

A PUBLIC POLICY PRACTICE NOTE

Variable Annuity Plans

November 2019

Developed by the Pension Committee



AMERICAN ACADEMY *of* ACTUARIES

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of the American Academy of Actuaries



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The American Academy of Actuaries is a 19,500-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.

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Introduction

This practice note is not a promulgation of the Actuarial Standards Board (ASB), is not an actuarial standard of practice, is not binding upon any actuary, and is not a definitive statement as to what constitutes generally accepted practice in the area under discussion. Events occurring subsequent to the publication of this practice note may make the practices described in the practice note irrelevant or obsolete.

This practice note was prepared by the Pension Committee of the American Academy of Actuaries (committee) to provide information to actuaries on current and emerging practices for measuring obligations of defined benefit pension plans that include variable annuity benefits. Cash balance plans that credit market rates of return are closely related, but are not addressed in this practice note. The intended users of this practice note are the members of actuarial organizations governed by the actuarial standards of practice promulgated by the ASB.

This practice note addresses several topics that have not yet been formally and explicitly addressed by the Internal Revenue Service (IRS), the Department of Labor (DOL), the Financial Accounting Standards Board (FASB), and the ASB. There is no assurance that such bodies would analyze these topics in the same manner as this practice note. The potential divergence between typically accepted actuarial objectives and certain interpretations of the available regulatory guidance may raise professionalism concerns. Dealing with these concerns may require a greater-than-usual amount of professional actuarial judgment. The Code of Professional Conduct, as well as the relevant actuarial standards of practice, even if not directly on point, may help the actuary think through these concerns.

Measurements of defined benefit pension plan obligations include calculations that assign plan costs to time periods, actuarial present value calculations, and estimates of the magnitude of future plan obligations. The application of the information contained herein is intended to cover qualified and non-qualified plans, and governmental and non-governmental plans for which the actuary is subject to Actuarial Standard of Practice No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions* and Actuarial Standard of Practice No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. Other actuarial standards of practice may also be relevant.

This practice note addresses issues actuaries may want to consider when setting assumptions, or providing advice on setting assumptions, for funding (as permitted by law), and for financial accounting.

This practice note is intended to be illustrative and spur professional discussion on this topic. Other reasonable methodologies may currently exist and new ones likely will evolve in the future.

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An exposure draft of this practice note was originally released in December 2015 and two comment letters were submitted. The authors of the note carefully considered the comments received and attempted to address the concerns raised in those comment letters. Some of the comments expressed a concern that the exposure draft appeared to advocate for a particular position in areas that are under the jurisdiction of regulatory bodies (particularly the IRS). Many of the edits to the practice note were in response to this concern. While the authors feel strongly that certain approaches are preferred from a theoretical perspective, we recognize that this practice note is not binding on any actuary and should not be considered guidance. These regulatory concerns were addressed in a [letter to the Treasury Department](#) requesting guidance. ***Until more definitive guidance is received on these issues, the reader should exercise caution when considering the approaches described in this practice note. If regulators do provide guidance in response to the request, it is possible that some of the methods described herein will be impermissible under that guidance.***

The committee welcomes any suggested improvements for future updates of this practice note. Suggestions may be sent to the pension policy analyst of the American Academy of Actuaries at 1850 M Street NW, Suite 300, Washington, DC 20036 or by emailing pensionanalyst@actuary.org.

Variable Annuity Plans

A variable annuity plan is a defined benefit pension plan in which the periodic benefit payable to a participant fluctuates based on a formula defined in the plan document.¹

Variable annuity plans have existed in the United States since at least the 1950s. The first official guidance regarding these plans was Revenue Ruling 185 in 1953. Variable annuity plans were explicitly recognized in the Internal Revenue Code (IRC) for the first time through the Pension Protection Act of 2006. Variable annuity plans offer certain characteristics of both defined benefit and defined contribution plans but are regulated as defined benefit plans.

Despite more than 60 years of existence, variable annuity plans comprise a very small portion of retirement plans. Most laws and related regulations have been drafted without specific consideration for variable annuity plans. In some cases, this may be entirely appropriate. For example, eligibility provisions for plans would not seem to be affected by variable benefit provisions. But many areas might need special treatment and currently lack guidance on how to apply existing rules. This practice note discusses several of these areas (funding targets, lump sum distributions, etc.); several more such areas that are beyond the scope of this practice note are identified at the end of the document.

Decisions concerning the applicability of the law and regulations to variable annuity plans affect plan sponsors and plan participants. Full disclosure of any regulatory uncertainties and open discussion with the plan sponsor and the plan sponsor's advisers can facilitate a better understanding of these plans and the risks they pose. In addition, Actuarial Standard of Practice (ASOP) No. 41, Section 3.4.1 requires that "The actuary should consider what cautions regarding possible uncertainty or risk in any results should be included in the actuarial report" and Section 4.1.3(d) requires the actuary to disclose "any cautions about risk and uncertainty" unless "the actuary determines that it is inappropriate to do so."

While many actuaries believe that the pure variable annuity valuation model discussed in this practice note is an appropriate starting point for plans that deviate only modestly from the pure variable annuity design, the IRS has not provided any guidance (formal or informal) indicating an acceptance of this view. ***Therefore actuaries applying the pure variable annuity model should consider including appropriate cautions in their actuarial communications as to the risk of this approach failing to gain acceptance with regulators and the risks associated with its use with regard to minimum funding, determination of Pension Benefit Guaranty Corporation (PBGC) premiums, benefit restrictions, financial reporting, and lump sum determinations (as applicable to the plan.***

¹ Treasury Regulation Section 1.411(a)(13)-1(d)(6) defines a "variable annuity benefit formula" as "any benefit formula under a defined benefit plan which provides that the amount payable is periodically adjusted by reference to the difference between a rate of return and a specified assumed interest rate."

The variable annuity formula may define a change in the entire accrued benefit or a portion of the accrued benefit. If the formula change applies to less than the entire benefit, the plan has a bifurcated formula with both fixed and variable components. The fixed component of the benefit may be measured using traditional techniques. This practice note addresses only the variable component of the benefit.

The variable benefit formula may apply to all plan participants or only a designated subset of plan participants. This practice note addresses only those benefits accrued under the variable formula.

A variable annuity plan is usually a career accumulation plan in which the plan document defines the amount of benefit that accrues to a participant each year. The accrual formula could be based on current compensation (e.g., $1\% \times \text{pay}$) or a fixed accrual ($\$X$ per year of service). The accrual for the plan year is generally not dependent on future changes in compensation, as it would be in a final average compensation plan. The annual accrual and the total accrued benefit are expressed as an annual amount payable at Normal Retirement Date (NRD) to the participant in the form of a life annuity. The annuity at NRD could be a single life annuity, or any of the other common forms of annuity typically available in a defined benefit plan.

The periodic adjustments in the plan benefit usually occur annually, but can also take place on a monthly, quarterly, or semiannual basis. Monthly adjustments are common in insured variable annuity plans offered by some insurance companies. Annual adjustments are common in qualified pension plans sponsored by employers. Most illustrations in this practice note assume annual adjustments, although a pure variable annuity plan (defined below) would have adjustments made immediately prior to each payment.

Periodic adjustments generally apply to all accrued variable benefits regardless of the participant's status. Thus variable benefits are adjusted periodically for active members, terminated vested members, and retired members. Some variations of variable annuity plans may adjust benefits differently for various membership classes. For example, a fixed annuity plan could offer a variable annuity option at retirement or, alternatively, a variable annuity plan could provide a fixed benefit option at retirement.

The plan document defines the exact formula for the periodic adjustment. The most common formula first defines an assumed investment return, often referred to as the "hurdle rate." The hurdle rate is expressed as an annual return, typically 3%, 4%, or 5%. Theoretically, any percentage could be used, but there are legal and practical limitations that usually confine the hurdle rate to not less than 3% (to comply with minimum distribution regulations) and seldom more than 6% or 7% (to avoid declining benefits). The hurdle rate is defined by the plan document and it is an integral part of the accrued benefit.

