A PUBLIC POLICY PRACTICE NOTE

ASOP No. 51: Risk Assessment in Practice

July 2020

Developed by the Pension Committee of the
American Academy of Actuaries

American Academy of Actuaries
Objective. Independent. Effective.™

PENSION COMMITTEE PRACTICE NOTE

This practice note is not a promulgation of the Actuarial Standards Board (ASB), 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 subsequent to this publication of the practice note may make the practices described in this practice note irrelevant or obsolete.

2020 Pension Committee

Bruce Cadenhead, MAAA, FSA, FCA, EA, Chairperson
Elena Black, MAAA, FSA, FCA, EA, Vice Chairperson

Michael Antoine, MAAA, FSA, FCA, EA
Michael Bain, MAAA, ASA, FCA, FSPA, EA
Rachel Barnes, MAAA, FSA, FCA, CERA, EA
Margaret Berger, MAAA, FSA, FCA, EA
Scott Hittner, MAAA, FSA, FCA, EA
Lloyd Katz, MAAA, FSA, FCA, EA
Grace Lattyak, MAAA, FSA, FCA, EA
Tonya Manning, MAAA, FSA, FCA, EA
A. Donald Morgan, MAAA, FSA, FCA, EA
Nadine Orloff, MAAA, FSA, FCA, EA
James Ritchie, MAAA, ASA, FCA, EA
Jason Russell, MAAA, FSA, EA
Mark Shemtob, MAAA, FSA, FCA, EA
Mary Stone, MAAA, FSA, FCA, EA
Todd Tauzer, MAAA, FSA, FCA, CERA
Aaron Weindling, MAAA, FSA, FCA, EA

The Committee gratefully acknowledges the contributions of Paul Angelo, Tammy Dixon, Julie Ferguson, Ellen Kleinstuber, Thomas Lowman, Kim Nicholl, Michael Pollack, and Elizabeth Wiley.

1850 M Street NW, Suite 300
Washington. D.C. 20036-5805

Table of Contents

I. Introduction

This practice note was developed by the ASOP No. 51 General Practice Note Work Group of the Pension Committee of the American Academy of Actuaries. The purpose of the practice note is to provide information to actuaries on current or emerging practices in which their peers are engaged that are affected by ASOP No. 51, *Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions*, as well as to help with the evolution of ideas in this area.

The intended users of this practice note are the members of the actuarial organizations that are governed by the ASOPs promulgated by the Actuarial Standards Board (ASB). It is anticipated that this practice note will be helpful to actuaries, but it is not an interpretation of ASOPs and is not intended to be a codification of generally accepted actuarial practice. Actuaries are not in any way bound to comply with practice notes or to conform their work to the practices described in this or any other practice note.

While many issues are discussed in this practice note, other approaches and interpretations are possible, and it is likely that new approaches will evolve on this topic as it is an emerging area of practice. Further, the applicable ASOPs should be referenced regarding any questions on the material covered in this practice note.

II. Overview

ASOP No. 51 requires the assessment and disclosure of risk when measuring pension plan obligations or calculating pension contributions. Risk, as considered in this ASOP, is the potential for actual future measurements to differ from expected future measurements due to deviations of actual future experience from that assumed, including potential deviations of actual future contributions deviating from those expected. The assessment and disclosure are intended to help the users of such analysis understand the impact of differences in actual and expected experience on the measured obligations and contributions, including potential volatility.

This ASOP specifically applies to funding valuations, pricing valuations, or risk assessments for defined benefit pension plans.

ASOP No. 51 does not apply to:

- Valuations that are used exclusively for financial reporting;
- Advisory services on the management or reduction of risk;
- Other post-employment benefit (OPEB) valuations;[1]
- Social insurance valuations; or

[1] ASOP No. 51 concepts may be useful in assessing the risk of OPEB plans, even though not required.

- Analysis in connection with applications for plan partitions or benefit suspensions under the Multiemployer Pension Relief Act of 2014.[2]

The ASOP requires a risk assessment for each measurement date. If multiple funding or pricing valuations are done as of that measurement date, a single risk assessment may be applied to each of those valuations if the risk assessment is appropriate for all the measurements in those valuations.

The ASOP evolved significantly through the drafting process as the balance between the costs and benefits of assessment and disclosure of risk was considered. The inclusion of contribution risk evolved over successive exposure drafts and is an example of a risk that will be more relevant to some plans than others. ASOP No. 51 also limits the scope of the risk assessment. For example, the likelihood or consequences of potential future changes in applicable law is not required. ASOP No. 51 also clarifies that the actuary is not expected to provide investment advice or evaluate the ability or willingness of the plan sponsor to make contributions to the plan when due.

Compliance with ASOP No. 51 may differ by type of plan and by individual plan circumstances. The practice note identifies some considerations that may differ in their applicability based on the type of plan (public sector, single employer, or multiemployer), complexity of plans, for plans of different sizes, and other factors. Professional judgment is to be used by the actuary to identify, assess, and communicate the risks that may affect an individual plan's financial condition to provide a meaningful assessment. Per the ASOP, not every possible risk will or should be assessed for each plan—focusing on the more significant risks may be more useful than an analysis of every possible risk.

The ASOP applies to plans of any size, so all actuaries must familiarize themselves with the requirements of the standard. Actuaries working on smaller plans may find certain risks are not significant and additional analysis of relevant risks may or may not be "significantly beneficial," as discussed in section 3.6 of the ASOP, for the user due to the size of the plan's obligation in comparison to the size of the plan sponsor.

The ASOP does not prescribe a particular method for assessing risk, but it does provide examples and considerations to help the actuary select a method. This practice note will also provide considerations regarding how actuaries might assess risk. The ASOP does not require the assessment to be based on numerical calculations; however, the actuary may perform or recommend completion of a numerical or other quantitative assessment.

Communication of the risk assessment is key to ensuring users understand how measurements may change when actual experience deviates from expected. Pursuant to the ASOP, the actuary should select the elements of risk assessment to include in the communication with consideration of the specific

[2] In general, multiemployer plan actuaries should assess and disclose risks under ASOP No. 51. However, the detailed regulatory guidelines, and various projections required, for partition and suspension applications under MPRA provide information for a thorough review of risks. As such, no additional risk analysis is required under ASOP No. 51 for such applications.

characteristics of the plan. The primary intent of the assessment is to increase transparency of key risks and enhance communication of them. In some situations, the assessment could lead to a more thorough follow-up analysis.

ASOP No. 51 extends and expands upon requirements of earlier ASOPs, such as ASOPs Nos. 4 and 41, to enable users of the actuarial findings to better understand the risks of future changes in the results of actuarial valuations made for funding or pricing purposes. The other ASOPs should be kept in mind as the actuary performs and communicates the risk assessment.

III. Background/History

In December 2014, the ASB approved a first exposure draft of what would eventually become ASOP No. 51. This was part of a broader review by the ASB Pension Committee of all the pension-related standards. The ASB Pension Committee recommended that more guidance should be provided on the assessment and disclosure of pension risk. Other ASOPs included some guidance in this realm. Examples include:

1. Section 3.16 of ASOP No. 4 provided guidance to an actuary whose assignment includes an analysis of the potential range of future pension obligations, costs, contributions, or funded status.
2. Section 4.1(r) of ASOP No. 4 requires disclosure that future pension measurements may differ significantly from current measurements, possibly resulting from a number of factors.
3. Section 3.4.1 of ASOP No. 41, *Actuarial Communications*, states "the actuary should consider what cautions regarding uncertainty or risk in any results should be included in the actuarial report."
4. Section 3.3.2 of ASOP No. 4 says, "In conjunction with the related guidance in ASOP No. 41, the actuary should consider the uncertainty or risk inherent in the measurement assumptions and methods and how the actuary's measurement treats such uncertainty or risk."

