings, factories, entertainment venues, and hotels. The loans are typically held in a trust or other type of bankruptcy-remote special purpose vehicle.

Commercial mortgages underlying CMBS typically have fixed interest rates. This is a differentiation from residential MBS, which often involve floating rate loans as well. The terms of the CMBS come with a fixed interest rate that is typically based on the at-issue Treasury rate plus a spread reflecting the risk profile.

The term length of commercial mortgages is dependent on the underlying properties and is typically in the range of 5 to 10 years. They often end with a balloon payment. The underlying loans often include prepayment penalties or yield-maintenance agreements to dis-incent the borrowers from paying the loan off early (which reduces the interest earnings).

Other characteristics of the underlying loans that may impact the risk profile of the CMBS security include:

- Non-recourse loans – most CMBS are non-recourse, meaning that the borrower cannot be held personally responsible for paying off the loan
- Assumption – if an underlying property is sold, the loan may be transferred to the purchaser
- Defeasance – requires the borrower to replace the “lost” interest and collateral to the investor in the event of prepayment; these are sometimes referred to as yield-maintenance agreements or make-whole provisions

Q64. What are the key risks associated with CMBS?

In addition to the risks of MBS generally as noted in question Q60, CMBS have the following additional risk considerations.

Risks associated with the nature of the underlying loans. Understanding the portfolio of loans is important to understand and model the risks. For example, if the loans are comprised primarily of retail properties, changes in consumer behaviors (such as a shift away from “brick and mortar” purchasing to online purchasing) may have significant impacts on the value of the underlying properties and the borrower’s ability to make payments on the loan. Similarly, office space is impacted by employer behaviors – as more workers work from home, office space is left empty, reducing its value and potentially impacting the borrower’s ability to pay. Considering these underlying risks, which in turn impact the likelihood of default, the value of the collateral upon

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default, and the pattern of the payments to the investors in the MBS, is important in modeling the asset's cash flows.

Risks associated with the terms of the underlying loans. The length of each individual loan will impact payment patterns. In addition, the terms of the loans (e.g., term length, defeasance) impact the risk profile. Since the loans are typically non-recourse, if a business borrower goes bankrupt, there is no alternative payor. If the property transfers hands, there may be a change in the creditworthiness of the counterparty. Prepayment is also a risk, since early payoff would reduce the interest earnings on the security. Inclusion of defeasance terms would mitigate risk associated with prepayment.

Q65. What are general characteristics of collateralized loan obligations (CLOs)?

A CLO is a structured financial instrument backed by a portfolio of debt, primarily broadly syndicated loans, often referred to as leveraged loans, which have floating interest rates tied to the SOFR. These portfolios may also include other types of loans, such as middle market loans, and a small portion of unsecured debt. The cash flows generated from the CLO's loan portfolio are allocated to various CLO securities, which are organized into a series of tranches. These tranches consist of floating rate coupon notes (also called bonds) and a residual or equity tranche, which is neither rated nor coupon-bearing.

The distribution of cash flows follows a "waterfall" structure, prioritizing payments to the most senior tranche first, followed by the next highest tranche, and so on. Any remaining cash flows, after all the notes have been paid, are directed to the residual tranche. The most senior tranche, typically rated AAA, usually makes up more than 50% of the CLO's structure, while the residual/equity tranche accounts for about 10% of the capital structure. This configuration results in a leverage ratio of approximately 10:1.

CLOs are designed with specific features to help ensure their success. These include requirements on the loan collateral, such as diversification, size, and quality limits. Additionally, the collateral is actively managed during a designated "reinvestment period." The CLO notes are overcollateralized, meaning the face value of the notes is set below the face value of the underlying collateral. Coverage tests, such as the Interest Coverage Test and Overcollateralization Test, are in place to detect and respond to collateral deterioration by adjusting the allocation of cash flows between the CLO notes and residual tranches. And embedded call options allow the owners of the residual tranche to refinance or reset the bond notes and other terms of the structure.

Q66. What are some of the key risks associated with CLOs?

There are risks at the collateral level, which impact the collateral cash flows, and therefore impact the notes and residual tranche. There are also risks associated with the structure of CLOs.

- Risks embedded in the underlying collateral of a CLO.

Understanding collateral risks is crucial as the cash flows from the collateral loans drive the returns for both the CLO notes and the residual tranches.

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- Credit risk: This arises from the deterioration of credit ratings and/or defaults. Important factors in assessing credit risk include ratings, loan seniority, loan covenants, industry trends, loan diversification, and the track record of the CLO manager.
 - Recovery risk or loss-given-default risk: Factors such as loan seniority, industry, and covenants play a critical role in evaluating recovery risk.
 - Prepayment risk: Prepayments tend to increase when loan spreads decrease. If this occurs during the reinvestment period, these cash flows will be reinvested at lower spreads, reducing returns on the loan portfolio.
 - Interest rate risk: Rising interest rates can increase interest payments on the underlying loan collateral, which in turn can heighten credit risk.
 - Spread risk: Narrowing spreads may lead to increased loan prepayments and a higher likelihood of call provisions being exercised by the residual tranche.
 - Market value risk: In stress scenarios, loans may trade below par. The market value of the underlying loans is a crucial factor in determining whether call provisions are invoked by the residual tranche.
 - Ratings risk: Lower quality assets, such as loans with a CCC rating, may be penalized in the overcollateralization (OC) test.
 - Diversification risk: A less diversified portfolio may be more susceptible to contagion risk.
 - Collateral quality risk: Breaching any of the collateral quality tests, such as the weighted average life (WAL), weighted average spread (WAS), and weighted average rating (WAR), will limit the manager's ability to reinvest loan cash flows and proceeds.
 - Collateral overlap risk: This is the risk that different CLOs have invested in some of the same loans. It is most pronounced for CLOs from the same manager.
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- Risks associated with the structure of a CLO.
 - Call risk: After the non-call period, equity investors have the right to call the notes through various rate adjustment transaction options, which reduce the CLO debt funding costs and enhance residual tranche returns. These options include:
 - Refinancing: Allows majority holders of the residual tranche to refinance some or all bond tranches.
 - Resets: Redeems and replaces all debt tranches while modifying original transaction terms, such as the maturity date, reinvestment period end date, and WAL test.
 - Reissues: Similar to resets, but all CLO assets are transferred to a new Special Purpose Vehicle (SPV).
 - Re-pricings: A cashless refinancing where some or all debt tranches are repriced without the costs associated with redeeming and issuing new tranches. Both debt and residual tranches are transferred to a new SPV, which issues the CLO structure.

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Equity investors might call the deal to refinance debt tranches when credit spreads tighten, allowing debt to be reissued at lower spreads, reducing funding costs, and benefiting the residual tranche. Historically, equity holders have been efficient in

exercising these options. For example, with a 10:1 leverage, a 5-basis point change in bond spreads equates to a 50-basis point benefit for equity holders.

- Extension risk: Note maturity dates can be extended under a reset or reissue, aiming to improve returns for equity holders. This extension may or may not benefit noteholders.
- Spread risk: As loan spreads decrease, excess cash flows from loans are reinvested at lower spreads. Unless note spreads are also decreased, this can negatively impact the Interest Coverage Test and may reduce cash flows to some tranches. After the non-call period, the residual tranche can reduce bond spreads through rate adjustment transaction options.
- Market risk: The value of both the notes and the residual tranche can fluctuate. Floating rate coupons on the notes help dampen their market value variability, but the residual tranche can be very volatile due to the high leverage, often around 10:1.
- Basis risk: The rates on the underlying collateral loans will reset, and perhaps have varying “term” periods, causing basis risk to the rates credited on the notes.
- Rating risk: There is a risk that rating agencies might downgrade note ratings based on their analysis.

Q67. What are the general characteristics of other asset-backed securities (ABSs)?

Other ABSs beyond those backed by mortgage loans or CLOs may include securities backed by credit card receivables, home equity loans, student loans, and auto loans. Other types are also possible. More exotic ABSs might be backed by assets such as royalty payments, lottery payments, parking lot revenues, movie revenues, etc.

The underlying assets in an ABS are often illiquid and cannot be sold on their own, so they are pooled and securitized. The typical tranche structure involves A, B, and C tranches. The credit quality and associated payment likelihood declines with the tranche – A is typically the largest with the best credit quality and C is the lowest quality with the highest yield.

A key difference in the nature of the underlying loans as compared to securities backed by mortgages is the credit quality. Many home equity, credit card, and auto loans are made to borrowers with lower credit rating than is required for mortgage loans, and are of small size. They may have weaker collateral as well.

Q68. What are key risks associated with other ABSs?

ABS risks are similar to MBS risks in that they include default and payment pattern risks, and the specific risk profile will depend on the underlying assets backing the security as well as the terms of the underlying loans.