Periodic benefit adjustments are generally defined by comparing the hurdle rate to the actual return on a portfolio of assets for the adjustment period. The plan document generally defines the methodology for determining the actual return on assets. In qualified plans, the adjustment period is generally the plan year. The portfolio of assets for which the actual return is measured could be:

- The entire plan trust
- A designated subaccount of the plan trust
- A specific investment index (e.g., the Standard and Poor's [S&P] 500)
- A specific investment fund (e.g., a mutual fund or a separate account of an insurance company or investment firm)

Assuming a plan that pays and adjusts benefits annually, the plan would generally define the annual adjustment of benefits previously accrued for a participant as follows (monthly benefit payments and adjustments are discussed below under *Variations*):

$$B_n = B_{n-1} \times (1 + i_n) / (1 + h)$$

where B_n is the accrued annual benefit as of the first day of the n th plan year, i_n is the actual rate of return on the portfolio of assets during the period between the beginning of year $n-1$ and the beginning of year n (i.e., for the $n-1$ plan year), and h is the hurdle rate.² If $i_n = h$ then $B_n = B_{n-1}$. The formula makes the term “hurdle rate” clear, as the actual return must equal or exceed the hurdle rate to avoid a decline in the benefit.

The formula above produces the change in benefit ignoring additional accruals. For an active participant who is accruing benefits, the formula reflecting the benefit accrual for the plan year is as follows:

$$B_n = B_{n-1} \times (1 + i_n) / (1 + h) + INC_{n-1}$$

where INC_{n-1} is the incremental benefit accrual for service during the year under the plan formula (e.g., 1% x annual pay or \$X, as in the prior examples). A pure variable annuity plan makes no promise concerning a fixed or guaranteed level of benefits other than that benefits already accrued will not vary between scheduled adjustment dates. Benefits could theoretically go to zero if the portfolio of assets experienced a -100% rate of return (and there were no additional benefit accruals).

A pure variable annuity benefit is one in which the plan sponsor can be fully insulated from gains or losses due to investment performance. A pure variable annuity plan would have the following features:

² Some plans may define the adjustment as: $B_n = B_{n-1} \times (1 + i_n - h)$. This variation has some theoretical basis for plans that pay monthly benefits but determine the adjustment annually. The slightly larger adjustment compensates for the gains that develop if the actual return is higher than the hurdle rate.

- benefit adjustments are made immediately prior to each payment for benefits in pay status and at least annually for benefits not in pay status; and
- benefit adjustments are based solely on the performance of the assets backing the obligation during the period between benefit payments.

The plan sponsor will be fully insulated from investment gains and losses if:

- benefits are fully funded as they accrue and credited with investment gains or losses from the time they accrue; and
- demographic gains/losses are fully funded as they occur.³

The Mathematical Consequence

The appendix provides a mathematical demonstration for a pure variable annuity showing that the assets needed to provide all future benefits are independent of both market interest rates and the portfolio of assets that back the benefit. Thus, it is irrelevant whether the assets backing the benefit are composed of fixed income or equities. To put this differently, if a pure variable benefit is evaluated using the hurdle rate and an appropriate mortality assumption and the present value is \$1 million, the present value is not affected by whether the \$1 million is invested in bonds, equities, or even cash; the amount is expected to be sufficient regardless, with any variation related only to mortality experience different from assumed.⁴ The asset allocation will affect how the benefit changes in the future, but it does not affect the amount of assets currently needed to provide that benefit—actuaries generally agree that this latter amount is the present value of the future benefit.⁵

There is an important corollary to this rule for pure variable annuity benefits. If the valuation assumes that benefits will be indexed based on a specific rate of return on assets, then to calculate the initial assets needed to provide the projected benefits resulting from that rate of return, the projected benefits must be discounted using the same specific rate of return on assets. The magnitude of the assumption is not relevant,

³ In theory, fully funding a demographic gain would require subtracting assets from the fund. In reality, this is generally impractical, so instead excess assets resulting from a gain would be offset against the cost of subsequent accruals or demographic losses.

⁴ To the extent that a plan provides subsidies (e.g., early retirement) or reduces the value of benefits in certain circumstances (e.g., suspension of benefits or imposition of a vesting requirement), then other demographic assumptions would also be relevant.

⁵ This concept is discussed more fully later in the practice note. Some have pointed out that, depending on interpretation, the IRS definition of present value contained in Treasury regulation §1.430(d)-1 may not represent the amount of assets currently needed to provide the benefit for certain types of plans.

but the return on assets assumption and the discount assumption must be identical to determine the necessary starting assets.⁶

This corollary may also be expressed with the discount rate set first. If the valuation assumes projected benefits will be discounted at a specific rate, then to calculate the initial assets needed to provide the projected benefits, the projected benefits must be assumed to be indexed based on asset returns equal to the discount rate. Any other asset growth assumption will result in a present value that is either inadequate or excessive to provide the projected benefits.

The mathematical consequence and corollary apply to pure variable plans that base the benefit adjustments on the return on the plan assets that back the benefit. Other plans that base adjustments on a return other than the plan assets (e.g., a plan that bases adjustments on the S&P 500 index, for which assets are not invested solely in the S&P 500) will not have these characteristics.

⁶It is not strictly necessary for these assumptions to match on a year-by-year basis, as long as they match over the life of the obligation. In other words, one can use a series of non-uniform returns or discount rates both to project benefits and to discount the resulting payments, or calculate a single equivalent rate of return which, in conjunction with the non-uniform discount rate assumption, produces the same calculated liability.

Variations on Pure Variable Design

A pure variable design can be modified in a variety of ways. Any variation from the pure model is likely to cause some deviation from the mathematical consequences previously demonstrated. Whether these deviations are material and how the deviations affect issues addressed in this practice note are important considerations for the actuary and plan sponsor. These modifications include:

Benefit payment frequency different from benefit adjustment frequency

The most common deviation from the pure variable model is monthly payment of benefits with only annual adjustment of benefit amounts. To facilitate administration, the actual change in benefit amounts is usually delayed a month or more to allow the administrator to determine these adjustments and implement the change. For a calendar year plan, the actual return on the portfolio of assets is generally determined for the calendar year and benefit adjustments are typically implemented in February or March of the following year, usually without any retroactive adjustment.

Separate non-variable floor benefit formula

A plan may provide the better of a variable benefit or a fixed “floor” benefit. This floor benefit may be set based on the same formula as the variable benefit (e.g., both fixed and variable formulas are 1% of pay for each year of service). Alternatively, it may be set at a different (typically lower) level to provide some limit on the downward adjustment to the benefit in the event of adverse investment experience (e.g., the benefit is the greater of a variable benefit of 1% of pay or a fixed benefit of 0.9% of pay). The floor benefit generally applies to the benefit in total, rather than applying separate floors to each year’s accrual.

Grandfathered frozen benefit

When a plan is converted to a variable plan, the change is usually made prospectively, affecting only future accruals (the so-called A+B transition). However, it is possible to apply the variable adjustment to some or all of the accrued benefit as well. In such case, for U.S. qualified plans the accrued benefit as of the date of conversion must be protected as a minimum, in which case it acts as a floor benefit described above. Over time, as additional benefits are earned, the floor benefit is likely to become less significant (this is known as “wearaway”). On the other hand, for a participant who terminates employment shortly after the conversion, the floor benefit promise may continue to have significant value.

If the variable benefit plan is considered a statutory hybrid plan (i.e., a U.S. qualified plan and the hurdle rate is less than 5%), the frozen accrued benefit may need to be maintained without wearaway in addition to all prospective variable benefits. In this case, most sponsors will likely conclude that the A+B transition approach is the only practical option.

Limit on the annual benefit adjustment

The amount the benefit can be reduced or increased in any given year may be limited to a specified percentage (e.g., 5%). Any adjustment beyond this amount may either be carried forward to future years in a separate notional account to be used as an offset against future adjustments, or be treated as a plan gain or loss. Similarly, the annual adjustment may be smoothed over multiple years, rather than being recognized all at once.

Conversion from variable to fixed annuity at retirement

The plan may limit the variable benefit adjustment to active and terminated vested participants, permitting or requiring the conversion of the variable benefit to a fixed benefit at retirement. If prevailing market interest rates at which the benefit can be effectively annuitized are close to the hurdle rate, this conversion is likely to have minimal cost. If market rates differ from the hurdle rate, the conversion will have a cost that must be borne by (i) the participant (in the form of a benefit adjustment); (ii) the sponsor (in the form of an increase/decrease in plan costs); or (iii) other participants (in the form of an adjustment to the annual increase/decrease in benefits). Where some group of participants is excluded from the annual benefit adjustment, assets backing the benefits of those participants are typically excluded when calculating the asset return used to determine the annual benefit adjustment. Any such exclusion would presumably have to be specified in the plan document.