The ASB Pension Committee recommended that additional guidance expanding on section 3.4.1 of ASOP No. 41 and section 3.3.2 of ASOP No. 4 (both dealing with uncertainty or risk) would be helpful. Additionally, the ASB Pension Committee recommended that providing additional disclosures would help the intended users of the actuarial findings to have a better understanding of the risks inherent in the measurements of pension obligations and actuarially determined pension plan contributions.

The second draft of ASOP No. 51, released in June 2016, reflected comments from the pension community, findings from the Pension Task Force, and a public hearing.

ASOP No. 51 was adopted in September 2017 and applies to any actuarial work product with a measurement date on or after November 1, 2018, that is covered by the scope of the ASOP as described in Section II, Overview, above.

IV. Key Definitions

The ASOP applies to funding valuations, certain pricing valuations, and risk assessments that are not part of a funding valuation or pricing valuation.

A **funding valuation** is defined in the ASOP as a measurement of pension obligations or projection of cash flows performed by the actuary intended to be used by the principal to determine plan contributions or to evaluate the adequacy of specified contribution levels to support benefit provisions. Generally, these are calculations by the actuary to develop an Actuarially Determined Contribution ("ADC") that the plan or plan sponsor will rely on when funding the plan (even if that contribution is zero) or evaluating the adequacy of fixed contributions to the plan. Actuaries perform pension valuations for multiple purposes; while the ASOP does not address every situation, generally a funding valuation, as defined by the ASOP, would not include the work listed below, which is not intended to be an exhaustive list:

- Estimates of projected future contribution levels for plan or plan sponsor budgeting purposes. However, if the results of the projection will be used by the plan or plan sponsor to determine future contribution levels, this ASOP would apply.
- PBGC variable premium calculations or Employee Retirement Income Security Act of 1974 (ERISA) 4010 calculations.
- Annual funding notice calculations.
- Valuation work under a PBGC distress termination.
- Valuations that provide measures of solvency or the amount required to settle liabilities, except in situations where the plan or plan sponsor relies on such results in the order to fund the plan to meet those solvency levels.
- Accounting valuations or valuations prepared exclusively for financial reporting, except in situations where the plan or plan sponsor relies on such results in order to fund the plan at certain levels.
- Valuations for unfunded nonqualified plans, except in situations where the plan or plan sponsor relies on such results to evaluate risk or in modeling a change to the provisions of such a plan, as described in the pricing valuation paragraphs below.
- Services in connection with applications for plan partitions or benefit suspensions under the Multiemployer Pension Relief Act of 2014, as noted in section 1.2 of the ASOP.

A **pricing valuation** is defined in the ASOP as a "measurement of pension obligations or projection of cash flows performed by the actuary to estimate the impact of proposed changes to plan benefit provisions on the plan contributions or to determine whether the proposed benefit provisions are supportable by specified contribution levels." The ASOP only applies to pricing valuations of a change that would, in the actuary's professional judgment, "significantly change the types or levels of risks" to the plan. Therefore, a calculation of the impact on contribution requirements for a change in plan provisions is a pricing valuation that may or may not require a risk assessment.

Other calculations not specifically identified as estimating the impact of proposed benefit changes on plan contributions might be considered a pricing valuation if the plan or plan sponsor is relying on the results to evaluate or fund a change in benefits. For example, an actuary may determine that, in his or her professional judgment, calculations made to reflect the addition of significant new benefits payable to participants as a result of litigation would be a pricing valuation because the plan or plan sponsor intends to fund the plan to cover those additional benefits.

Similar to funding valuations, a projection might not constitute a pricing valuation unless it is used by the plan or plan sponsor to determine contributions needed to cover a change in plan benefits. Even if the projection is a pricing valuation, it would not require an ASOP No. 51 assessment unless the plan changes would significantly change the plan's risk profile.

A **risk assessment** that is not part of a funding or pricing valuation is not separately defined by the ASOP, leaving the question of whether the ASOP applies to the actuary's professional judgment. In general, a valuation or set of projections that are not funding or pricing valuations may be subject to the ASOP when the plan or plan sponsor has engaged the actuary to perform such valuation in order to determine future contribution levels, to evaluate certain risks for the plan, or to make a policy decision (such as to change the plan's investment mix or asset allocation or to change the sponsor's funding policy). However, the ASOP does not provide guidance on management of risks identified or assessed.

Risks

The ASOP requires the actuary to identify risks that can reasonably be anticipated to affect a plan's future financial condition. **Risk**, in this context, is defined as "the potential of actual future measurements deviating from expected future measurements resulting from actual future experience deviating from actuarially assumed experience." In other words, the actuary should identify situations where valuation assumptions may lead to deviations if experience is different than anticipated. This practice note focuses on unfavorable deviations.

The ASOP identifies several examples of risks that, in the actuary's professional judgment, may reasonably be anticipated to significantly affect the plan's future financial condition. These identified risks are discussed in detail in Section V, Risk Identification, below.

- **Investment risk**: the potential that investment returns will be different than expected.
- **Asset/liability mismatch risk**: the potential that changes in asset values as a result of interest rate changes will not match changes in the value of liabilities or other movements between assets and liabilities.
- **Interest rate risk:** the potential that interest rates will be different than expected.
- **Longevity and other demographic risks:** the potential that mortality or other demographic experience will be different than expected.
- **Contribution risk:** defined in the ASOP as the potential of actual future contributions deviating from expected future contributions, for example, that actual contributions are not made in

accordance with the plan's funding policy, that withdrawal liability assessments or other anticipated payments to the plan are not made, or that material changes occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base.

- **Other risks:** the risks discussed within the ASOP and this practice note are examples and not meant to provide a comprehensive list of risks any individual plan may face. An additional example is **assumption change risk,** which can be defined as the potential that assumptions could change in a manner that is not expected.

Terms Defined in Other ASOPs

The ASOP relies on a number of terms—"significantly," "reasonably," "significantly beneficial," "significant," "professional judgment"—that have been partially or fully defined in ASOP No. 1, *Introductory Actuarial Standards of Practice*, and are repeated below.

- Professional Judgment—Actuaries bring to their assignments not only highly specialized training, but also the broader knowledge and understanding that come from experience. For example, the ASOPs frequently call upon actuaries to apply both training and experience to their professional assignments, recognizing that reasonable differences may arise when actuaries project the effect of uncertain events.

- Reasonable—In many instances, the ASOPs call for the actuary to take "reasonable" steps, make "reasonable" inquiries, select "reasonable" assumptions or methods, or otherwise exercise professional judgment to produce a "reasonable" result when rendering actuarial services. The intent is to call upon the actuary to exercise the level of care and diligence that, in the actuary's professional judgment, is necessary to complete the assignment in an appropriate manner.

  Because actuarial practice commonly involves the estimation of uncertain events, there will often be a range of reasonable methods and assumptions, and two actuaries could follow a particular ASOP, both using reasonable methods and assumptions, and reach different but reasonable results. There may be different assumptions that are reasonable for different clients, plans, or purposes.

- Significance/Significant—Significance can have different meanings. A result may be deemed to be statistically significant if it is determined that the probability that the result was produced by random chance is small. An event may be described as significant if the likelihood of its occurrence is more than remote. In addition, a result may be significant because it is of consequence. Other uses may be encountered in actuarial practice. The actuary should exercise care in interpreting or using these words.

Plausible

The ASOP refers to a new term, “plausible,” when discussing the selection of assumptions for the assessment of risk in section 3.5:

> “One or more assumptions selected for the assessment of risk should differ from the assumptions used to determine expected future measurements and should result in one or more plausible outcomes.”

What is plausible requires professional judgment that may vary by situation.