The underlying loans are often issued to borrowers with lower credit ratings on average, which

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increases the risk of default or slowdown in payments. Loss given default is also often higher due to the potentially lower collateralization standards as well as challenges in obtaining and liquidating the collateral that underlies the loans.

Certain types of assets may not have fixed payment terms. For example, credit card receivables may only have minimum payment requirements, and therefore the stream of payments to the security owner can vary month to month, and this would most significantly impact the most subordinated tranche.

Credit card loan backed ABSs may have lock-up periods in which no principal is paid. Student loans may have deferral periods. Government student loans tend to have better repayment likelihood and lower default risk.

Q69. What are general characteristics of assets with equity-like characteristics, such as limited partnerships, private equity, etc.?

Limited partnerships can serve different purposes. Some limited partnerships are characterized by complex or capital-intensive assets (e.g., energy, commodity, real estate, etc.) that are placed into SPVs to provide an income stream based upon the underlying assets. Others may relate to an equity interest in an entity.

The varied nature of limited partnerships may lead some actuaries to consider whether inclusion is practical for asset adequacy analysis or even appropriate for asset adequacy analysis. In some cases, because of the inherent difficulties and limitations in analyzing limited partnerships or the complex underlying assets, assets are removed from asset adequacy analysis due to practicality. While such assets are complex and difficult to model, some actuaries include them in asset adequacy analysis to account for their expected high expected return relative to publicly traded assets and resulting potential contribution to the asset adequacy analysis results. Furthermore, assets with equity-like characteristics tend to have longer durations, which can provide a better match with longer duration and less liquid liabilities, particularly those beyond 30 years, and some actuaries include these assets in asset adequacy analysis. When included in asset adequacy analysis, one method some actuaries use to evaluate limited partnerships is to look through the limited partnership structure to the underlying assets and model each individually.

Q70. What are some of the key risks associated with assets with equity-like characteristics, such as limited partnerships, private equity, etc.?

- **Illiquidity:** These types of assets are typically private securities and not traded on public exchanges. If the asset owner wishes to sell, they likely must engage third-party valuation and other independent firms to run the sale process and address legal aspects.
- **Investment Horizon:** These assets are frequently longer-dated investments. A limited partner stake in a private equity fund, for example, may have a fund life of 10+ years.
- **Valuation:** Assets are not publicly traded and there is often not just one source of truth for the price of an investment. This again affects an investor's ability to sell the asset, as well as potential ongoing costs of valuing the asset for internal/external reporting.

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- Fees: These assets typically require more structuring and due diligence, as well as ongoing expertise to manage, which leads to higher investment and legal fees to purchase and own the asset.

Q71. What considerations might be given to including derivatives in asset adequacy analysis?

Actuaries may choose to include derivatives in their asset adequacy analysis if the company holds such instruments to either hedge risk arising from certain product designs or to hedge risk arising from adverse economic outcomes.

Consideration for inclusion of derivatives in asset adequacy testing may depend on the extent to which such derivatives are integral to managing the risk profile for these products

or to a broader risk profile. Examples of product designs that may incorporate the use of hedge instruments are fixed-

indexed annuities, guaranteed benefits associated with variable annuities, or general account products with guaranteed minimum interest rates. To hedge applicable risks, companies utilize interest rate swaps, swaptions, caps and floors, credit default swaps, options and futures on equity indices, and other instruments. An example could be the use of interest rate swaps and swaptions to mitigate interest rate risk on a block of long-term care business or immediate annuities.

If derivatives are deemed to be appropriate for inclusion in asset adequacy analysis, decisions need to be made on both a point-in-time (testing date) and projected basis. As of the testing date, a carrying value that is consistent with statutory values is desired and would appropriately reflect various scenarios.

With regard to projection of cash flows, derivatives are typically modeled on a seriatim basis to recognize the timing of cash flows as well as each derivative contract's characteristics. Some companies elect to use external vendor software to model derivatives. Testing is typically performed on deterministic scenarios for CFT, although in some cases, and depending on the type of derivative, stochastic analysis is used. The underlying mechanics for valuation typically utilize various underlying models to value the path-dependency including closed-form solutions like the Black-Scholes formula and customized approaches where a closed-form solution may not be adequate. The complexity of the cash flow and valuation models can vary significantly and typically are reliant on an actuary's input, comfort level with the formulas, and input from subject matter experts. Materiality is another key consideration as to whether derivatives are included.

Q72. What are the key risks associated with derivatives?

One key risk of utilizing derivatives is leverage. Since derivatives can control a large amount of notional exposure for a relatively small initial cash outlay, it is important to ensure that the amount of derivatives utilized in projections are sized appropriately to the exposure being hedged. The exposure being hedged may change over time in a projection due to differing market conditions.

Basis risk is another key risk with utilizing derivatives. Basis risk is the potential difference

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between how the underlying exposure that is being hedged will change and the derivative itself will change. Examples of this could be hedging the interest rate risk of a 10-year bond with a 2-year Treasury future and hedging a large cap mutual fund with futures on the S&P 500 equity index. Due to differences in the underlying exposures, they are unlikely to move in a perfectly correlated manner. Models may not contemplate basis risk due to simplifying assumptions.

Most derivatives require an initial funding amount, either a premium if an option-based derivative or an initial margin amount if a futures-based derivative. Additionally, most derivatives require a daily cash settlement or other collateral posting of market value gains and losses. Models may not incorporate the liquidity and funding needs of derivative transactions, only the initial premium and the periodic or ultimate cash settlements. Actuaries should consider the liquidity and collateral requirements of derivatives contracts when included in their asset adequacy analysis.

Cost and availability are also key risks. The cost of entering new positions may be substantial in some market conditions (e.g., low rate and high volatility conditions) or may not even be available in extreme market conditions. In statutory accounting, some derivatives are accounted for on a market value basis. The exposure being hedged may not be accounted for on a market value basis, but rather on a book value basis. Even though the hedge may perform exactly as expected, there may be accounting mismatches that create additional volatility in projected statutory statement amounts.

Section G: Modeling Considerations—Policy Cash Flow Risk

Q73. What is policy cash flow risk?

Cash flow risk is the risk that the amount or timing of cash flows will differ from expectations or assumptions. Policy cash flow risk, which is a subset of cash flow risk, is defined in ASOP No. 7 as follows:

“The risk that the amount or timing of cash flows under a policy or contract will differ from expectations or assumptions for reasons other than a change in investment rates of return or a change in asset cash flows.”

This risk is commonly referred to as C-2 risk.

Q74. How might the appointed actuary typically decide on the scope of policy cash flow risk testing?

A good first step is to identify the material or most significant policy cash flow risks. These risks may be identified through a review of sensitivity analyses from prior pricing and/or projection work, combined with the appointed actuary’s general knowledge of the product line(s). In deciding on the scope of testing, many actuaries consider the potential volatility of future experience, the significance of any anticipated variance in terms of its effect on results (i.e., ending or interim surplus), the existence of any known repricing capability for nonguaranteed elements, and any known interrelationships with asset, investment rate of return, or other policy cash flow risks.

The policy cash flow risks considered generally include mortality, morbidity, lapse, and expense risks, as well as any significant options held by the policyholder, such as interest rate guarantees, policy loan utilization, the flexibility to pay or not pay premiums, guaranteed minimum death benefits, guaranteed minimum withdrawal benefits, or guaranteed minimum income benefits (GMIBs).

While both favorable and unfavorable deviations in future experience are possible, given the “moderately adverse” framework of asset adequacy analysis, many actuaries believe the appointed actuary’s primary focus regarding any policy cash flow risk is the potential for adverse deviation.

Q75. What is meant by “sensitivity testing” for policy cash flow risk?

Sensitivity testing for policy cash flow risk involves the testing of non-asset-related variables under various scenarios to demonstrate the adequacy of reserves. After the completion of the testing of the adequacy of assets supporting specified liabilities under a basic set of scenarios (each scenario involving different economic assumptions that focus

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primarily on asset and/or investment rate-of-return risk), the appointed actuary choosing to do such sensitivity testing may perform additional tests. These tests incorporate, for each significant type of policy cash flow risk (where significant is defined by the appointed actuary), a range of variations from the base policy cash flow assumption. The range in value for each assumption is generally determined based on the actuary's judgment of the reasonable possibility that such variations will occur. There may also be statistical techniques to identify an appropriate range in value. The basic economic scenarios generally are then rerun to determine the impact of such variation in the policy cash flow variables.

Certain sensitivity tests also can be run in order to evaluate the impact of adverse experience of more than one variable at a time.

Q76. What types of sensitivity testing is commonly done?

New product designs and benefits, and an increased recognition of the materiality of certain risks, have brought more focus on sensitivity testing, from both appointed actuaries and regulators. In the 2012 survey, respondents cited examples that have generated increased focus for sensitivity testing, including dynamic lapse parameters, interest or equity rates, reinvestment spreads, and payout annuity mortality.