Conversion from fixed to variable annuity at retirement

The plan may offer variable annuities as an optional form of payment at retirement (e.g., active participants may accrue fixed benefits, but be permitted to select a variable benefit at retirement). The conversion to a variable benefit can be made without gain or loss to the plan if the fixed benefit is converted to its equivalent lump sum value at current market rates and then the lump sum value is converted to a variable annuity using the variable hurdle rate.⁷ If current market rates are close to the hurdle rate, the adjustment in the annuity amount may be small. However, when market rates are significantly different than the hurdle rate, the adjustment will be large. Alternatively, the plan may define a fixed basis for conversion from a fixed benefit to a variable benefit, but this structure introduces the potential for gains or losses and possible arbitrage. This approach may also distort the relative value of various optional forms of benefit.

Maximum benefits

Qualified plans are subject to the maximum benefit limitations of IRC Section 415. Qualified plans may also adopt lower maximum benefits, and non-qualified plans may adopt any type of maximum benefit. To the extent these limits affect the periodic adjustments to the benefits, the plan will vary from the pure variable model. This variation could be significant if a non-de minimis percentage of plan participants are

⁷ As discussed below and in the appendix, the value of a pure variable benefit is usually calculated using the hurdle rate, thus the conversion from lump sum to equivalent annuity would use the hurdle rate.

materially affected by 415 limits, as the full upside adjustment may not be available. In this situation one would expect the liability to be lower than would be the case with a pure variable benefit.

This is not an exhaustive list of possible variations. Plans may include more than one of these or other variations. When designing a new variable annuity plan, thorough evaluation of each variation may be appropriate to determine the effects of deviation from the pure model. For some plans, the deviation from the pure model may be quite significant. Whether to start with the pure variable model and adjust to account for the effect of these deviations, or to start with the traditional valuation model and adjust for the effect of variable features, is a matter of actuarial judgment. Whether the IRS or a court would find the pure variable annuity or any of these design variations acceptable for a U.S. qualified plan under current statutes and regulations is uncertain. For example, IRC Section 411(a)(9) raises a question for variable plans.⁸ In addition, any variation of benefit indexing that could exceed a “market rate of return” as defined by the current Treasury regulations may conflict with those regulations.

⁸ This section requires that the amount of the normal retirement benefit be equal to the greater of the largest early retirement benefit under the plan and the benefit under the plan commencing at normal retirement age. See the discussion in the *Minimum Benefit Based on Prior Early Retirement Benefit* section of this practice note.

Guidance From Actuarial Standards of Practice

Actuarial Standard of Practice No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations* (ASOP 27),⁹ and Actuarial Standard of Practice No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions* (ASOP 4),¹⁰ provide guidance to the actuary on selecting certain assumptions and on measuring the associated obligation that are essential to properly valuing variable annuities. Although neither ASOP 27 nor ASOP 4 specifically addresses variable annuities, they contain provisions that can aid the actuary.

Section 3.2 of ASOP 27 is particularly helpful and is reproduced here:

3.2 Identification of Economic Assumptions Used in the Measurement—The actuary should consider the following factors when identifying the types of economic assumptions to use for a specific measurement:

- a. the purpose of the measurement;
- b. the characteristics of the obligation to be measured (measurement period, pattern of plan payments over time, open/closed group, materiality, volatility, etc.); and
- c. materiality of the assumption to the measurement (see section 3.5.2).

The types of economic assumptions used to measure obligations under a defined benefit pension plan may include inflation, investment return, discount rate, compensation increases and other economic factors such as Social Security, cost-of-living adjustments, rate of payroll growth, growth of individual account balances, and variable conversion factors.

Similarly, section 3.3 of ASOP 4 provides:

Purpose of the Measurement—When measuring pension obligations and determining **periodic costs** or **actuarially determined contributions**, the actuary should reflect the purpose of the measurement.

Several purposes of the measurement are considered in this practice note, including funding calculations, financial disclosure, and determining actuarial equivalence. The unique characteristics of the variable annuity obligation in conjunction with the purpose of the measurement are integral to valuing variable annuities.

Section 3.12 of ASOP 27 deals with the consistency of material economic assumptions selected by the actuary and generally requires that all such assumptions for a particular measurement be consistent. In some cases, the actuary will be required to use a

⁹ Revised September 2013.

¹⁰ Revised December 2013.

prescribed assumption.¹¹ Regarding this, section 3.12 of ASOP 27 provides that “Assumptions selected by the actuary need not be consistent with prescribed assumptions, which are discussed in section 3.13.” IRC sections 430(h)(2) and (3) prescribe the discount rate and mortality assumptions respectively that are required to be used for valuations under The Pension Protection Act of 2006 (PPA).¹²

Based on consideration of the purpose of the measurement and the characteristics of the variable annuity, some actuaries believe it may be necessary to select economic assumptions that are consistent with the prescribed discount rate assumption in order to obtain an appropriate result. The primary basis for this conclusion is that the prescribed discount rate assumption represents a return on an asset portfolio (albeit a theoretical portfolio), and that any assumption regarding benefit indexing based on portfolio returns would be based on the same assumption. The rationale for this argument is discussed in more detail in the next section.

Section 3.6 of ASOP 27 requires that each economic assumption selected by the actuary be reasonable. Some actuaries read section 3.6 as requiring that the actuary select an expected return on assets that represents a reasonable expectation of returns on the actual asset portfolio. However, consistent with the discussion in the preceding paragraph, other actuaries believe that the discount rate represents a prescribed assumption regarding the return on the asset portfolio, and thus the expected return on assets is also a prescribed assumption for this purpose, not an assumption “selected by the actuary.”

The section titled “Valuing Variable Annuity Plan Variations” discusses features that may be incorporated within a variable annuity plan that may complicate the measurement of the associated obligation.

Section 3.5.3 of ASOP 4 provides guidance that is relevant in valuing these features:

Plan Provisions That Are Difficult to Measure—Some plan provisions may create pension obligations that are difficult to appropriately measure using traditional valuation procedures. Examples of such plan provisions include the following:

- a. gain sharing provisions that trigger benefit increases when investment returns are favorable but do not trigger benefit decreases when investment returns are unfavorable;
- b. floor-offset provisions that provide a minimum defined benefit in the event a participant’s account balance in a separate plan falls below some threshold;

¹¹ ASOP 27 defines a prescribed assumption as a specific assumption that is either (1) selected by another party, to the extent that law, regulation, or accounting standards give that party responsibility for selection of the assumption (Section 2.5), or (2) mandated or selected from a specific range or set of assumptions deemed acceptable by applicable law (statutes, regulations, and other legally binding authority) (Section 2.6).

¹² Pub. L. 109-280.

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- c. benefit provisions that are tied to an external index, but subject to a floor or ceiling, such as certain cost of living adjustment provisions and cash balance crediting provisions; and
- d. benefit provisions that may be triggered by an event such as a plant shutdown or a change in control of the plan sponsor.

For such plan provisions, the actuary should consider using alternative valuation procedures, such as stochastic modeling, option-pricing techniques, or deterministic procedures in conjunction with assumptions that are adjusted to reflect the impact of variations in experience from year to year. When selecting alternative valuation procedures for such plan provisions, the actuary should use professional judgment based on the purpose of the measurement and other relevant factors.

Traditional Liability Measurement of Pure Variable Benefits

The plan sponsor's commitment in a pure variable annuity plan can be thought of as the promise to fund a lifetime annuity under the assumption that plan assets always earn a return equal to the hurdle rate. If the sponsor funds the full value of the benefits that accrue each year, the benefit obligation will increase or decrease based on actual investment experience. If investment experience matches the hurdle rate, then the plan benefits are not adjusted and the assets will be sufficient to precisely cover all benefits (assuming other underlying assumptions—particularly mortality¹³—are met).