V. Risk Identification

Section 3.2 requires actuaries to identify risks to be assessed that in their judgment may reasonably be anticipated to significantly affect the plan’s future financial condition. “Reasonably” and “significantly” primarily speak to the potential frequency and severity of such deviations. An implausible risk might not be reasonably anticipated even if deviations may potentially be severe. Other deviations that are more common may be immaterial to the plan’s future financial condition. Many risks are interrelated, and so while a risk may seem insignificant on its own, it may be correlated with other potential risks that in combination could materially affect the plan’s future financial condition. Additionally, considerations such as the actual and projected financial condition of the particular plan, the scope of the actuarial engagement, and the size of the plan (perhaps in relation to the size of the plan sponsor) may provide further context for what may be reasonable.

Section 3.2 offers the following list of examples of potential risks to be identified: investment risk, asset/liability mismatch risk, interest rate risk, longevity and other demographic risks, and contribution risk. These risks are likely to vary in significance depending on multiple factors, including the plan type. For illustration purposes, the examples listed below will focus on general risk identification for public plans, multiemployer plans, and single-employer plans.

- **Investment risk:** The portion of a plan’s asset portfolio that is invested in return-seeking assets would be of primary focus here, as the assets driven by movements in interest rates are likely to overlap with both asset/liability mismatch and interest rate risks described below.

  For a plan with assets invested in return-seeking portfolios that carry a significant amount of investment volatility, there is significant risk that future returns will deviate from the expected return on assets. That deviation from future returns will have a material impact on the future financial condition of the plan. Investment risk can result in either an underfunded position or an overfunded position, both of which can lead to unfavorable consequences. If the plan is invested primarily in fixed-income assets or engaged in a glide-path strategy toward less volatile portfolios in response to plan closure or other plan objectives, such as liability-driven investing (LDI), the investment risk may be less acute.

Plans using a long-term rate of return assumption for the purpose of liability measurement may incur additional risks related to the likelihood of achieving that rate of return assumption in future years.

The ASOP does not require or expect the actuary to provide specific investment advice. This does not mean that actuaries cannot be helpful in making assessments or setting assumptions related to investment risk. For example, actuaries with suitable training and experience can help to translate investment policies into an expected long-term rate of return.

- **Asset/liability mismatch risk:** A related but different risk is "the potential that changes in asset values are not matched by changes in the value of liabilities." One source of asset/liability mismatch is related to investment risk, as described above. The actuary's evaluation might consider to what extent allocations are made to assets that hedge movements in liabilities, either to the allocation of liability-hedging assets relative to entire plan assets, or to the duration of fixed income portfolio relative to liability duration. Plans that employ LDI or other significant hedging strategies are less exposed to asset/liability mismatch risk.

  Additional mismatch risk is embedded in plans that tie the discount rate to the expected return on assets. If the expected return going forward decreases, future asset growth is expected to decrease while measures of liability increase immediately (this also can be described as a form of assumption change risk). This issue primarily arises in public and multiemployer plans.

  Many public, multiemployer, and single-employer plans also use some form of asset smoothing in funding calculations, which could temporarily create additional asset/liability mismatches.

  Finally, interest rate risk and demographic risk can also be identified as a form of asset/liability mismatch risk and are addressed below.

- **Interest rate risk:** The concept of interest rate risk has many potential applications for the actuary to consider in the risk evaluation. A traditional defined benefit plan that offers only annuity forms of payment may pose interest rate risk only with respect to the rates used to discount expected cash flows to the valuation date. Plans that pay lump sums subject to IRC Section 417(e) will exhibit additional interest rate sensitivity, as the interest rates used to value those lump sums may not exactly match the rates used to discount expected cash flows. Finally, hybrid plans, such as cash balance or pension equity plans, may be valued using assumed future interest crediting rates and/or annuity conversion assumptions that often differ from the rates used to discount expected cash flows.

  In single-employer plans, the discount rate used to determine plan liabilities and minimum funding requirements is based on corporate bond interest rates. For many single-employer plans, the interest rate risk for liabilities is currently mitigated due to the legislation that creates a corridor around a 25-year average of corporate bond interest rates and sets a "floor" under

funding discount rates. However, as the currently applicable corridor that stabilizes contribution requirements widens, this dependency will grow more sensitive. In addition, PBGC premiums, which may be an additional component of minimum required contributions if paid from trust assets, are based on current corporate bond rates or a 24-month average of corporate bond rates, creating additional interest rate risk.

For public plans, interest rates may affect mechanics within the plan valuation process. Examples could include credited interest rates on member contributions, settlement costs, and lump sum calculations.

- **Longevity and other demographic risks:** Longevity risk is a significant risk for most pension plans given the relatively long duration of their liabilities. It has also been an area of much focus with the development of more commonly updated base mortality tables and generational mortality projections. Longevity risk is more likely to impact plans with long-tailed liabilities, such as plans offering only annuity options; it is magnified in the case of such a plan that provides cost-of-living adjustments (COLAs). These risks may have a different impact based on the plan's duration and whether the plan is open, closed, or frozen.

  Longevity risk may be exacerbated when plans are funded using outdated tables and/or inadequate longevity improvement assumptions in their valuations. Plans whose mortality assumptions are not selected on the basis of credible experience inherently bear more longevity risk. Longevity risk may also arise when a mortality assumption is prescribed by a regulatory agency, for the assumption may not adequately reflect longevity specific to the plan's demographics. This risk may overlap with assumption change risk discussed below.

  Longevity risk may also materialize when medical advances or other environmental or social factors result in greater-than-assumed future improvements to longevity.

  Other demographic risk is a much broader category and can generally be viewed as any other non-economic assumption (retirement, withdrawal, disability, election timing and form of payment, etc.) that has the potential to unfavorably alter the plan's financial condition if actual experience does not match the assumptions. In many cases, this may be significant when the plan offers some sort of subsidized benefit, but the valuation assumption is that not everyone will take the benefit when it is most valuable for them to do so. This risk may affect single-employer plans that offer early retirement windows, and public plans with certain other features such as Deferred Retirement Option Plans (DROPs). Smaller plans may see larger gains or losses as a percentage of liability if experience deviates from expected due to fewer participants.

- **Contribution risk:** The ASOP takes special note of contribution risk by defining it separately as the potential of actual future contributions deviating from expected future contributions. In many situations, this is an emerging area of practice for actuarial risk assessments. While the

actuary is not required to evaluate the plan or plan sponsor's ability or willingness to make contributions when due, an assessment of contribution risk involves other considerations as well.

One type of contribution risk is that future contributions are not made according to established funding policy. This risk is common in public plans. Contribution risk may occur when future contributions deviate from expected contributions, statutory restraints limit contributions, or anticipated payments from the plan or plan sponsors are not received as expected.

In identifying contribution risk for public plans, an actuary might look to any historical deviations or statutory contribution mandates that may lead to concerns about future deviations from an actuarially calculated contribution. In situations where a plan has multiple plan sponsors, actuaries might consider the impact if some sponsors are fully meeting their obligations while others are not (for example, the interaction between a state government and local governments in a cost-sharing multiple-employer plan).

For multiemployer plans, an actuary might look to negotiated collective bargaining agreements that set contributions to the pension plan, past patterns of increases, and other factors that may constrain future contribution levels. In cases where employer withdrawal liability payments provide a material portion of future contribution income, the actuary might review historical patterns of assessing, collecting, and settling withdrawal liability. The actuary might also want to recommend that the plan retain outside financial or labor-market experts to assess the collectability of withdrawal liability payments.

In our experience, it is worthwhile to consider other indications of contribution risk available through external analyses or other known factors. One example could be comparing historic revenue growth for public plan sponsors or creditworthiness for multiemployer plan contributing employers, where available, to evaluate the feasibility of anticipated contribution increases. While the ASOP does not require the actuary to anticipate the explicit ability or willingness of particular plans or plan sponsors to make future contributions when due, nor assess the impact of future changes in applicable law, the actuary might consider disclosing contribution risk even when it is not measured.

Another form of contribution risk could arise from deviations of assumptions that are used to calculate contributions such as covered population or payroll. The actuary might evaluate the implications if the covered population were to decline or future payrolls were to not increase as much as assumed. While many single-employer plans have anticipated declines in population, public and multiemployer plans are more frequently dependent on stable active membership for a contribution base.