From the 2012 survey of appointed actuaries, the following table gives the top 10 items most frequently sensitivity tested:

Lapse	91%
Life insurance mortality	80%
Expenses	71%
Asset defaults	57%
Payout annuity mortality	38%
Morbidity	36%
Interest or equity rates	36%
Reinvestment spreads	30%
Dynamic lapse parameters	27%
Premium persistency	20%

Q77. What policy cash flows are typically sensitivity tested under a gross premium reserve test?

Sensitivity testing is usually performed for a gross premium reserve test. Most respondents to the 2012 survey of appointed actuaries indicated that they perform sensitivity tests on the key variables for policy cash flows (e.g., expenses, lapses, mortality, and morbidity).

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Q78. Do actuaries use their company’s own experience to set modeling assumptions for policy cash flow risk?

Most actuaries utilize their own company’s experience, wherever possible, to establish the key assumptions related to policy cash flow risk. The following table summarizes the percentage of respondents to the 2012 survey of appointed actuaries who reported setting their key assumptions by either company experience, industry experience, both, or actuarial judgment. A response of “Not applicable” was also included to capture responses where an assumption was not considered relevant:

Assumption	Company	Industry	Both	Actuarial Judgment	Not Applicable
Lapse	66%	2%	20%	4%	7%
Mortality	42%	11%	38%	2%	7%
Disability and recovery	16%	15%	17%	1%	51%
Morbidity	24%	8%	19%	1%	48%
Dynamic policyholder behavior	19%	4%	11%	42%	25%

Q79. When may the use of dynamic lapse assumptions be appropriate?

Several factors can affect lapse rates for a product, including attained age, policy duration, level of surrender charges, sophistication of the market, qualified vs. nonqualified status, distribution system, in-the-momentness of various contract options (e.g., guaranteed minimum death and withdrawal benefits, annuitization benefits), and the difference between the rate credited on the policy versus rates that could be earned on other similar products in the marketplace. Certain products are known to have increased lapses when interest rates increase. When the product being tested is known to be interest sensitive (e.g., fixed deferred annuities), the actuary may choose to consider the use of dynamic lapse assumptions — i.e., to vary the lapse rates from scenario to scenario and from year to year — based on the dynamics involved. For policies that are not interest sensitive (e.g., disability income), actuaries would not typically use dynamic lapse assumptions.

In the 2012 survey of appointed actuaries, roughly 72% of those surveyed responded that they use dynamic lapse assumptions for interest-sensitive products that allow surrender, 7% responded that they do not use a dynamic lapse assumption, and 22% responded that the assumption was not applicable.

Q80. How might the actuary address longevity risk in the setting of mortality and mortality improvement assumptions?

Longevity risk is the risk related to the increasing life expectancy of policyholders, which may translate to higher-than-expected cash flows. As with most assumptions, the extent to

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which an actuary considers longevity risk in asset adequacy analysis depends upon the underlying products being tested, though products such as payout annuities, pension risk transfer business, guaranteed living income and withdrawal benefits, and longevity swaps typically would be materially impacted by longevity risk.

A possible approach to setting assumptions for asset adequacy analysis may be to incorporate both a mortality table and a mortality improvement scale. For improvement scales, there are standard industry tables available, both with and without margin. Some actuaries may choose to develop their own assumptions. Also, the actuary could include mortality improvement through a reduction in the base mortality rates.

The appointed actuary may consider the impact of events that could or have impacted mortality — for example, the COVID-19 pandemic. The actuary may consider whether adjustments to the underlying mortality table or future projections of mortality related to lingering COVID-19 impacts (i.e., long COVID) are appropriate. The actuary may determine that COVID-19 impacts should be added or removed from the underlying mortality table and that there may or may not be future adjustments required related to COVID.

The actuary may consider applying a margin to mortality tables and mortality improvement scales. There are available reference points for each. In selecting margins to apply to the mortality table, the actuary may consider the 10% margin generally included in annuity valuation tables. Larger margins may be appropriate for very small or less credible blocks of business, and smaller margins may be appropriate for larger or more credible blocks of business. For mortality improvement, Canadian valuation guidance in 2016 called for a 50% margin for 25 years from the valuation date and 0% thereafter.

Other considerations in addressing longevity risk in asset adequacy analysis are correlations of assumptions and sensitivity testing. Regarding correlation, the actuary may consider the relationship of margins on the base mortality table and the margins on the mortality improvement scale. Depending on the risks to be covered by these margins, the margins could be adjusted for correlation. For example, if the margin is intended to cover random fluctuation risk, there is likely not any correlation. However, if the margin is intended to cover the risk of a severe mortality event such as a pandemic, correlation may be considered.

On sensitivity testing, such scenarios may incorporate all types of risk with simple increases/decreases to base assumptions. Another approach is to evaluate specific components of the risk (e.g., pandemic, etc.) as described above. Sensitivity testing could help identify assumptions that are relatively more significant to the results and contain more variability, and therefore may involve relatively more analysis to develop.

Q81. What are “secondary guarantees” and what additional policy cash flow risks are associated with them?

An account balance product is an insurance or annuity product that has an explicit visible account balance upon which surrender and other benefits depend. Typical account balance

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products include fixed and variable universal life and deferred annuities. For traditional account balance products, the continuation of benefits other than surrender depends entirely on the continuing existence of a positive account balance, as the costs for those benefits are charged directly against the account balance and the benefit is no longer available after the account balance drops to zero. A secondary guarantee may be extended to a benefit whose amount and/or duration may exceed that supported by the account balance. Examples of secondary guarantees include no-lapse guarantees on universal life insurance, and death benefits, maturity benefits, withdrawal benefits, and income benefits on annuities. Thus, the secondary guarantee adds the risk that the account balance will be insufficient to fund the guaranteed benefit. Therefore, secondary benefits require testing over various scenarios of interest rates and/or equity returns to ascertain whether the reserve is sufficient to fund the secondary guarantees.

Q82. What methods are used to perform asset adequacy analysis for products with secondary guarantees?

ASOP No. 22, *Statements of Actuarial Opinion Based on Asset Adequacy Analysis for Life Insurance, Annuity, or Health Insurance Reserves and Other Liabilities*, Section 3.1.1, states the following:

“The actuary should use professional judgment in choosing an appropriate analysis method. The actuary may use a single method of analysis for all reserves and other liabilities or a number of different methods of analyses for each of several blocks of business.”

The actuary should consider using CFT and should refer to ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows*. CFT is generally appropriate where cash flows vary under different economic scenarios.

The actuary may consider using analysis methods other than CFT to evaluate the adequacy of the assets to support the reserves and other liabilities being tested.”

If the cash flows for products with secondary guarantees is expected to vary under different economic scenarios, then it may be appropriate to perform asset adequacy analysis using CFT.

Section H: Modeling Considerations—Expenses

Q83. What kinds of expenses are modeled for asset adequacy analysis?

According to VM-30, the Appointed Actuary should opine that “The reserves and related actuarial items, when considered in light of the assets held by the company with respect to such reserves and related actuarial items including, but not limited to, the investment earnings on the assets, and the considerations anticipated to be received and retained under the policies and contracts, make adequate provision, according to presently accepted ASOPs, for the anticipated cash flows required by the contractual obligations **and related expenses** of the company.” [emphasis added]

In ASOP No. 22, the definition of cash flow (Section 2.3) and the definition gross premium reserves (Section 2.6) both include expenses.

The expenses to be considered typically include maintenance expenses, commissions, investment expenses, and overhead expenses associated with the liabilities to be tested.

Q84. Are acquisition expenses considered?

The goal of asset adequacy testing is to evaluate the adequacy of reserves associated with inforce business. It is possible that inforce business (especially if it is in its first policy year) may still have acquisition expenses associated with it, which would, therefore, usually be considered expenses related to the business being tested. In addition, renewal commissions would likely be included. Expense studies that allocate expenses between acquisition and maintenance can provide helpful information to the actuary in determining which expenses to include.

Q85. How are expense assumptions set, and how are they checked for reasonableness?

In a 2012 survey of appointed actuaries, nearly all responding actuaries indicated they set unit expenses based on their own company’s experience. Other approaches used by responding actuaries included the use of pricing expenses or industry data (e.g., expenses from LOMA [formerly, Life Office Management Association], SOA studies, or the Generally Recognized Expense Table [GRET]).

A majority of respondents stated that they reconcile modeled expenses to the income statement as a way to check for reasonableness. Dynamic validations of the model (in which a few historical years of actual expenses are compared to a future years of projected expenses) may also provide helpful information to check reasonableness. Some states, such as California and New York, require an annual reconciliation of modeled expenses to the annual statement.

Q86. Pricing actuaries may assume that expenses will decrease over time, as economies of scale are reached. May this be reflected in testing?

Appointed actuaries sometimes reflect possible changes in future expense levels due to economies of scale or expense reduction initiatives. One approach may involve splitting

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the expenses into fixed and variable components, with different assumptions for each. Another practice in use is to use pricing assumptions, which sometimes assumes a decline in unit costs.