If the assets earn more than the hurdle rate, the benefits are adjusted upward by the same percentage difference so that the benefit obligation increases in lockstep with the assets. If the assets return less than the hurdle rate, the benefits are adjusted downward so that the benefit obligation decreases in lockstep with the assets. Investment gains and losses do not create surplus or unfunded liabilities; however, as noted, other non-investment experience gains or losses may lead to a surplus or deficit. If the sponsor adjusts contributions to account for the non-investment gains or losses as they emerge, assets and liabilities will remain in balance.

The sponsor's obligation is also independent of market interest rates. Because the obligation is tied directly to the performance of the portfolio of assets, changes in market interest rates have no effect on the sponsor's obligation. This is demonstrated mathematically in the appendix. Note that the benefit obligation described in the appendix is general and applies to both an accrued benefit and the annual incremental accrual of the benefit.

Traditionally, actuaries have often valued variable benefit plans by simply valuing a level annuity equal to the current nominal benefit (B_0) at the hurdle rate. The sponsor's obligation can be thought of as the amount needed to fund a level annuity at the hurdle rate. Any investment gains or losses adjust the actual benefits payable to the participant. If there are other gains or losses (e.g., mortality), the sponsor funds these as they emerge. Under the traditional method, the actuary would define the liability at time $t = 0$ of a benefit in pay status as:¹⁴

$$L_0 = B_0 \times (1 + v^1 + v^2 + v^3 + \dots + v^{n-1})$$

where $v = 1 / (1 + h)$ and n represents the number of years that payments are expected to be made.

¹³ Other potential sources of gain or loss, such as early or late retirement, can be eliminated by providing actuarially equivalent benefits in those contingencies (with equivalence determined using the hurdle rate).

¹⁴ In all demonstrations in this practice note, mortality is omitted to simplify the demonstration. In practice, the probability of survivorship is applied to all benefit amounts, but this has no effect on the conclusions demonstrated herein.

If the actual assets at time $t = 0$ (A_0) are not equal to L_0 , the plan has a surplus or deficit. If there is a deficit, the deficit is equal to U_0 where:

$$U_0 = L_0 - A_0$$

U_0 is the amount needed at time $t = 0$ to fully fund the plan. If this amount is not immediately funded, but is rather amortized over future years, the balance of the unfunded liability will grow with the rate of return on assets.¹⁵

As discussed above, if benefits are fully funded, then all investment gains and losses are passed on to participants and the plan will remain fully funded. If benefits are not fully funded, the plan sponsor's future funding obligation will be adjusted for any asset gains and losses on the unfunded portion of the benefit liability.

For example, consider a plan where the value of variable benefits earned at time $t = 0$ is \$1,000,000 based on a 5% hurdle rate. If plan assets are \$1,000,000, the plan will remain fully funded one year later (assuming there are no further benefit accruals), without regard to the asset return during the year. However, if plan assets are only \$800,000 at time $t = 0$, the unfunded liability is \$200,000. The sponsor might expect to be able to meet this obligation by contributing \$210,000 (\$200,000 increased at the 5% hurdle rate) to the plan on the next valuation date, but the actual contribution required to fully fund the benefit at that time will depend on the investment return during the year. If assets earn 15%, they will grow to \$920,000. Plan liabilities will grow by the same 15% (5% interest at the hurdle rate, plus an approximately 10% adjustment to benefits for returns in excess of the hurdle rate) to \$1,150,000. This means the sponsor would now have to contribute \$230,000 to cover the unfunded liability. This \$20,000 loss is equal to the 10% excess of the actual return (15%) over the 5% hurdle rate, applied to the \$200,000 unfunded amount.

This example illustrates a fundamental difference between a pure variable plan and a traditional fixed benefit plan. In a traditional fixed benefit plan, investment gains will reduce any existing unfunded liability. In a pure variable benefit plan, investment gains will cause any existing unfunded liability to increase.

¹⁵ Assuming no gains or losses from non-investment sources.

Potential Liability Measurement of Pure Variable Benefits Under Accounting and Regulatory Requirements

Measurement of pension obligations, particularly the selection of the discount rate used to determine the obligation, is regulated or influenced in multiple ways. Pension obligations are determined for multiple purposes including funding, accounting, potential benefit restrictions, and disclosure. Most regulatory guidance is formulated under the implicit assumption that benefit obligations have a fixed value dependent on market-based bond yields or expected returns on plan assets. When applied to a pure variable annuity plan without a consistent adjustment to the expected indexing of plan benefits, this approach could produce a measurement of the obligation that would be either inadequate or excessive to fund the projected benefits. The following sections discuss this anomalous result and its implications in further detail.

To understand the interaction between the discount rate and the payment stream being valued, it is helpful to first consider some basic questions about a discount rate. In particular, what is it an assumption about?

This may seem like an unnecessary question, but it is an important one in the context of measuring variable benefits. The discount rate could be viewed simply as a prescribed component of a calculation that produces a value ultimately used in determining financial measures, such as required contributions or financial disclosure entries. As a prescribed component of a calculation, the discount rate has little or no implication on the other assumptions involved in the calculation.

When used as an assumption for future plan experience rather than simply a prescribed component of a calculation, the discount rate helps determine a present value of future payments that will be sufficient to provide those future payments assuming the present value grows at the discount rate. Thus, the discount rate by its very nature is both the rate at which the future payments are discounted and the rate at which the present value is assumed to grow.

A pension obligation, or liability, when expressed as a present value (rather than simply as a calculation component) represents an estimate of the amount of money needed today to meet some future obligation (expressed as a projected stream of benefit payments). In calculating the present value, **the presumption is that the amount set aside will be sufficient to back the obligation if the plan's assets earn a return equal to the discount rate.** In other words, the discount rate is the assumption for the investment earnings on assets that would be sufficient to back the obligation. If this presumption proves correct, there will be sufficient assets to settle the obligation. If the presumption proves incorrect, the assets will be either insufficient or excessive. Regardless of actual experience, the presumption is that the liability will grow at the discount rate (with appropriate adjustments for new accruals and benefit payments). In general, discount rates may be established with reference to different portfolios representing different

levels of risk, but in all cases, the discount rate represents an investment return. We will refer to this as the “amount needed today” view of present value.

One might question whether the value of future cash flows, discounted to the present using a set of prescribed discount rates, represents an alternate view of present value. We will refer to this as the “discounted cash flow” view of present value. However, if an amount of assets equal to the present value so derived earns a return consistent with the discount rate then the resulting assets will precisely cover those future cash flows. This demonstrates the general consistency between these two views.¹⁶

This analysis holds for any type of pension plan. The actuary may not believe that a prescribed discount rate is reasonable for the purpose of the measurement. However, it is nevertheless true that if assets backing the obligation are equal to the calculated liability and if those assets earn a return equal to the discount rate (and the other assumptions are also realized), then there will be sufficient assets to meet the plan’s obligations.

This analysis is also consistent with private sector financial accounting, even though such accounting introduces an expected rate of return on assets that is different from the discount rate.¹⁷ Financial accounting provides that the discount rate is generally based on high-quality fixed income investments, and represents the return that those investments might be expected to provide if held to maturity. The expected return on assets, which is only used as a component of pension cost, is based on the actual investments of the pension fund and may be independent of the growth in liabilities. The benefit obligation grows at the discount rate, not the expected return on assets, thus supporting the concept that the assumption concerning the discounting of future cash flows and the growth of the obligation is one and the same assumption.

Treasury regulation §1.430(d)-1(b)(4) defines present value as follows:

“The present value of a benefit (including a portion of a benefit) with respect to a participant that is taken into account under the rules of paragraph (c) of this section is determined as of the valuation date by multiplying the amount of that benefit by the probability that the benefit will be paid at a future date and then discounting the resulting product using the appropriate interest rate under §1.430(h)(2)-1...”

¹⁶ Investopedia, for example, defines present value as “the current worth of a future sum of money or stream of [cash flows](#) given a specified [rate of return](#). Future cash flows are discounted at the [discount rate](#), and the higher the [discount rate](#), the lower the present value of the future cash flows.” This definition seems to take for granted the equality between these two definitions of present value.

¹⁷ Under international accounting standard (IAS) 19, the expected return on assets is effectively the discount rate; a separate return assumption based on the plan’s investment portfolio is no longer identified. The comments in this section apply to U.S. GAAP reporting.