For multiemployer plans, most actuaries generally do not have the training or experience to forecast industry activity but can review recent historical experience and related factors (the

state of the local economy, cyclical trends in employment, competition from non-union employers or other trade unions). If this informal review identifies changes in the covered industries that may result in lower levels of covered employment and/or fewer contributing employers, or other factors that could materially affect the projections, the actuary might also suggest that the plan retain outside experts to opine on future industry considerations and the reasonableness of contribution projections, particularly because some plan trustees may not have the training or experience to forecast industry activity beyond the next few years.

Public plans are also exposed to employment volatility, but potentially to a lesser extent, as public plan sponsors are more permanent in nature. With some public plans, the built-in lag between the measurement date when contributions are calculated and the actual dates contributions are paid may result in contributions that are inadequate to meet the expressed funding policy.

Plans subject to minimum legal funding requirements that do not tie contributions to a headcount or covered payroll basis (typically single-employer plans) might not, in the actuary's professional judgment, have significant contribution risk, as such risk is defined in the ASOP.

- **Assumption change risk:** The actuary is often tasked with choosing assumptions for a particular valuation at a particular measurement date, and those assumptions may change for future valuations. The ASOP does not require the actuary to consider changes in law or regulation in assessing plan risks; however, trends, market and plan-specific experience, and intentions of the plan or plan sponsor may all impact how the actuary sets assumptions in the future and anticipates potential changes and their impact in the present.

  For example, at the time an assessment is performed, an actuary may believe in his/her professional judgment that a selected long-term expected rate of return is likely to be reasonable over the foreseeable future. The actuary's assessment of investment risk might therefore focus on the likelihood of the plan achieving that assumed rate of return. However, an unexpected change in market conditions could provide for a more pessimistic capital market outlook. This may lead the actuary to lower the expected rate of return assumption in a future year—a change that may significantly affect a plan's future financial condition. Identifying the assumption change risk before it happens and detailing its potential impact may be a prudent application of this ASOP.

  The actuary might consider whether the assumptions used for the annual valuation are appropriate for other purposes. For example, do the assumptions and methods used to determine costs for groups that terminate participation in a public plan support adequate funding? In a multiemployer plan, are the assumptions used for determining withdrawal liability assessments for employers that terminate participation in the plan adequate to fund their share of the plan's vested benefits, and what are the plans' ongoing risks after the employer withdraws?

Assumption change risk may overlap with many other risks noted above, although the discussions within the other risks are likely to focus on experience that differs from the assumption, as opposed to the likelihood of that assumption changing in the future.

The ASOP leaves it to the actuary to identify risks that may be significant with respect to the plan's future financial condition. Examples of such risks are noted below.

- **Inflationary risk:** the potential that rates of inflation are different than expected.
- **Salary risk:** the potential that pay increases are different than expected.
- **Asymmetry risk:** the potential that embedded options in the plan formula (such as floors and caps on interest crediting rates in a cash balance plan, or a "greater of" actuarial basis in a plan that pays lump sums, or a "gain sharing" design) do not move as expected. To some degree, this risk may overlap with interest rate risk described above.
- **Covered payroll/headcount risk:** the potential that covered payroll or covered employee counts do not grow as expected. This risk may overlap with contribution risk described above.
- **Covered employment/contributory hours:** the potential that employees covered by the plan is different than expected. For example, employment may not rebound to prior levels, or may continue to decline. This risk will nearly always overlap with contribution risk described above.
- **Lump sum payment risk:** the potential that participant behavior with respect to lump sum elections is different than expected. This risk may overlap with interest rate or other demographic risks.
- **Adverse selection risk:** the potential that participant behavior with respect to certain form of payment elections is different than expected. This risk may overlap with lump sum payment risk or other demographic risks. Employees who can "purchase" service or select their benefit level (tier) can also present risk.
- **Risk of insolvency upon termination:** the possibility that a plan might terminate and have insufficient assets to settle liabilities. This risk may be associated with investment risk, interest rate risk, or contribution risk.

The above list provides examples of risks and how they may be identified. There are many other risks that may apply to a pension plan and should be considered in this risk identification process. In all cases, it is the actuary's responsibility to reasonably identify the risks that may significantly affect the plan's future financial condition.

ASOP No. 51 applies to defined benefit plans of all sizes. However certain risk considerations may have greater applicability to smaller plans. Smaller plans may be more likely to terminate with little notice as compared to larger plans. Thus, smaller plans need to assess the ability to pay out all benefits upon plan termination as required by the plan's provisions and applicable law. It therefore may be beneficial for the sponsors of smaller plans to be aware of the plan's funded status on a plan termination basis. In addition, a plan's funded status (different from a plan termination funded determination) could also

affect whether certain plan participants who are considered "Highly Compensated Employees" under the Internal Revenue Code would be entitled to a lump sum distribution or an annuity purchase upon retirement or termination of employment.[3]

VI. General Risk Assessment

The ASOP states the risk assessment should take into consideration all the risks identified for the plan, whether specifically noted in section 3.2 of ASOP No. 51 or separately identified by the actuary. The risk assessment should consider the effect of the identified risks on both the current and future financial condition of the plan. These effects might be evaluated based on numerical calculations; however, a quantitative analysis is not required by ASOP No. 51. Some actuaries might decide to provide generic quantitative illustrations rather than a plan-specific analysis. For example, some actuaries might find it adequate, when discussing assumption change risk, to note than many pension plans have a liability duration of between 10 and 15 years, meaning that a 100-basis point change in discount rates would change the liability in the opposite direction by 10% to 15%.

When a quantitative assessment is not performed, identified risks are typically discussed in qualitative terms by describing the general effects or range of potential outcomes that may result. As an example, the range of potential outcomes related to asset/liability mismatch risk might be described qualitatively by noting that the plan's funded status could increase or decrease due to liabilities and assets changing by different amounts due to market forces, and a decrease in funded status could lead to increased contributions, reduced benefit security for participants, or the need to make future plan design changes to keep the plan sustainable.

While it may be possible to adequately describe certain risks using generic examples such as the ones noted above; pursuant to 3.3, each risk assessment should take into consideration the circumstances specific to each plan. While not necessarily an exhaustive list, some examples of plan-specific circumstances and questions an actuary may want to consider in evaluating the plan's risks include:

- **Funding policy**—How are past, present, and future benefits financed? How might the plan or plan sponsor decide whether to contribute an amount other than the minimum required or actuarially determined contribution?
- **Investment policy**—How much risk is the plan or plan sponsor taking currently with the plan investments? How does the interest rate sensitivity of the investments compare to the interest rate sensitivity of the liabilities?
- **Funded status**—How is funded status measured? What are the consequences of changes in funded status for contribution levels, benefit amounts (via COLAs or gainsharing arrangements) and the availability of certain benefits (such as lump sum distributions)?
- **Plan demographics**—Are plan benefits continuing to accrue or frozen? Does the plan allow new entrants? What are the relative proportions of the retired, terminated, and active participant groups?

[3] Treas. Reg. 1.401(a)(4)-5(b)(3)(ii)

- **Plan features**—Does the plan pay out large amount lump sums? Is the benefit tied to career-average or final-average pay? Does the plan allow for service purchases? Are there COLAs applied to benefits? Are there any embedded options or difficult-to-value features?
- **Sources of funding**—Where do contributions come from?
    A. Are contribution rates in the public sector set by statute? Are there limits on how much rates can change from year to year? Do changes require a constitutional or other statutory amendment?
    B. Does a church plan lack both regulatory funding requirements and a consistent self-imposed funding practice?
    C. Are there employee contributions, and if so are there limitations and/or variability in those contributions?
    D. Are there non-traditional funding sources available (for example, pension obligation bonds, funding tied to special tax revenues, funding supplied by related enterprises like variable state lottery revenues, contributions from residuals in the entertainment industry, and container ship rates in longshoremen plans)?