ASOP No. 7, *Statements of Actuarial Opinion Based on Asset Adequacy Analysis for Life Insurance, Annuity, or Health Insurance Reserves and Other Liabilities*, Section 3.5.2, states that “Considerations that might affect the projection include claim settlement and benefit payment practices, expense-control strategies.”

VM-30 requires that the actuarial memorandum should include “Documentation of assumptions used for ... commissions and expenses and morbidity.”

As with any assumption, the actuary should choose assumptions that are appropriate for the analysis.

Q87. Are insurance expenses generally adjusted for inflation?

Eighty-one percent of the respondents in the 2012 survey stated that they adjust expenses for inflation. A common way to do this is to have per-unit expenses and/or per-policy expenses — i.e., those that relate to fixed expenses — increase with the level of inflation appropriate to each scenario. Of those in the 2012 survey who model inflation, approximately 45% indicated they use a flat inflation assumption for all scenarios, and 55% percent indicated they vary the inflation rate by scenario. Certain expenses, such as those that vary as a percentage of reserves or account values, would automatically change as the level of reserves per policy changes over time. The level of inflation appropriate to a given scenario may be related to consideration of the long-term average real returns on the projected comparable investments. Some actuaries reflect both current and long-term inflation by using a starting rate of inflation that is consistent with current economic conditions and grading over time to a long-term inflation assumption.

Q88. Do actuaries perform sensitivity tests on the expense levels assumed in testing?

ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows*, Section 3.10.2, states that the appointed actuary “should consider and appropriately address the sensitivity of the model to the effect of variations in key assumptions.”

For some products and/or companies, expenses may be considered a key assumption. In the 2012 survey of appointed actuaries, 71% of the respondents indicated they do some sensitivity testing on expenses. Those respondents further indicated that additional sensitivity tests are performed on inflation and investment expense assumptions.

Q89. How are overhead expenses commonly reflected in testing?

There are many definitions of overhead expenses in use. Additionally, there are many opinions as to proper reflection of overhead to tested lines of business.

With respect to definition of overhead, some overhead expenses, such as management

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salaries, are typically viewed as recurring expenses. Other overhead expenses may be viewed as extraordinary or nonrecurring. For example, some appointed actuaries would view expenses associated with the attempt to acquire a new block of business as extraordinary in nature, not as obligations of the inforce business being tested, but rather as being an obligation of the new block of business after it is acquired. Other actuaries point out that a similar level of extraordinary expense occurs each year and therefore include it as part of the maintenance expenses used in CFT.

With respect to reflection of overhead, the 2012 survey showed a wide range of practices with respect to the allocation of overhead in testing models. The majority (73%) of appointed actuaries let unit expenses fully reflect all policy-related maintenance and overhead expenses. Others let unit expenses reflect the policy-related expenses only and reflect overhead through a separate model or an on-top adjustment to the results. Still others do not reflect the overhead in the unit expenses at all. As described in question Q83, VM-30 requires that asset adequacy testing consider “the anticipated cash flows required by the contractual obligations and related expenses of the company.” Therefore, if certain expenses are excluded the actuary would need to document why they are not related to the contractual obligations.

Q90. How are investment expenses typically handled in CFT?

There are several practices that have been observed:

- Develop a formula of investment expenses as several basis points per year, which are deducted from the earned rate for each asset type.
- Reflect investment expenses explicitly or use, in the projections, an earned rate that is already reduced by the investment expense assumption.
- Develop investment expenses as part of their analysis of their company’s total expenses and therefore do not explicitly model them.

Regardless of the approach used, actuaries may check the reasonableness of their modeled investment expenses by reconciling to the annual statement or to other company data. The actuary may also wish to consult their investment department or advisor in setting this assumption for both the inforce assets as well as their planned reinvestment assets. Actuarial Guideline No. 53 (AG53), which clarifies the requirements of the Valuation Manual and is required if a company meets the conditions outlined in the scope, states that “Assumed investment expenses, whether paid to an external asset manager or to internal investment management staff, as well as additional expenses that are directly attributable to the specific investments, should be commensurate with the expected expenses in light of the complexity of the assets.” In addition, AG53 indicates that the asset adequacy documentation should include “Identification of the assumed gross asset yield and the key components (for example, default and investment expenses) deducted to arrive at the assumed net asset yield.”

Section I: Reliance on Other Parties

Q91. What is the relationship between the appointed actuary and those on whom the actuary relies?

Prior to accepting the position of appointed actuary, or as soon as practicable thereafter, the actuary may choose to meet with the persons or firms upon whom the actuary intends to rely. The following documents contain guidance on reliance:

- VM-30, Sections 3.A.1.d and 3.A.6, contain both guidance and requirements.
- ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows*, Section 4.1.
- ASOP No. 22, *Statements of Opinion Based on Asset Adequacy Analysis by Actuaries for Life or Health Insurers*, Sections 3.1.12 and 4.1.r. Note that this ASOP points to ASOP Nos. 23, 41, and 56 for further guidance.

Respondents to the 2012 survey of appointed actuaries indicated that reliance statements are typically received from the following:

- Company investment staff: 63%
- Senior company management: 47%
- IT or administrative staff: 46%
- Line of business actuaries: 34%
- External investment advisors: 15%
- Consultants: 7%
- Other (mostly third-party administrators, reinsurers, or accountants): 21%

Sensibly, the actuary will typically not rely upon a person for whom the actuary has a high degree of oversight and control of work product (e.g., an actuarial student who reports to him or her). Also, the actuary will typically not rely upon the company's external auditor, as per a Notice to Practitioners dated February 1991 from the American Institute of Certified Public Accountants:

“The auditor should not consent to be referred to in an actuarial opinion in which the actuary expresses reliance on the auditor for the accuracy of the underlying data. If the auditor becomes aware that an actuary has expressed such reliance on the auditor, the auditor should advise the actuary that he or she does not consent to such reference, and the auditor should consider other actions that may be appropriate and may also wish to consult with legal counsel.”

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Q92. What data reliability tests might the appointed actuary perform?

The statement of actuarial opinion applies to all inforce business on the statement date, including both assumed and reinsured business. Tests of data reliability will typically depend upon the method used for asset adequacy analysis and whether the appointed actuary has relied upon others in developing data, procedures, or assumptions.

VM-30 provides recommended language with respect to what is included in the reliance as well as the extent of the actuary's review. Tests of data reliability may include evaluation of data for reasonableness and consistency and reconciliation of the underlying records to applicable exhibits and schedules of the annual statement (e.g., Exhibits 5, 6, and 7; claim liabilities in Exhibit 8, Part 1; equivalent items in the separate account statement, and the underlying assets).

Other ASOP references for tests of data reliability are:

- ASOP No. 7, *Analysis of Life, Health, or Property/Casualty Insurer Cash Flows*;
- ASOP No. 22, *Statements of Actuarial Opinion Based on Asset Adequacy Analysis by for Life Insurance, Annuity, or Health Insurance Reserves and Other Liabilities*;
- ASOP No. 23, *Data Quality*;
- ASOP No. 41, *Actuarial Communications*; and
- ASOP No. 56, *Modeling*.

Q93. Upon whom may the appointed actuary rely for accuracy of records and information?

Many actuaries believe that the person they are relying upon should have the necessary breadth and depth of knowledge with respect to the related subject matter. Section 3.A.6 of VM-30 allows the appointed actuary to rely on other experts in developing data, assumptions, projections, and analysis, supported by a statement of each such expert with the information prescribed by Section 3.A.12. Section 3.A.12 states the following:

“If the appointed actuary relies on other experts for data, assumptions, projections or analysis in forming the actuarial opinion, the actuarial opinion should identify the experts the actuary is relying upon, and a precise identification of the information provided by the experts. In addition, the experts on whom the appointed actuary relies shall provide a certification that identifies the specific information provided; states that supporting documentation was provided; opines on the accuracy, completeness or reasonableness of the information provided; and describes their qualifications. This certification shall include the signature, name, title, company, address and telephone number of the person rendering the certification, as well as the date on which it is signed.”

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Q94. What level of detail is used to review the underlying liability inforce records from a third party?

From the 2004 survey of appointed actuaries, 131 respondents answered this question as follows:

No review, just reliance from third party	14%
A limited, cursory review looking for glaring discrepancies	11%
A moderate review of reasonableness and consistency	73%
An in-depth analysis (audit level)	2%

Within the “moderate review” category, one or more of the following methods was used:

Verify inforce against company work papers	92%
Compare data with prior year for consistency	84%
Perform test to identify questionable values	45%
Other	1%

Q95. What level of detail is used to review the underlying asset inforce records from a third party?