§1.430(h)(2)-1 defines the interest (discount) rates as the corporate bond yield curve (YC) or the segment rates based on the corporate bond yield curve. Because the segment rates are an artificial construct—in particular the stabilized rates, which are based on a 25-year average of bond yields—one might argue that since these rates don't necessarily represent a reasonable expectation of returns, the IRS might intend a definition of present value that is consistent with the discounted cash flow view, but that is *not* consistent with the “amount needed today” view (i.e., that the present value is not intended to represent an amount of money that, if assumptions are met, will grow to be sufficient to provide for the benefit). However, as discussed above, these two views of present value need not conflict with each other. If returns are consistent with the segment rates, the present value of future cash flows discounted using these rates will, in fact, be sufficient to provide for the benefit (as long as other assumptions are also met).

A pure variable annuity plan uses the same portfolio to determine the benefit indexing and to back the obligation. Determining the benefit adjustment based on the return on one portfolio of assets but discounting the obligation based on the expected return on a different portfolio of assets would be internally inconsistent and produce a fundamental mismatch. If the obligation is discounted based on the expected return on a particular portfolio (e.g., high-quality fixed income securities), then the underlying presumption is that assets set aside to back the obligation earn a return equal to the discount rate. Consequently, if the benefit indexing is consistent with the discount rate, the present value will be sufficient—if all other assumptions are met—to provide the benefits, and will align with both the “amount needed today” and “discounted cash flow” views of present value. If the benefit indexing is not consistent with the discount rate, the present value will be either insufficient or excessive for providing the benefits.

Indexing benefits in a pure variable annuity plan based on one rate of assumed return and discounting the resulting payment stream using a different rate of assumed return is mathematically possible. However, the result would not be consistent with the “amount needed today” view of present value (although mathematically it would still be consistent with the “discounted cash flow” view of present value). The IRS definition of present value could be interpreted to provide such a divergent result if one interprets the IRS regulations as requiring a different return assumption for projecting the benefit in a pure variable annuity plan than is used for discounting. Possible interpretations of the IRS regulations are discussed later in this practice note.

The implications of this view are fundamentally different for a pure variable annuity plan than for any other type of pension plan. For a plan in which benefit amounts are independent of the return on plan assets, these two views of present value will always be consistent—the liability is the amount that would be sufficient to back the benefits if all of the assumptions (including asset returns equal to the prescribed discount rate) are met. For a pure variable annuity plan that uses different rates to determine benefit indexing and to discount the payments, these two views of present value will always be in conflict—the calculated obligation is guaranteed to be different from the amount needed to provide benefits because all assumptions cannot simultaneously be met.

Although few, if any, plans would be regarded as pure variable annuity plans, some plans deviate only modestly from the pure variable annuity model. For example, some plans pay benefits monthly but adjust benefits quarterly, semiannually, or annually. These plans will experience a gain or loss equal to the difference in the benefits actually paid compared to the benefits that would have been paid if monthly adjustments had been made. This amount will generally be relatively small unless the actual investment experience is significantly different from the hurdle rate. The annual adjustment could also be calculated to reflect this gain or loss, thus further limiting the effect. Accordingly, for plans that deviate only modestly from the pure model, an appropriate starting point for valuing these plans may be the pure variable model, modified as necessary to capture the cost of the deviation from the pure variable design.

Financial Accounting in the Private Sector

Financial accounting standards for U.S. private sector employers that sponsor single-employer plans require a benefit obligation to be discounted at the rates at which the benefit obligation could be effectively settled, while also providing certain guidance on acceptable means of estimating those rates, as follows:

ASC 715-30-35-43¹⁸

“Assumed discount rates shall reflect the rates at which the benefits could be effectively settled. It is appropriate in estimating those rates to look to available information about rates implicit in current prices of annuity contracts that could be used to effect settlement of the obligation (including information about available annuity rates published by the Pension Benefit Guaranty Corporation). In making those estimates employers may also look to rates of return on high-quality fixed-income investments available and expected to be available during the period to maturity of the pension benefits.”

This description provides the actuary with two possible approaches for determining the benefit obligation for a pure variable annuity plan:

Method 1: One could look to the discount rate inherent in insurer pricing of similar variable annuities. Although insurers typically do not publish these discount rates, it is possible to infer a discount rate by comparing the cost of comparable annuities with different hurdle rates. It will usually be more practical to compare pricing of individual annuities, rather than group annuities, as individual quotes are readily available from insurers. This analysis will generally demonstrate that for a pure variable annuity product, the pricing is consistent with valuation of the fixed benefit at the hurdle rate. This result makes sense, because, as discussed above, the funds needed to pay benefits for a pure variable annuity can be determined by valuing a level annuity at the current nominal

¹⁸ Accounting Standards Codification Topic 715 (ASC 715) is the standard that prescribes the accounting for pension benefits under U.S. private sector accounting rules.

value of the benefit using a discount rate equal to the hurdle rate. It is therefore reasonable to conclude that insurer pricing for the plan as a whole would be determined in this manner.

The insurer would not select separate assumptions for expected returns and discounting, as this would produce an amount different from the amount needed to provide the benefit. Rather, the insurer will value the nominal annuity using the hurdle rate (with appropriate other assumptions).

This result is mathematically identical to assuming a discount rate equal to the expected return on the underlying assets and assuming benefit indexing based on that same return.

Some actuaries, preparers of financial statements, or auditors may be troubled by this method because disclosing a discount rate equal to the hurdle rate, or equal to the expected return on a portfolio of underlying assets, may seem inconsistent with the accounting standards' requirements for setting the discount rate. This concern can potentially be addressed by a disclosure that the value of the benefits is based on a settlement interest rate that is independent of current market rates because of the nature of the obligation.

Method 2: Future indexed benefits can be discounted at a rate consistent with high-quality fixed income investments at the measurement date. In this case, an assumption also needs to be made regarding the future indexation of the variable benefits.

Whichever approach is used, the actuary may anticipate having discussions with the plan sponsor's auditors about the appropriate methodology. In practice, a number of auditors have been comfortable with an approach that effectively values liabilities at the hurdle rate.

Indexing Assumption Consistent With Discount Rate

The indexed benefits would be assumed to be indexed to the same high-quality fixed income investments as are used to determine the discount rate. The benefit stream would then increase (or decrease) based on the spread between the hurdle rate and the discount rate. This method is consistent with the basic presumption that a liability expressed as a present value of future obligations will grow at the rate at which the future obligation was discounted. It is also consistent with the fundamental objective of ASC 715 regarding discount rate setting. For example, ASC 715-30-35-44 provides that "The objective of selecting assumed discount rates using that method is to measure the single amount that, if invested at the measurement date in a portfolio of high-quality debt instruments, would provide the necessary future cash flows to pay benefits when due." This objective can only be achieved if the indexed benefits are assumed to be indexed to the same high-quality fixed income investments.

As demonstrated in the appendix, the amount needed to provide a pure variable benefit (that is, the present value of the future payments) is independent of the asset mix used to

determine the adjustment to the benefit, because the benefit stream will be adjusted to reflect actual investment return. Valuing the obligation substituting any asset mix for the actual asset mix will not change the amount needed to provide the underlying benefit, so long as the asset mix assumed for indexing purposes is consistent with that assumed for discounting purposes.

Assuming a discount rate based on high-quality fixed income assets but a benefit adjustment based on a different asset mix would produce a result that is inconsistent with the ASC 715 objective of determining the amount at which liabilities could effectively be settled, and a present value that would be either inadequate or excessive to provide the benefits, regardless of the actual return.

Indexing Assumption Independent of Discount Rate

It is possible to develop an assumption for future indexing based on the expected return on the asset mix used to index the variable benefits and independent of the discount rate used to measure the benefit obligation. As noted, this result could be viewed as inconsistent with the principles underlying ASC 715, because the benefit obligation would not represent the amount for which the benefits could effectively be settled.

However, some sponsors and their auditors may view this approach as more consistent with the ASC 715 requirement that each significant assumption used reflect the best estimate solely with respect to that individual assumption.

The arguments for and against setting the indexing assumption independent of the discount rate, and whether these are truly independent assumptions, are explored in more detail in the *Single-Employer Private Sector Funding* section of this practice note, below.