Frequently, the effect an identified risk has on a plan varies based on several different factors and circumstances. These factors may change over time, so that the same assessment an actuary makes in one year may not be appropriate in future years. For example, a plan's investment allocation may stay the same for several years, but over time the funded percentage has declined from 120% to 100%. In performing a risk assessment, the actuary might want to consider whether the recent decline in funded percentage results in similar or different investment risks to the plan, or if the degree to which the investment risk affects the plan has changed.

In performing a risk assessment, actuaries might want to consider the combined effect of identified risks. Often risks interact with each other to either amplify or mitigate their combined effect. A common example of the leveraging effect is interest rate and mortality risk—as life expectancies change, plan liabilities also change (in the same direction) and may change the duration of plan liabilities, which in turn affects the interest rate sensitivity of the liabilities.

The ASOP leaves it up to actuary's professional judgment to consider whether assessment of each risk can be adequately covered by a qualitative risk assessment, or whether some quantitative assessment is needed. In some cases, the scope of the assignment from the client may define whether a quantitative risk assessment is included in what the actuary is engaged to do. The scope of an engagement does not eliminate the obligation to include a risk assessment when required under ASOP No. 51, but it may help the actuary determine how to approach the risk assessment. As discussed later under Section VII, Considerations for Additional Risk Assessment Recommendation, and Section XI, Communications, of this practice note, a qualitative risk assessment might be accompanied by a recommendation for the plan or plan sponsor to engage the actuary for a quantitative assessment.

VII. Considerations for Additional Risk Assessment Recommendation

Section 3.6 of the ASOP provides that actuaries should recommend a more detailed assessment of the identified risks if, in their professional judgment, such a more detailed assessment would be significantly

beneficial to the intended user. While the ASOP uses the plural term “risks,” in our view, it seems reasonable for the actuary to suggest a more detailed assessment of only one particular risk, or of specific risks for which such assessment is deemed significantly beneficial. The actuary might also suggest a more detailed assessment of the totality of the risks considered in the initial assessment. The additional risk assessment can also take a variety of forms, from a simple analysis to a complex quantitative assessment. Various approaches are discussed in Section VIII, Quantitative Risk Assessment Approaches, of this practice note.

It is up to actuaries to recommend a more detailed risk assessment for each situation that they believe to be significantly beneficial to the intended user. The ASOP provides a partial list of factors that the actuary should consider in making this assessment. Among these factors are the findings of the risk assessment, the absolute and relative (to the sponsor) size of the plan, the funded status, the plan’s asset allocation, and any known indications of difficulty that the plan or plan sponsor has had or is expected to have in making required contributions. Additional factors to consider are the length of time since the last detailed assessment and any known significant changes in circumstances that have occurred since that time. For public plans, changes might include updates to statutory contribution rates. For multiemployer plans, factors to consider might include changes in zone status, net cash flow and potential insolvency, the extent of employer withdrawals, and dependency on withdrawal liability payments for necessary funding.

There is no algorithm for considering all of these issues and determining when a detailed assessment will be significantly beneficial. The actuary will have good information on some of these factors—primarily the ones specific to the plan. On other factors—such as how great a risk the plan presents to the sponsor and how plan risks might relate to sponsor business risks—the actuary may have more limited information.

The plan or plan sponsor may be in the best position to judge what information will be significantly beneficial to them. Either may need to rely on the actuary for assistance in determining what additional information might be beneficial. For example, multiemployer plan sponsors may not reasonably be able to determine long-term factors, particularly in industries that are rapidly changing, and may need to consult other experts. A recommendation by the actuary that additional analysis of the risk may be beneficial places no requirement on the prospective user beyond deciding whether an additional analysis would in fact be significantly beneficial. The actuary can only express an opinion and provide reasoning as to why the additional analysis could be significantly beneficial; it is the prospective user who must decide whether such an analysis will be performed.

Of course, there will be situations where an actuary can easily determine that an additional analysis would not be significantly beneficial to the user. Examples might include a substantially overfunded plan, a plan that is clearly immaterial to the sponsor, a plan whose obligations are fully immunized, a plan for which a detailed risk analysis was performed a year ago and has had no major changes in its circumstances, as well as many others. However, in many situations, after considering all the factors discussed above, it would seem possible that additional analysis of certain risks could be significantly beneficial and thus, pursuant to the ASOP, should be recommended.

VIII. Quantitative Risk Assessment Approaches

Actuaries may employ a variety of methods in performing a quantitative risk assessment. The methods that best support the assessment of risk for a plan or client may be situational. ASOP No. 51 lists four common approaches to performing a quantitative risk assessment that are discussed below: scenario tests, sensitivity tests, stress tests, and stochastic modeling.

One aspect of the terminology used in ASOP No. 51 is worth noting. "Sensitivity test" can refer to an analysis of how sensitive valuation results are either to changes in valuation assumptions or to actual experience that differs from those assumptions. In ASOP No. 51, sensitivity test is defined only as the former, sensitivity to assumption changes, while scenario tests and stress tests consider variations in actual experience relative to the underlying actuarial assumptions. The following discussion follows the ASOP No. 51 terminology.

Scenario Tests

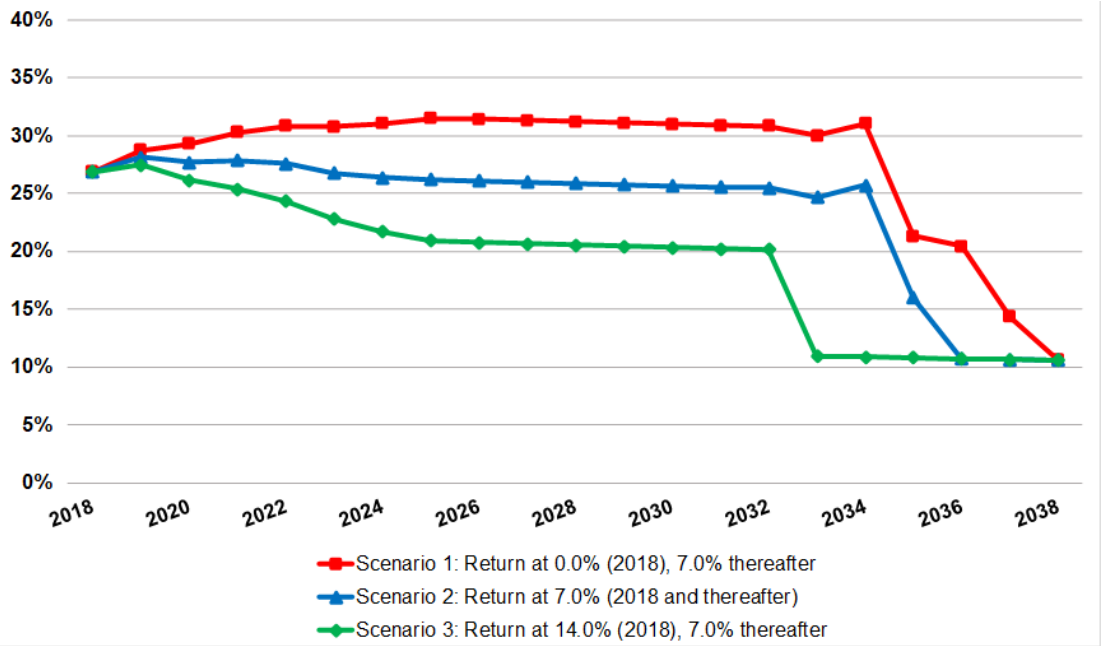
Scenario tests examine the impact on a plan's financial condition of having a one-time single event occur, or of multiple simultaneously occurring events. In preparing a scenario test, it is helpful to first create a baseline scenario in which all actuarial assumptions (discount rate, investment return, demographic experience, etc.) are exactly met over a future time period, which can be relatively short (five to 10 years) or longer (20 to 25 years). After establishing the baseline, projected actual experience relative to one or more of the baseline assumptions is changed to illustrate the impact of the identified element or elements of actuarial experience. Some examples of scenario tests might include:

- Plan assets earning more or less than the plan's assumed rate of investment return in a single year, with the effect of that short-term experience projected over the forecast period.
- Individual salaries growing faster or slower than the assumed rates of salary increase.
- Levels of employment (active member headcount or contribution units) increasing or decreasing rather than remaining constant as in the baseline scenario.