From the 2004 survey of appointed actuaries, 130 respondents answered this question as follows:

No review, just reliance from third party	18%
A limited, cursory review looking for glaring discrepancies	26%
A moderate review of reasonableness and consistency	53%
An in-depth analysis (audit level)	3%

Within the “moderate review” category, one or more of the following methods was used:

Verify inforce against company work papers	90%
Compare data with prior year for consistency	85%
Perform tests to identify questionable values	60%

Q96. What level of detail is used to review assumption support from a third party?

From the 2004 survey of appointed actuaries, 117 respondents answered this question as follows:

No review, just reliance from third party:	8%
A limited, cursory review looking for glaring discrepancies	11%
A moderate review of reasonableness and consistency	79%
An in-depth analysis (audit level)	3%

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Within the “moderate review” category, one or more of the following methods was used:

Compare data with prior year analysis	87%
Compare assumptions with company data studies and analysis	80%
Other	3%

Section J: Analysis of Results

Q97. What measures are commonly used to test reserve adequacy for the actuarial opinion?

Among the respondents to the 2012 survey of appointed actuaries, 42% indicated they use the present value of ending surplus as the primary basis to determine reserve adequacy, while 50% focus on accumulated value. Still another 8% use other present values (such as present value of profits) as the primary basis to determine reserve adequacy.

Of the 92% who use either present value or accumulated value of surplus, 47% of survey respondents rely primarily on book value of surplus to determine reserve adequacy, 32% rely primarily on market value, and 13% use market value of assets minus book value of liabilities as their definition of surplus for this purpose.

One basis used by many actuaries is the estimated “ending net market value,” calculated by estimating the market value of assets at the interest rates in effect at the end of the scenario and deducting the present value (as of the end of the projection, at the same interest rates) of the remaining projected benefits and expenses. This gives an estimate of the market value of the ending surplus. Some actuaries assume that the remaining liabilities are lapsed for cash value with the liquidation of assets at market value to cover the cash surrender.

When asked how market value of liabilities (MVL) were determined, 35% of survey respondents answered that MVL was not relevant to their work. Of those for whom MVL was relevant, some respondents gave different answers for different lines of business, such that the following percentages add to more than 65%: 26% used cash surrender value, 20% used the present value of future cash flows (as of the end of the projection), and 4% used a gross premium reserve. Also, 32% said that they used the book value of liabilities or the statutory reserves as their proxy for MVL.

Some actuaries project the book values (as opposed to market values) until the remaining liabilities are not material, with a positive book value of surplus at the end of the test period considered acceptable. Some regulators require that the ending value of surplus results be presented on a market value basis.

Additionally, some actuaries consider the size and frequency of any interim deficiencies.

Q98. How do actuaries define the criteria used to determine reserve adequacy?

The 2012 survey asked, “What is your current criteria for establishing reserve adequacy?” Of those who responded, 70% chose answers suggesting use of a predetermined rule or guideline. Their answers broke down as follows:

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- Thirty-six percent indicated that their criterion was “Enough to pass a specified number of New York 7 scenarios, but not necessarily all of them.”
- Nineteen percent indicated that their criterion was “Enough to pass all of the New York 7 scenarios.”
- Eleven percent answered, “Enough to pass a specified percentage of the stochastic scenarios.”
- Three percent answered, “Enough to pass the level interest scenario.”

The remaining 30% gave answers indicating that they were applying some kind of additional judgment. Of the total respondents, 6% indicated that they opined based on their own alternate deterministic scenarios. Others gave written answers describing a series of (or combinations of) diverse tests. For example, passing a specified number (but not all) of the New York 7 and a specified percentage of stochastic scenarios was the choice of 8% of the respondents.

In interpreting these survey results, it is important to consider the low-interest-rate environment that existed when the survey was taken (fall 2012).

Q99. What factors are considered in setting the criteria for reserve adequacy?

Some actuaries believe that the development of appropriate criteria for reserve adequacy is heavily dependent on the degree of conservatism used to establish the assumptions for each scenario. Some actuaries use a criterion of positive surplus in all scenarios tested for the reserve to be deemed adequate if all of the scenarios in the study represent moderately adverse or more favorable conditions. On the other hand, some actuaries believe that if stochastic approaches were used (generating scenarios that represent the universe of possible outcomes, including extremely adverse conditions “in the tail”), additional reserves would not usually be necessary if a specified small percentage of the scenarios produced negative surplus.

ASOP No. 22, *Statements of Opinion Based on Asset Adequacy Analysis by Actuaries for Life or Health Insurers*, states that failing a small percentage of a large number of scenarios may not indicate the need for additional reserves or other liabilities. In judging the results of a multi-scenario test, the actuary will typically bear in mind that the surplus generated by any scenario typically is subject to a number of assumptions used in the testing (e.g., investment strategy, interest crediting strategy, and dynamic lapse formula). The liberalism or conservatism of these various assumptions can influence the interpretation of the results.

Additionally, to the extent the actuary considers mandatory scenarios (such as the New York 7 in New York filings), certain of these scenarios may be considered beyond moderately adverse, depending on the current economic environment. ASOP No. 22 gives guidance in this area. Section 3.2.2 states that “the actuary should determine whether the reserves and other liabilities being tested are adequate under moderately adverse conditions, in light of the assets supporting such reserves and other liabilities.”

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Actuarial judgment may indicate that certain mandatory scenarios exceed this requirement. In such cases, testing similar, but less severe, scenarios may be appropriate in reaching a determination.

Although the criteria for establishing reserve adequacy are generally better understood now than they were 20 years ago, one article that is still a useful general reference is “Zen and the Art of Reserve and Asset Adequacy,” by D. Becker, M. Smith, and M. Zurcher. This article was first published in Lincoln National’s *Reinsurance Reporter* (3rd quarter, 1993), which is now published by Swiss Re Life & Health America.

For sets of randomly generated scenarios, some actuaries consider what percentage of scenarios failed and by how much. An actuarial test of reserve adequacy is not a solvency test. While a test of solvency generally would involve the passing of a very large percentage of scenarios (and a reasonable limit to the severity of a failure), a reserve typically may be considered adequate as long as a reasonable percentage of scenarios, including a high percentage of moderately adverse scenarios, is passed.

In establishing adequacy criteria, some actuaries consider whether the guidelines apply at the line of business (or product) level or for the entire company. Some actuaries believe that the tolerance for adverse results will be lower at the aggregate than at a line of business level.

Ultimately, the decision to establish additional reserves depends on the actuary’s judgment, regardless of the chosen criteria. The basis of the judgment is typically documented in the supporting memorandum. If additional reserves are recommended and management decides not to strengthen reserves, then the appointed actuary may issue an opinion other than a nonqualified opinion.

To get some indication of the impact of deliberate conservatism in asset adequacy analysis, the following question was included in the 2012 survey: “If you intentionally hold implicit or explicit margins of conservatism, by how much do these impact overall results?” Eighteen percent of respondents estimated the impact of conservatism on results at 0% to 5%; 31% chose the range 6–10%; 9% selected an impact of 11% or more. Twenty-one percent answered, “Not applicable,” and 21% answered “Don’t know.”

Q100. How often have actuaries established additional reserves as a result of asset adequacy analysis?

Approximately 45% of those responding to this question in the 2012 survey of appointed actuaries reported that they have increased reserves as a result of asset adequacy analysis at some point in the past.

Of those who answered yes to this question, 50% established additional reserves for year-end 2011.

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Q101. To what extent do actuaries look at interim results to determine reserve adequacy?

In the 2012 survey of appointed actuaries, 74% of the survey respondents indicated they consider projected results in interim periods as “important” (67%) or “critically important” (7%). The remaining respondents said that such interim results are either “not very important” (18%) or “unimportant” (8%).

Consistent with the above responses, 75% of all respondents look at the projected results in interim periods and 7% look at the year-by-year present value of those interim results. Of all respondents, 58% use book value of surplus when examining interim results, while 11% use market values and 6% use market values of assets less book value of liabilities.

Regarding the scenarios that are considered, 63% of the respondents look at all of the New York 7 scenarios, 16% look at New York 7 scenario No. 1 only, while the remaining respondents look at (i) subsets of the New York 7 scenarios Nos. 1 to 7, (ii) all deterministic scenarios, or (iii) all deterministic and stochastic scenarios.

Of those who strengthened reserves based on interim results, the method used to release the strengthened reserves generally varied based on the reasons the reserves were strengthened. For example, some reserves are released over the life of the business (e.g., to reflect mortality deterioration or low interest rates) while others are released over a fixed period (e.g., to cover a short-term period of higher asset defaults).

VM-30 requires the preparation of a RAAIS. The RAAIS requests commentary on any interim results that may be of significant concern to the appointed actuary. Such commentary may include a discussion of large negative values, early negative values, and protracted periods of negative value.

Some states may impose additional requirements with respect to interim results. As an example, in the 2023 California “Holiday Letter” (dated Nov. 1, 2023; Subject “2023 Actuarial Memorandum and Regulatory Asset Adequacy Issues Summary”) specifically requires that “If negative interim or ending surplus results are of no significant concern to the Appointed Actuary, explain why.”