Plans That Base Benefit Adjustments on an Outside Index or Fund

Basing variable benefit adjustments on an investment index (e.g., the S&P 500) or mutual fund without investing in that index/fund introduces risk, but arguably does not change the obligation. Some actuaries believe that there is a meaningful distinction that can be drawn between plans that determine benefits based on their own internal rate of return and those that determine benefits based on an external index/fund. In particular, for the pure variable plan, as demonstrated above, any portfolio of assets can be used to back the obligation because the return on those assets and the corresponding adjustments to the benefits cancel out. Thus any portfolio of assets with a market value equal to the liability can be considered a settlement portfolio. When benefit adjustments are instead based on a specified index/fund, on the other hand, one can only effectively settle that obligation by investing in that index. Thus there is only one settlement portfolio. Investment in any other portfolio would result in a mismatch between assets and liabilities.

If the outside index/fund is regarded as the settlement portfolio, then the expected return on this portfolio may be used as the discount rate and also for benefit indexing. This approach yields the same result as for the pure variable design. As the same liability measure is obtained by valuing a fixed obligation at the hurdle rate, the hurdle rate could be used as a shortcut in place of the expected return on the underlying portfolio.

This approach creates the opportunity for plan assets to be invested in something other than the index used to adjust benefits, thus breaking the direct link between the growth of assets and the growth of liabilities. Setting the indexing assumption independently of the discount rate may be more appropriate in this circumstance. For example, benefits might be indexed to an outside equity index, while plan assets could be invested in fixed income securities. Although this investment approach seems to parallel the theoretical settlement portfolio for a traditional plan, it would not provide a settlement portfolio for the variable annuity plan. For a traditional plan, a settlement portfolio of high-quality fixed income securities can be constructed such that the market value of the portfolio will match the value of plan benefits, even as economic conditions change. For a variable annuity plan tied to an outside index, the settlement portfolio is a portfolio invested in the outside index. A portfolio of fixed income investments will not match plan obligations unless the outside index/fund comprises similar fixed income investments or the return on the fixed income portfolio happens to match the return on the index over the life of the plan.

Expected Return on Plan Assets

If the indexing assumption is consistent with the discount rate, then plan assets and liabilities for a pure variable annuity plan would be expected to grow at the same rate. It then makes intuitive sense for the interest cost and the expected return on plan assets to be calculated using the same rate. However, this view may not fit comfortably with the language in the accounting standard that the expected asset return assumption reflect “the average rate of earnings expected on the existing assets that qualify as plan assets and contributions to the plan expected to be made during the period.” On the premise that plan assets are automatically a settlement portfolio for a pure variable plan, then the expected return on those assets could be used as the discount rate and to determine benefit indexing. This approach clearly results in consistency between interest cost and expected return. Mathematically equivalent results are obtained by valuing a fixed obligation at the hurdle rate; therefore, using the hurdle rate for all purposes (including the expected return) can be viewed as simply a calculation convenience. As this latter approach may not tie to a literal reading of the accounting standard, the actuary will likely want to discuss this calculation with the plan sponsor and its auditors.

As discussed above, for a plan that uses an outside index to adjust benefits, plan assets would only be regarded as a settlement portfolio if they match the outside index. Nevertheless, one could likewise argue that the expected return on this settlement portfolio is an appropriate discount rate. In this situation, expected return and discount rate would not necessarily match unless the plan was invested to match the index.

PBO vs. ABO

The benefit attribution method required by ASC 715 is the projected unit credit method, which for some plans will produce a projected benefit obligation (PBO) in excess of the value of benefits currently accrued—the accumulated benefit obligation (ABO). In the general case where the benefit attributable to past service does not change based on future compensation (i.e., a career average rather than final average design), some have argued that the ABO is a more meaningful liability measure and should therefore be used as the basis for accounting calculations.

However, FASB has indicated that even a career average pay plan (perhaps more properly called career accumulation, because it need not calculate an average) should generally use the projected unit credit method with service prorated to determine PBO. For a variable annuity plan, another argument distinguishing the accrued benefit from a projected and prorated benefit amount is that the benefit that has already been accrued is fundamentally different in nature from benefits not yet accrued because the accrued benefit is already subject to variation due to fluctuations in asset value, while future accruals are not yet subject to that variation.

To the extent that the attribution method results in a PBO in excess of the ABO, the valuation approach described above may need some modification. As established above, once a benefit is earned, its value is determined using the hurdle rate. Before a benefit is earned, there is no adjustment for the difference between actual and expected returns, and thus no guarantee that the obligation can be settled at the hurdle rate. The obligation relating to the portion of the benefit that is not yet earned (the excess of the PBO benefit over the ABO benefit, often called the effect of future salary increases but more accurately the effect of prorating the projected benefit) can be viewed as equivalent to the obligation to pay a lump sum on the date the benefit is earned equal to that benefit valued at the hurdle rate. The value of that obligation on the valuation date would then be that amount calculated at the date the benefit is earned, discounted back to the valuation date using an appropriate discount rate. The hurdle rate may not be the best rate to use for discounting during the period between the valuation date and the accrual date because there is no automatic connection between liabilities and assets that would cancel out the effect of returns above or below the hurdle rate.

For many plans, the excess of PBO over ABO may be relatively small, and the effect of discounting this piece of the obligation from the accrual date back to the valuation date at a different rate may not produce a significantly different result from simply using the hurdle rate as the discount rate (i.e., Method 1).

Discussing these issues with the plan sponsor and auditor and reaching a consensus could avoid misunderstandings.

Financial Accounting in the Public Sector

Governmental Accounting Standards Board (GASB) Statement No. 67 requires that benefit obligations be measured using the entry age normal (EAN) method and a discount rate equal to the expected rate of return on plan assets (EROA).¹⁹

The requirement to use the EROA works well with pure variable benefit plans. The actuary can assume that benefits change each year based on the EROA and discount at this same rate. Liabilities for all inactives will be identical to valuing benefits at the hurdle rate.

As discussed above under *Financial Accounting in the Private Sector*, any time the actuary recognizes an obligation for benefits that have not yet been earned (as will typically be the case with the EAN method), there will be a period of time between the valuation date and the date the benefit is earned, during which there is no benefit escalation. During this period, for this portion of the benefit, a discount rate other than the hurdle rate may be appropriate. Applying the EAN method using a benefit escalation factor equal to the EROA/discount rate will likely yield an appropriate result, but one that will differ from discounting using the hurdle rate.

Single-Employer Private Sector Funding

The PPA requires the actuary to discount expected future benefit payments using the full yield curve or segment rates under IRC Section 430. Therefore, it is necessary to make an assumption regarding the future change in benefit amounts. IRC Section 430 regulations and informal IRS guidance could be read to suggest that even when benefit payments are tied to the return on plan assets, the expected benefit payments—and thus the expected return assumption—are determined without regard to whether discounting those expected benefit payments with IRC Section 430-mandated interest rates would yield a funding target that would be sufficient to pay the benefits.

The final 430 regulations provide some guidance to actuaries concerning the benefit change assumption. The regulations provide that assumptions other than prescribed assumptions “must be reasonable (taking into account the experience of the plan and reasonable expectations).” In addition, the non-prescribed assumptions “must, in combination, offer the plan’s enrolled actuary’s best estimate of anticipated experience under the plan based on information determined as of the valuation date.”

¹⁹ In the event of projected insolvency, the rate would be a blend of the EROA and the yield on 20-year AA/Aa or higher tax-exempt municipal bonds. We expect that this would be an unlikely outcome for a variable annuity plan and have not addressed it further in this practice note.

Q&A #6 of the 2010 Enrolled Actuaries Meeting Gray Book is also pertinent.²⁰ The question asks whether the actuary can use the hurdle rate to value a variable benefit or whether the actuary can assume that investment returns will equal those implied by the full yield curve. The answer states, “The actuary develops the best estimate of benefits using the actuary’s best estimate of the return on plan assets. The simplifications described in this question are appropriate only if they represent the actuary’s best estimate.”

Note also that IRC Section 430 requires a determination of an expected return on assets for asset smoothing purposes, also suggesting that an expected return on plan assets must be determined without regard to the discount rate.