In the example below of the first scenario test listed above, in the single year after the valuation date, plan assets are assumed to earn either 0%, the assumed rate (7.0% in this example), or twice the assumed return. This shows the effect of a reasonable range of short-term experience. Also, because the variation is restricted to one year of investment experience, this scenario test might be used to anticipate the next year's valuation results by interpolating based on actual returns as they emerge during the year.

The valuation result shown here is the employer contribution rate for a plan funded on an actuarially determined basis. Other typical results could include unfunded actuarial accrued liability, funded ratio and projected cashflows (to assess plan solvency).

Projected Employer Contribution Rates (% of Payroll)
Under Three Hypothetical Market Return Scenarios for 2018



Stress Tests

A stress test looks at the impact of severely adverse changes in one factor, or relatively few factors, potentially interrelated. A stress test can be thought of as a more extreme version of a scenario test, and one where the variation from experience is unfavorable, generating actuarial losses not gains. Some examples of stress test scenarios that could be evaluated include:

- The effect of one or more years of significant investment losses, perhaps followed by a recovery;
- The effect of using actual investment returns from some period of prior years (back-testing);
- The effect of a significant and lasting reduction in the covered active participant population through a reduction in workforce or an early retirement window; and
- The combined effect of a reduction in the covered active population and significant investment losses that both resulted from a significant economic event.

Another test could be an assessment of the likelihood that a financially stressed plan might become illiquid and incur penalties in situations where there is a penalty for premature cash-out of some assets (e.g., private equities). Showing how the results of the stress test differ from a baseline scenario illustrates how significant the impact of adverse actual experience could be on key plan metrics and on the plan's overall financial condition.

A particular type of stress test (that is a form of scenario testing) takes an actual period of historical experience and illustrates the financial ramifications of that event happening again in the future. The most common example would be to assume some period of actual investment returns is repeated in the future. Severe recent examples of this type of stress tests could be based on either the early-2000s "dot-

com bubble" burst or the late-2000s subprime mortgage crisis. These two examples would have been considered highly unlikely yet occurred in the same decade, indicating that examination of such extreme downside events could provide value in informing financial preparation and future decision-making. Another potential stress test might be based on the anticipated total financial impact of the COVID-19 pandemic, which would include experience beyond just investment returns.

Recent literature has proposed two relatively severe stress tests for public pension plans, but these might also be considered for use with other types of plans. The 2014 Report of the Blue Ribbon Panel commissioned by the Society of Actuaries recommended performing 30-year financial projections using the following assumptions: 1) returns of 3 percentage points more and less than the baseline assumption, and 2) plan sponsors contribute 80% of the actuarially determined contribution. More recently, researchers at the Pew Charitable Trust have recommended 30-year projections under a fixed 5% return scenario and an asset shock scenario, based on a 20% loss in asset value in year one, followed by three years of recovery.

As noted above, a stress test is distinguished from a scenario test in that it focuses specifically on adverse experience while a scenario test would often examine the effects of both adverse and favorable actuarial experience.

Sensitivity Tests

A sensitivity test assesses the impact of a change in an actuarial assumption on future assets, liabilities, and plan costs. A sensitivity test could be a single, point-in-time estimate or a multiyear projection, similar to scenario testing. For example, a sensitivity test might be used to assess the effect of a change in the discount rate on the current year liabilities, funded status, and contributions. This test might also be used to show how funded status and total contributions (or the discounted value of those contributions) change over a period of time, say 10 years, in response to a change in an assumption. As with a scenario test, a sensitivity test also requires a baseline determination of plan costs under current assumptions. Another helpful sensitivity test could be a change in the underlying inflation assumption, which affects multiple other economic assumptions (e.g., discount rate, expected investment return, compensation increases, cost-of-living adjustments, etc.)

Stochastic Modeling

With stochastic modeling, a large number of potential outcomes (usually several thousand) are generated by treating one or more of the inputs as random variables that change over time. As the random variables change, other dependent variables change and produce an array of outputs. For example, treating inflation as a random variable changes the level of investment returns, compensation increases, and cost-of-living adjustments, as well as the assets, liabilities, and contributions that depend on these values.

The distribution of stochastically generated results allows an actuary to illustrate the range of possible outcomes over a period of time as well as calculate the likelihood of achieving a particular outcome. Stochastic forecasting can answer questions such as:

- What is the median expected contribution rate over the next 20 years? How high could the contribution rate be expected to get during that time period? What is the likelihood of future contributions exceeding a certain threshold?
- How likely is it that the plan stays above, or eventually achieves, a certain funded percentage under the current funding policy? How might changing to a different funding policy affect the chances of staying above or achieving that same threshold?
- What is the likelihood that a multiemployer plan will enter or exit the "Green Zone"?
- What are the chances that a plan's current funding policy results in insolvency within a certain number of years?
- How does a contribution or benefit change impact the plan's projected financial condition?
- What is the likelihood that a plan will be sufficiently funded to allow it to terminate in a standard termination within a particular period of time?

Another application of stochastic forecasting is looking at the distribution of potential experience relative to an individual assumption. For example, consider the following table of results from modeling the future investment return for a given asset allocation:

Time Horizon	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile
10 years	1.10%	4.03%	6.06%	8.10%	11.03%
20 years	3.40%	5.47%	6.91%	8.35%	10.42%

It might be informative to a plan or plan sponsor to understand that they have almost a 50% chance of achieving a 7% rate of return over the next 20 years, but for the next 10 years there is a lower probability.

Other Methods and Considerations

ASOP No. 51 identifies the four specific risk assessment methods discussed above; however, other techniques and analyses can also be informative to the plan or plan sponsors and the readers of valuation reports in understanding the risks. Actuaries may find that other types of analysis are useful and consider including them in their discussions of risk. One such example, also mentioned in ASOP No. 51 is a comparison of the present value of accrued benefits using a discount rate based on a long-term rate of return to a present value that is based on a minimal-risk investment return. This analysis would help quantify the cost of the risk that is associated with investment in return-seeking investments.

For many plans, projected cash flows may be as important as the liability measurement. The actuary might consider the impact of projected negative cash flows (i.e., contributions and investment income that are projected to fall below benefits, expenses, and (for multiemployer plans) withdrawal liability payments), as negative cash flows may magnify the investment risk associated with certain sequences of asset returns.

To assess longevity risk for plans where the liabilities are measured using blue-collar mortality tables, the actuary might consider performing illustrative projections using a white-collar table. This exercise

might be appropriate for such plans whose participants are highly compensated or have generous benefits.

Whenever an actuary performs an open group projection, there is an explicit new entrant profile assumption. Variations in the new entrant assumption may yield material differences in the projection results. The actuary might evaluate differences between the assumed new entrant profile and potentially different new entrant profiles. For example, the experience of new entrants over each of the past several years may be different from the cumulative experience over those years. In addition, the use of a single age for new entrants rather than a distribution of new entrants across several age categories may result in a misstatement of future benefit payments or new entrants in cash flow projections.

Considerations in Selecting an Approach to Risk Assessment

When considering what methods of illustrating pension plan risk may be appropriate to a particular plan or plan sponsor, there are a variety of factors that an actuary might want to consider.