Note that for blocks of business subject to principle-based reserves, the modeling of interim or future reserve amounts can be challenging. Some actuaries may use proxy interim values for such reserves.

Q102. If, based on asset adequacy analysis, the reserves are judged to be inadequate, how does the actuary decide upon the amount of additional reserves?

Approximately one-half of the respondents to this question in the 2012 survey indicated that they never had to set up additional reserves. Of the remainder, 65% indicated that they calculate the present value necessary to eliminate the deficiency based on the same criteria they use for establishing reserve adequacy, and 18% indicated that, in addition to

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using present values, they also adjust reflect deficiencies in interim results. The remaining 17% reported use of a variety of techniques, including conditional tail expectation measures, gross premium reserves, amounts necessary to keep results positive for a predetermined length of time, and professional judgment.

Q103. When additional actuarial reserves are established, where are they placed in the annual statement?

The NAIC Annual Statement Instructions should be followed in the posting of additional actuarial reserves established as the result of asset adequacy analysis. In the 2023 Statutory Annual Statement additional actuarial reserves related to Exhibit 5 and Exhibit 7 business would be reported in the “Miscellaneous” section of Exhibit 5. Exhibit 6 has specific lines for additional actuarial reserves.

Q104. What might the appointed actuary do if notified of a material reserve misstatement?

In the 2013 NAIC’s *Annual Statement Instructions* for Life, Accident and Health insurers (Instruction 12 of the Actuarial Opinion section therein), the following is noted:

“The insurer required to furnish an actuarial opinion shall require its appointed actuary to notify its board of directors or its audit committee in writing within five (5) business days after any determination by the appointed actuary that the opinion submitted to the domiciliary Commissioner was in error as a result of reliance on data or other information (other than assumptions) that, as of the balance sheet date, was factually incorrect. The opinion shall be considered to be in error if the opinion would have not been issued or would have been materially altered had the correct data or other information been used. The opinion shall not be considered to be in error if it would have been materially altered or not issued solely because of data or information concerning events subsequent to the balance sheet date or because actual results differ from those projected.”

And,

“No appointed actuary shall be liable in any manner to any person for any statement made in connection with the above paragraphs if such statement is made in a good faith effort to comply with the above paragraphs.”

Recent NAIC *Annual Statement Instructions* do not include such language, but such language may inform a path for the appointed actuary to take, including communication with the BOD and the state of domicile.

Section K: Preparing the Opinion and Memorandum

Q105. What documents contain the requirements for the opinion and memorandum?

The requirements are contained in the SVL adopted by a state. Except for New York, additional requirements, including specific guidance on content and format, are contained in VM-30. New York requirements and guidance are contained in Regulation 126 and with additional requirements/considerations provided in the annual “Special Considerations” letter.

Q106. Where can one find the format and content of the opinion?

Apart from New York filings, the format and content of the opinion is contained in VM-30 (e.g., VM -30, Section 3 of the 2024 Valuation Manual). The New York requirements are contained in Regulation 126.

Q107. What is a “qualified opinion”?

VM-30 defines qualified, unqualified, adverse, and inconclusive opinions. The following is from the “Definition” section of VM-30:

“The term ‘qualified opinion’ means an actuarial opinion in which the appointed actuary determines the reserves for a certain item(s) are in question because they cannot be reasonably estimated, or the actuary is unable to render an opinion on those items. Such qualified opinion should state whether the stated reserve amount makes adequate provision for the liabilities associated with the specified reserves, except for the item(s) to which the qualification relates. The actuary is not required to issue a qualified opinion if the actuary reasonably believes that the item(s) in question are not likely to be material. (A qualified opinion does not meet one or more of the statements in Section 3.A.7.a through Section 3.A.7.d.)”

The appointed actuary will need to identify whether the opinion is unqualified, adverse, qualified, or inconclusive in the table of key indicators of the opinion. If the opinion is adverse, qualified, or inconclusive, the appointed actuary should explicitly state the reason for such an opinion (Section 3. A.10 of VM-30).

Q108. How does one determine which reserves and related actuarial items are to be included in the opinion?

The “actuarial opinion must apply to all in-force business on the annual statement date, whether directly issued or assumed, regardless of when or where issued,” per VM-30 Section 2.C.1. Thus, it applies to both assumed and ceded reinsurance business.

VM-30 Section 3.A.5 has a table the actuary is to tabulate with the reserves and

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related actuarial items. As this table reconciles to items on the statutory balance sheet it is generally filled out on a net of reinsurance ceded basis and therefore does not disclose ceded amounts. Additionally, this table does not include business assumed on a ModCo basis. As these amounts are included in the opinion, the actuary may consider adjusting the table as presented in VM-30 to accommodate such amounts. Included in this table are reserves and related actuarial items from Exhibits 5, 6, 7, and 8. Also included are separate account amounts, IMR, AVR, deferred premium assets and uncollected premiums. There is also a catchall category labeled “Other Reserves and Related Actuarial Items Tested.” This allows for inclusion of other items on page 2 and page 3 of the annual statement (e.g., page 2, accrued retrospective premiums).

Q109. What types of other actuarial reports do actuaries prepare in connection with asset adequacy analysis?

All states require the preparation of an actuarial opinion that is filed with the annual statement. The SVL and VM-30 require that an actuarial memorandum be prepared. Details regarding what is to be included in the memorandum are contained in VM-30. Most states do not require that the actuarial memorandum be filed along with the actuarial opinion. A few states require that the actuarial memorandum, or an executive summary of the actuarial memorandum, be filed.

New York Regulation 126 requires that an actuarial memorandum be submitted by all licensed insurers (not only domestic companies). Specific requirements can be found in Regulation 126 as well as in the annual New York “Special Considerations” letter.

VM-30 requires that the RAAIS, an executive summary of the memorandum, be submitted by the appointed actuary, typically by April 1 of each year. Additional reports include X-Factors memorandum and most recently disclosure of information required by Actuarial Guideline LIII, which may be incorporated within the VM -30 memorandum or as a stand-alone document.

In addition to regulatory reports, many actuaries prepare reports for other audiences such as internal management, external auditors, the BOD, and rating agencies.

Management reports typically include an executive summary of the memorandum rather than the entire memorandum. Some actuaries use the same executive summary for management that is used for regulators, while others prepare a modified summary that may contain information not included in the regulatory summary. External auditors typically request copies of both the memorandum and the executive summary for management, along with supporting analysis and documentation. Rating agencies typically request copies of both the actuarial opinion and memorandum.

Q110. What level of detail is typically included in the actuarial memorandum?

VM-30, Section 3.B. provides details on what must be included in the memorandum.

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Below is a table giving the responses from the 2012 survey of appointed actuaries for the general type of information respondents include in the memorandum. Although this survey is dated, it includes elements that are not specifically addressed in VM-30 and may be informative to the audience of the memorandum. The percentages represent the percentage of respondents that include the respective item in the memorandum:

Description of scenarios used	99%
Description of sensitivity tests	98%
Description of company and markets in which products are sold	92%
Product description of each product modeled	89%
Products subject to asset adequacy	89%
Breakdown of modeled reserves by line and by type of reserve	88%
Description of reinsurance	87%
Aggregation methods used	83%
Description of reserves not tested	79%
Results by each line of business	79%
Breakdown of modeled assets by line and by asset type	79%
Interim results in the aggregate	72%
Interim results by line of business	56%
Definition of moderately adverse conditions	53%
Factors causing better or worse results in each line of business	48%
Reconciliation between Sept. 30 and Dec. 31	41%

Responses from the survey regarding the level of detail for liability assumptions by line of business:

Detailed listing of key assumptions, high-level description for others	64%
Detailed description and/or listing of assumption factors used	60%
Only high-level description of assumptions	17%

Responses from the survey regarding the level of detail for asset assumptions by portfolio:

Asset segmentation/allocation description	75%
Detailed listing of key assumptions, high-level description for others	56%
Detailed description and/or listing of assumption factors used	43%
Only high-level description of assumptions	23%

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Q111. What is typically contained in an executive summary for management?

Information included in the executive summary for management differs widely, depending on the types of items that are of interest to company management. Many actuaries include a description of the asset adequacy methods used, a description of the major changes in assumptions and/or methods from the prior year, a description of the criteria used to determine asset adequacy, and a summary of the asset adequacy results. Some executive summaries give a brief history of the objectives of asset adequacy analysis, the areas that contributed to the study, a description of the scenarios used, and results that highlight the concerns of management. Other items that are sometimes included are projections of RBC levels at certain future points, interim results during the projection period, and breakdowns of CFT results by major product line. In any event, discussion of the conditions that pose a risk to asset adequacy and how the company could manage under such conditions might be valuable.

Q112. What is discussed in the RAAIS?