However, the actuary might also consider the long-standing and generally accepted definition of a “reasonable assumption” as one that does not generate actuarial gains or losses if the assumption is exactly realized. This requirement is included in pre-PPA regulation §1.412(c)(3)-1(c)(2) (“If each actuarial assumption is exactly realized under a reasonable funding method, no experience gains or losses are produced”). Pre-PPA IRC Section 412(c)(3), on which the cited regulation is based, required assumptions to be individually reasonable or to produce, in the aggregate, total contributions equivalent to those that would be determined by individually reasonable assumptions, and, in combination, to offer the actuary’s best estimate of anticipated experience under the plan. Its successor, IRC Section 430(h)(1), includes similar language to 412(c)(3), requiring that non-prescribed assumptions must be individually reasonable and in combination offer the actuary’s best estimate of experience under the plan. The IRS has not yet clarified the extent to which §1.412(c)(3)-1(c)(2) applies to PPA valuations, if at all. As the pre-PPA version of IRC Section 412(c)(3) was repealed by PPA for most single-employer plans, one could reasonably argue that, although §1.412(c)(3)-1(c)(2) was not explicitly repealed, the no-gain/-loss requirement no longer applies. It is worth noting, however, that the no-gain/-loss principle still generally holds under the PPA for most pension plans. That is, if all assumptions are realized (including returns consistent with the discount rate), gains and losses will not occur. For a variable annuity plan, on the other hand, determining expected benefits using an independently determined expected return, and then discounting those expected benefit payments using IRC Section 430 interest rates, will generate gains and losses regardless of experience (even when the return on assets assumption is exactly realized, or when the return on assets is equal to the discount rate), as demonstrated in the example in the *Expected Return Independent of Discount* section below.

Thus there are two views regarding how to set the expected return on plan assets assumption for a pure variable annuity plan. Similar to the approaches discussed above in *Financial Accounting in the Private Sector*, these theories are 1) that the expected return should be consistent with the discount assumption (which we will refer to here as the

²⁰ Note that Gray Book Q&As are not formal guidance, do not undergo the level of review within IRS or the public exposure of more formal IRS guidance, and cannot be relied upon.

“single assumption” approach), and 2) that the expected return should be independent of the discount assumption (the “Independent Expected Return” approach). The support for each of these approaches for funding purposes is discussed in more detail below. Enrolled actuaries will likely need to consider these issues when determining the approach to use for IRC Section 430 funding valuations if the actuary has concluded the valuation is best approached by beginning with the pure variable model. To the extent that the expected return and discount rate are not viewed as a single prescribed assumption, the actuary would presumably also consider guidance from the actuarial standards of practice when setting non-prescribed assumptions under the PPA for these plans.

An enrolled actuary signing the Schedule SB or certifying the Adjusted Funding Target Attainment Percentage (AFTAP) may also consider these risks in determining the related plan liability measures and minimum required contribution. Based on one reading of the regulation, the regulation example cited below, and informal guidance (2010 Gray Book Q&A 6), many actuaries are more comfortable with the Independent Expected Return approach—particularly when it might be viewed as the more conservative (i.e., higher liability) option—despite its theoretical shortcomings. This practice note does not presume that either approach is preferable from a compliance perspective and it is possible that both approaches will ultimately be accepted by the IRS. Legal counsel may also be a helpful resource in deciding between approaches.

Expected Return and Discount Rate Are a Single Assumption

The “single assumption” approach recognizes that the typical definition of a present value involves a discount rate and a return assumption that are the same. A present value is the current amount that, if fully funded, will provide the future cash flows if the assets consistently earn a return equal to the discount rate. From this perspective, the discount rate and the return on assets can be considered one assumption.

Under the PPA, this equivalence between expected return and discount rate is automatic for most plans, as there is no separate expected return assumption used to measure liabilities. In effect, the expected return can be seen as a prescribed assumption equal to the discount rate, not an independent assumption subject to the actuary’s best estimate.

For a pure variable annuity plan, this viewpoint is consistent with the fact that the amount needed to provide benefits is independent of how the plan assets are invested (as demonstrated in the appendix), and also with the basic presumption that a liability grows at the discount rate used to calculate that liability. An expected return equal to the discount rate is the only rate that produces an obligation equivalent to the assets needed to provide the benefits—that is, it is the only rate that produces a liability that satisfies the “amount needed today” definition of a present value. Using an expected return in excess of the discount rate would result in the calculation of additional incremental liabilities that can only arise if there is an offsetting change in the plan assets, and that, if funded, would result in surplus assets regardless of future asset returns. An expected return less than the discount rate would result in a funding target that would be insufficient to provide the benefits.

In other words, when the discount rate is prescribed, liabilities calculated reflecting an assumed return consistent with that rate will produce the amount needed to provide the benefits, assuming all other assumptions are realized. If the plan is fully funded, any asset mix will provide the promised benefits. The IRS has applied a similar concept in prescribing how to adjust the maximum benefit limitations under IRC Section 415 for a variable annuity in pay status.²¹

Where the obligation is measured using segment rates (as opposed to the full YC) there is some smoothing introduced in the calculation, especially after reflecting the interest rate stabilization enacted in the Moving Ahead for Progress in the 21st Century Act (MAP-21),²² the Highway and Transportation Funding Act of 2014 (HATFA),²³ and the Bipartisan Budget Act of 2015 (BBA 2015).²⁴ Nonetheless, the underlying theory still holds. If assets are set aside equal to the obligation and if returns on those assets are equal to the rate used to discount benefits, the benefit adjustment cancels out the effect of differences between the discount rate and the hurdle rate, producing the same result, regardless of the discount rate. In this case, the return assumption is defined not as a single rate, or even as a single set of annual rates, but rather with reference to the discount curve. Thus, different underlying return scenarios would apply for measurements that use different discount curves (whether stabilized, non-stabilized, PBGC premium purposes, or some other basis), yet each measurement would produce substantially the same result—exactly as would be expected for an obligation that is not interest-rate-sensitive.

This result can be demonstrated mathematically as follows:

An EROA that matches the return of the YC or segment rates would be an array of returns. This array can be expressed as

$$I_t = I_1, I_2, I_3, \dots, I_n$$

where each element of the array reflects the annual effective return from the measurement date ($t = 0$) to the benefit payment date ($t = n$). Expressed alternatively, for every value of t from 1 to n ,

$$I_t = (I / v^t)^{1/t} - 1$$

where v^t is the effective discount factor of the YC or segment rate at time t .

The benefit array to be valued then can be seen to be

²¹ Reg. §1.415(b)-1, Example 10

²² Pub. L. 112-141.

²³ Pub. L. 113-159.

²⁴ Pub. L. 114-74.

$$B_n = B_0, B_0 \times (1 + I_1) / (1 + h), B_0 \times (1 + I_2)^2 / (1 + h)^2, \dots, B_0 \times (1 + I_n)^n / (1 + h)^n$$

This array of benefits then is discounted based on the YC or segment rates. Because the EROA array is defined in terms of the YC or segment rates, the discount factor can be expressed in terms of the EROA as follows:

$$v^t = 1 / (1 + I_t)^t$$

Substituting the right side of this equation for v^t in the normal expression for the liability, the liability can be expressed as:

$$L_0 = B_0 \times \left(1 + \frac{1+I_1}{1+h} \times \frac{1}{1+I_1} + \frac{(1+I_2)^2}{(1+h)^2} \times \frac{1}{(1+I_2)^2} + \dots + \frac{(1+I_{n-1})^{n-1}}{(1+h)^{n-1}} \times \frac{1}{(1+I_{n-1})^{n-1}} \right)$$

This equation easily simplifies to a level annuity of B_0 evaluated at the hurdle rate, the same result as the traditional method. Thus, if the array of returns is consistent with the discount curve (full YC or segment rates), this method produces the same liability as the traditional method.