- **Nature, scale, and complexity of the plan**—Not all plans and plan sponsors are created equal; each has its own unique factors that may influence what type of risk assessment will best illustrate the risks that are most significant for the plan. For some plans, a basic scenario test that shows what happens if the long-term investment return varies up and down by a fixed margin (such as 50 or 100 basis points) might be enough to illustrate investment risk in a funding valuation report, but when it comes to evaluating potential changes in plan design, investment allocation, or funding policy, a stochastic analysis and stress testing may provide a more complete picture of risk.
- **Practical considerations in use**—In determining the risk assessment tools that are best suited to a particular situation, the actuary might consider the relative usefulness, reliability, timeliness, and cost efficiency of the range of options considered. For example, an actuary might consider that stochastic modeling would best illustrate risk in a given situation, but the relative cost (both in expense and the amount of time it would take to prepare such an analysis) of a simpler scenario test might provide adequate information. In this case, the scenario test illustration might be accompanied by a suggestion that when feasible a stochastic analysis could be provided.
- **Professional judgment**—Ultimately, an actuary will use professional judgment to recommend the methods that would most appropriately balance these different factors, whether a quantitative risk assessment is needed (or whether a qualitative assessment will suffice), and whether the actuary should recommend additional analysis beyond the scope of the current assignment. The actuary's general experience, combined with specific knowledge of the plan, plan sponsor, and other relevant factors that may vary from plan to plan will all guide the actuary in making this evaluation.

Assumptions Used in Assessment of Risk

The nature of the risk assessments discussed in this section typically require the selection of assumptions that are specific to the risk assessment. Pursuant to section 3.5, for any of the methods discussed here, at least one of the significant actuarial assumptions used for the risk assessment should differ from those used in the funding or pricing valuation to determine expected future measurements. This is another area in which the actuary must rely on professional judgment to determine what assumption variations will most effectively illustrate the plan's risks. Per the ASOP, the actuary may consider the views of others, such as investment advisers, economists, and authors of published surveys. The plan or plan sponsor may also have suggestions about the risks that most concern it and what it would like to see illustrated; this may either directly inform the actuary's assumption selection or may be a consideration in selecting appropriate variations. Even when influenced heavily by outside experts, the selection of assumptions appropriate to a risk assessment must meet the requirements of ASOPs Nos. 27 and 35, including that they be reasonable for the intended purpose and reflect the actuary's own professional judgment.[4]

IX. Plan Maturity Measures

In discussing plan maturity measures, section 3.7 of ASOP No. 51 indicates that, in addition to providing the basic risk assessments, the actuary should calculate and disclose plan maturity measures that are relevant to understanding risks associated with plan, based on the actuary's professional judgment. Examples of maturity measures include:

1. Number of inactive members (or retired members) divided by number of active members
2. Inactive or retired actuarial accrued liability divided by total actuarial accrued liability
3. Benefit payments divided by contributions
4. Net cash flow (contributions minus benefit payments and administrative expenses) divided by market value of assets
5. Market value of assets divided by current active member payroll
6. Actuarial accrued liability divided by current active member payroll
7. Duration of the actuarial accrued liability

The first example is a "support ratio" or "dependency ratio" showing the proportion of inactive members (or members in pay status) to active members. While this may be an informative statistic for unfunded plans such as Social Security or a pay-as-you-go retiree medical plan), it has less significance for a plan under which benefits are intended to be prefunded during each members' active service. Example 2 is a similar measurement in that it shows the percentage of total liabilities for members who are no longer working. This might be a more appropriate maturity measure for a prefunded plan, because it focuses on the proportion of total plan liabilities that are associated with members in pay status. Both of these ratios can be useful because:

[4] See sections 3.5.6 of ASOP No. 27 and 3.10.6 of ASOP No. 35.

- The ability to change benefit provisions for retirees to reduce liabilities is relatively limited. Therefore, the greater the ratio of retirees to actives, or retired liabilities to total liabilities, the more difficult it becomes to address funding issues by reducing benefits.
- If these ratios are increasing over time, this is a good indication that benefit payment obligations will rely more and more on plan investments. That possibility is even more specifically indicated by the next two maturity measures.

Examples 3 *(Benefit payments divided by contributions)* and 4 *(Net cash flow [contributions minus benefit payments] divided by market value of assets)* may be thought of roughly as the investment analogs of examples 1 and 2. These can be particularly useful in reviewing the plan's investment policy as they indicate to what extent current plan assets are needed to provide current benefits. Because benefits must be paid immediately when due, this can affect the liquidity management of plan assets through the timing of asset sales and resulting investment returns. Furthermore, negative cash flow coupled with investment return volatility may yield surprising results even if a plan's investment return assumption is achieved over the long term, as the timing of favorable and unfavorable returns can have a dramatic impact on the plan's financial status. Plans with higher negative cash flow as a percent of assets will generally find it harder to recover from market downturns.

Examples 5 *(Market value of assets divided by current active member payroll)* and 6 *(Actuarial accrued liability divided by current active member payroll)* are useful measures of both plan maturity and cost volatility and are discussed separately later in this section.

Finally, example 7 *(Duration of the actuarial accrued liability*) provides a measure of how sensitive plan liabilities are to a change in the valuation discount rate. Again, this can be useful in reviewing the plan's investment policy, particularly for plans where the discount rate is based on current market interest rates.

Pursuant to section 3.7, when selecting which maturity measures to include in the risk assessment report, the actuary should consider the significance of each maturity measure when assessing risk. As described above, some measures may provide similar information, and some measures are more useful for pay-as-you-go plans while others are more useful for funded plans. The actuary might consider these differences when selecting maturity measures for calculation and disclosure.

The actuary might also consider that for some maturity measures, the progression of the measure is as significant as the current level of the measure. For such measures, a table of historical values will be more useful than only showing one or two years of recent values. Discussion on the expected trend going forward may provide further insight into financial risks. Section X, Historical Information, of this practice note discusses this in more detail.

As is generally true for risk assessments, the ASOP says the actuary should provide commentary to help the intended user understand the significance of the disclosed plan maturity measures when assessing risk. Although not specifically required by the ASOP, the actuary might consider discussing any trend or progression of values in the historical measurements.

This section concludes with a more detailed discussion of one type of maturity measure: volatility ratios.

Volatility Ratios—Plan Maturity Measure and Quantitative Risk Assessment

Volatility ratios (sometimes called volatility indexes) are an easy-to-calculate measure of the relative sensitivity of employer contributions to changes in assets or liabilities. These measures are most appropriate for ongoing plans where the contributions are expressed as a percentage of payroll.[5] For such plans, there are two common volatility ratios:

Asset Volatility Ratio (AVR): Assets / Payroll

Liability Volatility Ratio (LVR): Accrued Liability / Payroll

These ratios are most commonly thought of as maturity measures, along with ratios of retired to active members and ratios of benefit payments to contributions. In particular, ASOP No. 51 lists only the AVR as an example of a plan maturity measure.

The actuary might find that the AVR and LVR provide a more specific measure of future cost volatility than headcount ratios, and so are more useful in a risk assessment than some other plan maturity measures. Also, while the Asset Volatility Ratio sometimes receives more attention (such as being listed in ASOP No. 51) the Liability Volatility Ratio might better capture intrinsic plan volatility. Note that as the plan approaches 100% funding and assets approach the accrued liability, the AVR approaches the LVR. In general, the AVR will illustrate cost sensitivity to investment experience, while the LVR will illustrate cost sensitivity to demographic experience and, especially, to changes in assumptions.

Although plans, plan sponsors, and other stakeholders initially may not be familiar with volatility ratios, they can come to appreciate the resulting insights into directional trends in cost volatility and especially the reasons for the relative volatility for different tiers or plans sponsored by the same employer.

Here is a simple Liability Volatility Ratio (LVR) example. Consider an employer with two plans with different benefits covering two classes of employees, Plan A and Plan B. Suppose Plan A has an LVR of 5 and Plan B has an LVR of 10. Then suppose the actuary changes an assumption for both plans that increases the Actuarial Accrued Liability (AAL) by 10%.