VM-30 lists the following items to be included in the RAAIS:

- Whether or not the opinion is unqualified or not, and if not, why;
- Descriptions of the scenarios tested (including whether those scenarios are stochastic or deterministic) and the sensitivity testing done relative to those scenarios;
- Whether there are ending surplus results that are negative, and the amount of any additional reserve established to eliminate the negative surplus at the end of the testing period;
- Any material differences in assumptions from the year before;
- The reserves subject to asset adequacy the year before, but not subject in the current opinion;
- Comments on any interim results that may be of significant concern;
- The method used to recognize the impact of reinsurance; and
- Whether the actuary recognized all options embedded in assets and liabilities and any equity-like features.

Some states, including New York and California, require additional disclosures within the RAAIS.

Section L: Impact of AG43, PBR, and Other Nonformulaic Valuation Standards

Q113. What is the “history” of statutory valuation and how is the role of asset adequacy analysis changing?

Elizur Wright established minimum reserve standards for Massachusetts insurance companies in 1858. These reserves were based on a formulaic method with prescribed assumptions such as mortality and valuation interest rate. Later, some companies tested their reserves using a GPV, but, as late as 1985, neither regulators nor the actuarial profession mandated use of CFT. With the introduction of interest-sensitive products having a flexible crediting rate closely related to the rate earned on assets backing the reserves, it became apparent that simplified formula reserves might become inadequate if the company could not earn the guaranteed minimum crediting rate. This situation was exacerbated by the inflationary and unstable interest rate experience in the 1980s, which caused further mismatch between assets and liabilities.

In response to this experience, regulators have gradually introduced more dynamic and flexible valuation requirements. The commissioners’ annuity reserve valuation method (CARVM) was introduced in 1980, requiring multi-scenario analysis of deferred annuities, with the scenarios depending on lapse and mortality experience, rather than interest rate paths. CARVM was further clarified in 1998 with Actuarial Guideline XXXIII. Dynamic valuation interest rates were introduced in 1982. The Academy drafted “Recommendation #7” requiring CFT, and in 1985, New York incorporated this draft language into Regulation 126; this was the first U.S. regulatory requirement for asset adequacy analysis. Since then, the regulatory requirement for asset adequacy analysis has grown to include almost all products and companies. In the early 1990s, the first version of the AOMR was adopted, bringing a level of standardization to asset adequacy analyses performed throughout the industry.

Flexible mortality assumptions for calculation of deficiency reserves were introduced in 2000 in the Valuation of Life Insurance Policies Model Regulation commonly known as “Regulation XXX.” Its successor, Actuarial Guideline XXXVIII, followed as new product designs were introduced. The year 2009 saw the introduction of AG43 for variable annuities, requiring a stochastic projection of interest rate and equity return scenarios, along with assumptions that were responsive to varying economic conditions in different scenarios. (The need for AG43 followed more than 10 years of research and committee work by the Academy, which was unable to find an appropriate simplified valuation method for valuing variable annuities with GMIBs.) Around the same time, it became apparent that ordinary life insurance and other products were also moving in the same direction, with multiple options and dynamic crediting rates embedded in these products. Meanwhile, it was apparent that AG38 and Regulation XXX sometimes produced reserves that were well in excess of those needed under moderately adverse conditions, as required by reserve adequacy standards. This led to increased focus on a PBR concept for valuation, wherein reserve calculation methods and assumptions are fully dynamic and flexible, following actuarial principles rather than

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prescribed formulas or assumptions, and result in reserve levels that some believe are adequate based on how they are calculated. Because this theoretical concept had not yet proved its reliability, the emerging standards took on a diverse mixture of old (formulaic, prescriptive) and new (experience-based, company-specific, actuarial professionalism) guidance. Consequently, new reserving methods following a PBA have been introduced in recent years, and these continue to evolve (refer to Q105).

Prior to the Valuation Manual, the SVL (NAIC Model Law #820) and the AOMR(s) governed the actuarial opinion and supporting memorandum. With the adoption of the Valuation Manual, the SVL (Section 3) and the VM-30 govern the opinion and supporting memorandum.

Q114. Which statutory standards follow the principles-based approach (PBA)?

The introduction of the Valuation Manual in 2017 set PBR requirements for life insurance and variable annuity products.¹ A three-year transition rule made this effective for all policies issued on or after Jan. 1, 2020. Variable annuities issued since 1980 are included by way of Actuarial Guideline 43, which points to VM-21. In addition, some requirements exist for stand-alone asset adequacy reserve analysis, which incorporates a PBA, such as for life insurance business subject to AG 38 Section 8C (AG38 8C), and Long-Term Care (Actuarial Guideline 51). Some states have adopted model regulations for synthetic GIC contracts which require an actuarial opinion based on asset adequacy analysis.

Although non-variable annuities do not currently have a PBR requirement, draft language is being discussed publicly and adoption is expected in the coming years.

Beyond statutory reserves, there are also capital requirements such as RBC C-3 Phase 1 for fixed annuities and single-premium life insurance and RBC C-3 Phase 2 for variable annuities. These, too, can involve projections of asset and liability cash flows, with differences in the level of prescription of assumptions and the testing requirements (e.g., scenarios), as well as the scope of the business included.

Q115. Do PBRs simultaneously satisfy the requirements of VM-30 asset adequacy with respect to adequacy of the reserves (i.e., reserve adequacy, in light of the supporting assets, under moderately adverse conditions)?

All inforce and assumed business is subject to asset adequacy testing under VM-30, regardless of the method used to determine the reserve. However, while the adequacy requirements are commonly met via a method such as CFT, other methods are possible.

Some actuaries believe that PBRs meet the “moderately adverse conditions” per VM-30, and thus include such business in the analysis via the method of Demonstration of Conservatism. Some actuaries will substantiate this through simplified testing or

¹ Specific exemptions are allowed for companies operating in a single state and not issuing certain products, with regulator approval.

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sensitivity analysis. Other actuaries will continue to include PBRs business in CFT or other analysis as part of VM-30 asset adequacy testing.

In considering whether PBRs reserve meets the moderately adverse conditions for reserve adequacy, an actuary may consider the following:

- An actuary might consider product-specific aspects (optionality, volatility of experience, sensitivity to various assumptions, etc.) as well as distribution of results (where available) under different financial conditions. With varying financial conditions, as well as possible differing product characteristics at different policy durations, it is possible that the decision made by the actuary could be different on different valuation dates.
- There is a further complication in that, under the Valuation Manual, only some of a company's reserves are subject to PBR methods. This could, for example, impact the ability to aggregate results depending on the analysis.
- There are variations between cash flow items an actuary will reflect in PBRs and asset adequacy analysis. For example, federal income taxes are not included in VM-20 and VM-21 calculations but would be included in asset adequacy analyses.

With the advent of PBRs and the Valuation Manual for life insurance, it is likely that practice in this area will continue to evolve.

Q116. How are AG43/VM-21 reserves treated in VM-30 asset adequacy analysis?

Like all inforce and assumed business, reserves for variable annuities determined under AG43/VM-21 are subject to asset adequacy testing. Given the PBA nature of AG43/VM-21, some actuaries believe that the reserve determined meets the “moderately adverse conditions” associated with reserve adequacy and thus include it in the analysis via the method of Demonstration of Conservatism. While such a reserve may be considered conservative at a particular valuation date, margins may deteriorate in the future under the same calculation method and assumptions. Thus, some actuaries will perform a simplified analysis (perhaps a single scenario) to satisfy themselves that the AG43/VM-21 reserve remains adequate.

Alternatively, some actuaries take the approach of continuing to fully incorporate the AG43/VM-21 business in asset adequacy analysis through a method such as CFT. In doing so, any elements of excess conservatism included in the VM-21 reserve calculation may become available as additional sufficiency in asset adequacy analysis (and alternatively, any insufficiency would also be reflected).

From the 2012 appointed actuary survey, 45% of the survey respondents reporting AG43/VM-21 reserves defined AG43 as meeting the reserve adequacy requirement, some with additional sensitivity testing, while 55% included the business in a CFT analysis. Note that at the time the survey was conducted, a standard scenario reserve floor was also required.

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Where the results of variable annuity product projections are included in the aggregate company results, it is necessary to first determine the reserve requirement under AG43/VM-21, as this serves as the initial reserve tested under asset adequacy analysis.

Q117. How are AG38 reserves included in VM-30 asset adequacy analysis?

There are currently two sections in AG38 that incorporate a PBA: Sections 8C and 8D. Both sections scope in universal life with secondary guarantees issued during certain periods. Section 8C includes all universal life with secondary guarantees issued between Jan. 1, 2007, through Dec. 31, 2012, and Section 8D includes universal life with secondary guarantees with multiple sets of charges issued between July 1, 2005, and Dec. 31, 2012. Section 8C includes a stand-alone asset adequacy analysis that tests the formulaic reserve used for products subject to this requirement. Section 8D is a reserve calculation using a PBA method. There is potential overlap between Sections 8C and 8D, resulting in some policies being subject to both of these requirements.