For Plan A: AAL = 5 x Payroll, so Δ AAL = 50% of payroll

For Plan B: AAL = 10 x Payroll, so Δ AAL = 100% of payroll

This shows that the impact of the assumption change on the employer's contribution rates will be roughly twice as great for Plan B compared to Plan A. A similar example using the Asset Volatility Ratios will show the relative impact of investment experience on the employer contribution rates for the two plans.

For an actual example, the following table shows the progression of these ratios over time for a public sector plan with separate tiers of benefits for General and Safety members:

[5] Similar maturity measures may be developed for plans with contributions based on some other measure of active employment, such as hours worked.

Year	General		Safety	
	AVR	LVR	AVR	LVR
2019	6.4	9.0	12.9	13.8
2018	6.0	8.9	12.2	13.4
2017	6.2	8.9	12.3	13.1
2016	6.2	8.6	12.1	12.9
2015	5.5	8.1	10.8	12.9

Here we see that the AVRs and LVRs are substantially higher for Safety than for General. Using the 2019 results we can observe that, comparing Safety to General:

10% asset loss is 129% vs 64% of payroll—so Safety rates will be twice as volatile

10% change in AAL is 138% vs 90% of payroll—so Safety rate impact is over 50% greater

Increasing plan maturity is a natural progression for most plans. Thus, increasing maturity measures are not an adverse result per se, but can be indicative of increasing sensitivity to other economic and demographic risks. This is particularly true for closed plans, which typically have accelerated growth in maturity.

X. Historical Information

In addition to identifying risks and plan maturity measures, section 3.8 of ASOP No. 51 requires the actuary to identify and disclose reasonably available historical values of the plan's actuarial measurements that the actuary believes, on the basis of professional judgment, to be significant to understanding the identified risks. The actuary should consider similarly identifying and disclosing other reasonably available historical information relevant to the actuarial measurements. As indicated in the ASOP, the selection of historical values to be disclosed should follow risk identification, as the historical information considered and presented should be consistent with the risk identification.

Most of the historical data that might be used to satisfy this requirement are based on actuarial measurements. Examples include:

1. Plan maturity measures (see previous section for further discussion)
2. Funded status
3. Any actuarially determined contributions (or other contribution information)
4. Actuarial gains/losses
5. Normal cost measures
6. Plan settlement liabilities
7. Ratios of valuation measures other than funded status

Some possibly informative historical data are not typically referred to as actuarial measurements but may nonetheless be of significant value in enhancing understanding of the identified risks for a plan. These include:

1. Comparison of actual contributions to actuarially determined contributions
2. Plan participant and active counts
3. Covered payroll
4. Tax base of the underlying public plan sponsor
5. Number and relative size of contributing employers to a multiemployer plan

The actuary should be selective in determining the items to disclose. Providing all possible information is likely to result in too much information that does not clearly communicate sources of risk, while selecting too few will leave users uninformed about the nature of the effects of demonstrable risks on the plan historically. Per section 3.7, it is important to recognize that some data that may be disclosed convey the same or similar information on risk, and the actuary should thus use professional judgment to select the most effective option or options among these similarly informative items.

The actuary must also use professional judgment to determine the appropriate period over which to disclose the historical information. This will be influenced by the period over which the information is available as well as costs and efforts required to develop the information for various periods and the value of the information gained from understanding the risks with longer periods. It is possible that the period available for initial disclosure will be shorter than the actuary believes is most effective long term, and that the period for which the historical information is shown will thus expand initially.

In addition to disclosing the identified historical information that the actuary believes will enhance the user's ability to understand the identified risks, section 3.7 requires the actuary to include commentary regarding the significance of each of the items disclosed in the assessment of risk. This analysis can consider both historical aspects and possible future implications of the disclosed items.

XI. Communications

The disclosures required for actuarial communications arising from ASOP No. 51 also need to comply with the communications requirements of ASOPs Nos. 4, 23, 27, 35, 41, and 44. In addition to these disclosures, section 4.1 provides several specific items associated with the ASOP No. 51 risk assessment that should be disclosed when relevant and material.

The risks identified in the assessment and the results of the assessment should be disclosed. This should include commentary that considers the specific circumstances of the plan. For example, the type of plan (single employer, multiemployer, or public sector), a plan's funded status, asset allocation, optional forms of payment, and participant makeup could all have a strong influence on the types of risk that are significant to the plan and the relative importance of those risks. Those circumstances therefore are typically noted as factors that were considered in the identification of risks and the potential effects of those risks to the extent they came into play.

Historical results, including any selected plan maturity measures that are anticipated to be helpful to the intended user in understanding the risk assessment, should be disclosed. This might take the form of charts, tables, graphs, or other methods of display. Regardless of how the results are shown, they should be accompanied by commentary that will help the intended user understand the significance of this information as it relates to the risk assessment of the plan.

When conducting a risk assessment, any significant limitations or constraints applicable to the assessment should be disclosed. For example, if the assessment consisted of a limited number of scenario tests and the actuary believed that an inadequate number of scenarios were modeled, the actuary should note that limitation in the disclosures of the risk assessment. Such limitation might include an inability to enumerate or evaluate all the significant sources of risk, or to identify their relative importance. If, in the professional judgment of the actuary, an additional analysis would be significantly beneficial, that additional analysis should be recommended to the intended user as noted previously.

Any of the required disclosures may be incorporated by reference in the actuarial communication subject to ASOP No. 51. The referenced report may have been prepared by the same actuary who prepared the current communication or by another party, but in any case, it must be judged by the current actuary to be consistent with the applicable requirements and should be available to the intended users of the actuarial communication subject to the ASOP. For example, if several deliverables for a plan are subject to ASOP No. 51—such as a valuation report, a valuation results presentation, and contribution strategy analysis—one deliverable could contain a complete risk assessment with all of the required ASOP No. 51 disclosures and the other deliverables could reference it, adding any other required disclosure items that arise under the ASOP due to other content beyond that included in the referenced deliverable. The ASOP No. 51 disclosures are typically made available by the time the plan or plan sponsor is expected to make decisions based on the applicable Statement of Actuarial Opinion, which may be at the time of issue or at some later date.

Reports prepared by third parties such as investment advisers or other actuaries, regardless of whether they are from the same firm or a different firm, may be referenced if they meet the requirements of the ASOP discussed above. An example of this would be an Asset-Liability Modeling (ALM) study conducted by another firm. Such an outside analysis may be considered for use in meeting the requirements of the ASOP if it is deemed reliable and relevant, as it would then necessarily be timelier and more cost-efficient than an additional analysis.

Any significant assumptions made and methods employed in the course of performing the risk assessment should be disclosed in accordance with the ASOP. If, for example, a stochastic projection of funded status was performed, the expected returns, standard deviations, and correlations of the various asset classes should be disclosed, along with the target asset allocations and the investment policy used to determine them. Similarly, the assumptions and methods used to determine the projected liabilities presented should be disclosed in accordance with ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*, including demographic assumptions such as employment levels, retirement, termination, mortality, and salary scale. Finally, the funding policy or set of alternative funding policies that were illustrated should be explained in sufficient detail that the intended user could be expected to understand how contribution levels are determined in the forecast, also in accordance with ASOP No. 35.

Prescribed assumptions or methods set by another party often play a role in the determination of contributions, as in the case of a government entity whose pension plan is sponsored directly or indirectly by that entity. Pursuant to section 4.2, those assumptions should be considered in the risk

assessment of the plan and, if the actuary, in his or her professional judgment, finds such a method or assumption deviates from reasonableness to a significant extent, that deviation should be disclosed. If the reasonableness of such an assumption cannot be evaluated, then the inability of the actuary to confirm the reasonableness of that assumption should be disclosed.

Additionally, if the actuary relies on other sources and in doing so disclaims responsibility for one or more material methods or assumptions that were set by another party, or if the actuary deviates materially from the requirements of ASOP No. 51, the disclaimer should be made, or deviation disclosed.

Nothing in ASOP No. 51 is intended to require the actuary to disclose confidential information.