AG38 8C:

Reserves determined under AG38 are subject to VM-30 asset adequacy analysis. In completing this analysis, many actuaries make use of various models, each representing different blocks of business, that are then summed to determine the aggregate results for the company. In such cases, the AG38 8C asset adequacy analysis may represent one of these subset blocks of the company. Alternatively, some actuaries may combine the AG38 8C policies with other policies of the company in completing their analysis. In such cases, the aggregate result may not be equal to what otherwise would have been the “sum of the parts.” Alternatively, an actuary could choose to consider the AG38 8C business as “tested”: in such case, any sufficiency found within the AG38 8C block would effectively not be included in the aggregate company results. (Note: If the AG38 8C result is a potential insufficiency, an additional reserve may be established to achieve adequacy. Such additional reserve would become part of the initial reserve tested for the AG38 8C business under asset adequacy analysis. Hence, it would not be expected that there could be a situation where an “insufficiency” could be ignored when choosing not to include the AG38 8C results in the aggregate results.)

AG38 8D:

Reserves determined under AG38 are subject to VM-30 reserve adequacy analysis. Given the PBA nature of AG38 8D, some actuaries believe that the reserve determined meets the “moderately adverse conditions” associated with asset adequacy analysis and thus these actuaries include the reserve in the analysis via the method of Demonstration of Conservatism. While such a reserve may be considered conservative at a particular valuation date, there may be changes in conditions or other factors that affect the margins. Thus, some actuaries will perform a simplified analysis (perhaps a single scenario) to satisfy themselves that the AG38 8D reserve remains adequate under the requirements of asset adequacy analysis.

Alternatively, some actuaries take the approach of continuing to fully include the AG38

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8D business in asset adequacy analysis through a method such as CFT. In doing so, elements of conservatism included in the AG38 8D reserve calculation may become available as additional sufficiency in the analysis.

Where the results of the AG38 8D products are included in the aggregate company results, it is necessary to first determine the reserve requirement under AG38 8D, as this serves as the initial reserve to be tested in the analysis.

Q118. How does AG38 8C interact with AG38 8D, and in turn with VM-30 asset adequacy analysis?

There are three combinations of the AG38 8C and AG38 8D policies to consider:

- a) Policies that are subject to AG38 8C, but not to AG38 8D:

Most actuaries would calculate the AG38 8C formulaic reserve and use this as the initial reserve in the stand-alone asset adequacy analysis. If an additional stand-alone asset adequacy analysis is indicated, this reserve would become part of the initial reserve for the asset adequacy analysis. Some actuaries would then perform the testing, possibly with this block as a subset of the total, or possibly combined with other business.

- b) Policies that are subject to AG38 8D, but not to AG38 8C:

Most actuaries would first calculate the AG38 8D reserve. Some actuaries would then consider this reserve to meet the reserve adequacy requirements via the method of Demonstration of Conservatism, possibly confirming this through a simplified analysis or other approach. Alternatively, some actuaries would include the AG38 8D business in the overall asset adequacy analysis, with its contribution to the sufficiency (or insufficiency) reflected in the company's aggregate result.

- c) Policies that are subject to both AG38 8C and AG38 8D:

Most actuaries would first calculate both the AG38 8C formulaic reserves and the AG38 8D reserves and determine the higher amount to be the appropriate initial reserve for the policy. If the AG38 8D reserve is higher, some actuaries would consider this reserve to automatically meet a “moderately adverse conditions” requirement. Alternatively, some actuaries would complete a stand-alone asset adequacy analysis to determine whether any additional reserves were required. If an additional stand-alone asset adequacy analysis is indicated, this reserve would become part of the initial reserve for asset adequacy analysis. Some actuaries would then perform the analysis, possibly with this block as a subset of the total, or possibly combined with other business. Alternatively, some actuaries would consider reserve adequacy requirement to have already been met.

It is noted that some of the aforementioned blocks may be combined, for example, AG38 8D that is also AG38 8C, with AG38 8C that is not also AG38 8D, in performing the AG38 8C asset adequacy analysis. Such approaches may vary given practical modeling

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and materiality considerations.

Q119. If an actuary establishes an additional reserve, is this additional reserve included in subsequent analyses?

Asset adequacy analysis is a test of the “initial reserve” for inforce policies as reported in the current statement. Thus, if an “additional reserve” is part of the initial reserve, it is generally included in the analysis.

For example, AG38 8C may result in an additional asset adequacy analysis reserve established. This becomes part of the reported reserve of the AG38 8C business. When the AG38 8C block is then tested under asset adequacy analysis, the entire initial (reported) reserve is included.

Q120. What differences exist between completing the asset adequacy analysis required under VM-30 versus that required under AG38 8C?

Asset adequacy analysis methods apply under both aggregate analysis and stand-alone analysis (AG38 8C). Thus, methods and approaches will be similar. Scope (business included) obviously differs. Assumptions and scenarios considered would generally not differ. However, some actuaries may include larger margins in stand-alone analyses given that natural offsets with other blocks of business are unavailable. Similarly, for stand-alone analysis, it may be that some scenarios otherwise considered for the total company are not applicable. Documented substantiation of differences applied to the policies that fall under these two requirements may be warranted.

Q121. What differences exist in establishment of additional reserves under VM-30 versus AG38 8C stand-alone asset adequacy analysis?

Many actuaries would use the same models, assumptions, scenarios, etc., in completing both requirements for the same block of business. As such, results of the analyses would be expected to be the same. However, some difference could exist if the AG38 8C business is combined with other business of the company in meeting VM-30 requirements. Regardless, the actuary will establish any additional reserve based on the results.

Consistency in analytic approach is generally desired. However, some actuaries believe that a more stringent standard should be applied when reviewing stand-alone testing results that do not have the opportunity for offset in the aggregate with other business of the company.

Q122. What differences exist in the reporting requirement of VM-30 versus other regulatory analyses?

The specific reporting requirements for VM-30, AG38 8C, AG38 8D, AG43, VM-20, AG51, etc., are found in the Valuation Manual, regulation, or guidelines. Many analyses require that a “stand-alone report” be prepared. As there can be substantial repetition of

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information among related reports, some actuaries will create a “base” report and then reference it in other reports where necessary. Some actuaries will create common report

“chapters” or “appendices” that can be combined in different ways to meet the multiple reporting requirements. Some actuaries will create a single “giant report” that includes all requirements. Other actuaries will create separate, distinct reports, potentially with significant repetition of data. Often the exact structure of the reports will vary depending on the relative importance of each block of business (materiality), the degree of complexity of the analysis, and/or in response to preferences expressed by the company’s domestic regulator or other recipient of the report.

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Appendix A: Acronym Definitions

ABS	Asset-Backed Security
Academy	American Academy of Actuaries
ACLI	American Council of Life Insurers
AG38 8C	Actuarial Guideline XXXVIII, Section 8C
AG38 8D	Actuarial Guideline XXXVIII, Section 8D
AG43	Actuarial Guideline XLIII for Variable Annuities
AG54	Actuarial Guideline LIII
ALM	Asset Liability Management
AOMR	Actuarial Opinion and Memorandum Regulation
ASOP	Actuarial Standard of Practice
AVR	Asset Valuation Reserve
BOD	Board of Directors
CARVM	Commissioners' Annuity Reserve Valuation Method
CE	Continuing Education
CFT	Cash Flow Testing
CLO	Collateralized Loan Obligation
CMBS	Commercial Mortgage-Backed Security
CMO	Collateralized Mortgage Obligation
DTA	Deferred Tax Asset
DTL	Deferred Tax Liability
FHLMC	Federal Home Loan Mortgage Corporation
FNMA	Federal National Mortgage Association
GMIB	Guaranteed Minimum Income Benefit
GNMA	Government National Mortgage Association
GPV	Gross Premium Valuation
IMR	Interest Maintenance Reserve
LATF	Life Actuarial Task Force
LIBOR	London Interbank Offered Rate
LOMA	Life Office Management Association
MBS	Mortgage-Backed Security
ModCo	Modified Coinsurance
MVL	Market Value of Liabilities
NAIC	National Association of Insurance Commissioners
OAS	Option-Adjusted Spread
PAC	Planned Amortization Class
PBA	Principle-Based Approach
PBR	Principle-Based Reserve
PIK	Payment in Kind
RAAIS	Regulatory Asset Adequacy Issues Summary
RBC	Risk-Based Capital
Regulation XXX	Valuation of Life Insurance Policies Model Regulation
SERT	Stochastic Exclusion Ratio Test
SOA	Society of Actuaries
SOFR	Secured Overnight Financing Rate

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SPV	Special Purpose Vehicle
SVL	Standard Valuation Law
VM-01	Valuation Manual-01
VM-20	Valuation Manual-20
VM-21	Valuation Manual-21
VM-30	Valuation Manual-30
VM-G	Valuation Manual-Appendix G
WAL	Weighted Average Life