Note that the array is expressed as a series of compound annual returns through each year. These could be converted to an array of successive annual returns, but the resulting assumption may be a bit awkward to describe in this manner. For example, if the first segment rate is 3% and the second segment rate is 4%, the assumed compound annual return through year 4 is 3% and through year 5 is 4%. This implies that the “return” during year 4 is 8.09% ($1.04^5 / 1.03^4 - 1$). A similar discontinuity in the assumed return would occur at year 19. This anomaly results because the segment rates are not really market interest rates, but simplified representations of market rates. If one uses a market yield curve, such as the IRS full YC, the implied returns would be smoother. Even then, the forward rates connecting the successive yields might not be the best estimate of annual returns on a fixed income portfolio. However, the overall yield to maturity of the portfolio (which would represent the return on that portfolio if each bond is held to maturity, assuming no defaults) would be a reasonable estimate of the average annual return. It may therefore be preferable to describe the expected returns as those implied by the yield curve, or as a series of compound annual returns, or to use a single average annual return reflecting the aggregate effect of the discount rates. This concept is discussed in greater detail in the appendix.

Actuaries supporting this method take the view that there is only one assumption involved—i.e., the discount rate and the rate at which the present value grows are the same and are prescribed, an interpretation consistent with the “amount needed today” definition of a present value calculation.

They also observe that:

- The asset allocation of the portfolio is irrelevant to determining the amount needed to provide the benefits for a pure variable plan.
- Liabilities and assets growing at the same rate precisely meet the actuary's best estimate of anticipated experience for a pure variable annuity plan.²⁵
- Prior to the PPA, the discount rate and expected return on assets were always the same, and the PPA does not change the fact that a present value grows at the rate at which it is discounted.
- The rate implied by the yield curve is a risk-adjusted expected return for any portfolio.²⁶

Finally, this interpretation is consistent with a generally accepted definition of a reasonable funding method. As discussed above, IRS regulations have long provided that “under a reasonable funding method, no experience gains or losses are produced” if each actuarial assumption is exactly realized. For a pure variable annuity plan, having an asset-return assumption that differs from the discount rate will produce gains or losses each year, and will therefore not be a reasonable funding method under the IRS definition. One can reconcile the regulations under IRC Section 430 and IRC Section 412 by recognizing that, under the PPA, when valuing a pure variable annuity plan, the expected return is effectively a prescribed assumption equal to the discount rate—that is, they represent a single prescribed assumption.

Although there is significant theoretical merit to this method, there is no official guidance specific to variable annuity plans supporting this interpretation. If the IRC section 412 regulations do not apply to PPA valuations because the related minimum funding requirements are now defined in IRC Section 430, then there would be no need to reconcile them to the IRC Section 430 regulations. The fact that gains and losses can occur for variable annuity plans even when all assumptions are met need not indicate a problem with the valuation methodology. Accordingly, the actuary must exercise professional judgment to determine whether to view the expected return and discount rate as a single assumption or separate assumptions when performing valuations on plans with variable benefit designs.

Expected Return Independent of Discount Assumption

Under the “Independent Expected Return” approach, the expected return is considered to be a separate, non-prescribed assumption. Actuaries following this approach interpret Treasury regulation §1.430(d)-1(f)(3) to require a determination of an expected return

²⁵ Reg. §1.415(b)-1, Example 10 could also be seen as providing support for this view. The discount rate used in adjusting the 415 limit to alternative payment forms and commencement dates is 5%. The assumed rate of return for benefit indexing is the same 5%, regardless of asset mix.

²⁶ Any higher EROA is only higher because more risk is being taken. If the extra risk is discounted for separately, then the remaining discounting is based on the yield curve.

based on the asset allocation of the fund and expected long-term returns on asset classes. The expected return could be an array of rates or a single level return. This return would likely differ from the return implied by the segment rates or YC. The 2010 Gray Book Q&A 6 appears to be consistent with this view.

Under this method, the liability at time $t = 0$ would be expressed as:

$$L'_0 = B_0 \times \left\{ 1 + \frac{1 + ER_1}{1 + h} \times \frac{1}{1 + I_1} + \frac{(1 + ER_2)^2}{(1 + h)^2} \times \frac{1}{(1 + I_2)^2} + \dots + \frac{(1 + ER_{n-1})^{n-1}}{(1 + h)^{n-1}} \times \frac{1}{(1 + I_{n-1})^{n-1}} \right\}$$

L'_0 (i.e., the funding target produced by the “Independent Expected Return” approach) will not equal L_0 (the funding target produced by the “single assumption” approach) unless one of two conditions are met. Either 1) $ER_t = I_t$ for every possible value of t , or 2) the differences between ER_t and I_t are both positive and negative to the degree that they exactly offset. These cases would be extremely rare. Note that when L_0 does not equal L'_0 , either amount could be greater. In other words, if Δ is defined as:

$$\Delta = L'_0 - L_0$$

Δ can be positive or negative. Furthermore, it can easily be demonstrated that if the initial asset is anything other than L_0 , say $L_0 + \Delta$, and no further contributions are made, then at time n the assets will be

$$A_n = B_n + \Delta \times (1 + AR)^n$$

where AR is the effective periodic actual rate of return over the entire period. In other words, if Δ is positive there will be surplus assets after the last payment, and if Δ is negative there will be insufficient assets to make the last payment.

Actuaries supporting this approach interpret the expected return assumption as a different assumption than the discount rate based on the regulations under IRC Section 430 (§1.430(d)-1(f)), in particular the requirement that each non-prescribed assumption should be reasonable. There are also close parallels between this approach and the calculation methodology described in the regulations for cash balance plans, which require that the interest credits on a cash balance benefit be estimated, the benefit projected, and the expected benefits discounted using IRC Section 430 interest rates.²⁷ For a cash balance plan with interest credits equal to the return on plan assets, this process would produce a funding target different than the account balance, and proponents of this approach may argue that Treasury would be unlikely to require a

²⁷ §1.430(d)-1(f)(5)(i) and Example 13 of §1.430(d)-1(f)(9).

project-and-discount approach for one type of indexed plan (cash balance plans) but endorse a different approach for another type of indexed plan. On the other hand, critics of this approach would point out that there is no official guidance illustrating this result specific to variable annuity plans, and that the cash balance plan illustrated in the example in the regulations is one that credits interest based on a specified index, not based on the return on plan assets, so that there is as of yet no formal guidance specific to plans that base benefit adjustments on returns on plan assets. In addition, a regulatory example illustrating a calculation in line with the “Independent Expected Return” approach does not necessarily preclude the use of the other approach.

In addition, critics of this approach would note that when both assets and liabilities are considered, this approach will generally produce gains or losses when all assumptions are precisely realized, which would appear to violate pre-PPA regulation §1.412(c)(3)-1(c)(2) if it is still applicable. For example, consider a plan with a 5% hurdle rate that is exactly fully funded based on an assumed rate of return on assets of 5.5% and a discount rate of 6%.²⁸ If both of these assumptions are exactly realized over the course of a year (that is plan assets earn 5.5% and the discount rate remains 6%), then liabilities will grow at the 6% rate, while assets will grow at the 5.5% rate, resulting in a plan that is 0.5% underfunded at year-end. Alternatively, if plan assets were to grow at the 6% discount rate (a result that normally would avoid the growth in underfunding in a traditional plan), then liabilities would grow at a rate of 6.5% (the 6% discount rate, plus a 0.5% loss due to benefits growing faster than anticipated), again resulting in a plan that is 0.5% underfunded at year-end. In other words, gains and losses will generally occur even though assumptions were exactly realized (i.e., discount rates remained unchanged and the expected return on assets was precisely realized). The anomalous result does not occur with a traditional fixed annuity plan where all assumptions are realized.

Actuaries following this approach may want, or be required by the ASOPs, to explain the implications to plan sponsors. If the return on assets assumption is less than the discount assumption, the required contributions will result in inadequate assets to provide the benefits and any future investment gains will increase the amount of the deficiency. Actuaries using this method in these circumstances could consider recommending contributions above the minimum funding requirement. Conversely, if the return on assets assumption is greater than the discount rate, the funding target will exceed the amount needed to provide the benefits. The actuary might consider advising the sponsor concerning the degree of this excess and the implications for funding policy.

Of course, for any plan the measured liability is unlikely to represent the “true” cost of benefits, as future gains or losses are a virtual certainty. But the actuary typically cannot anticipate these gains or losses, as would be the case for gains or losses arising from a mismatch between the expected return assumption and the discount rate in a pure variable annuity plan.

²⁸ For purposes of this example we have simplified the calculation by using a single effective interest rate, rather than the three PPA segment rates. This simplification has no bearing on the conclusion.

As with the method discussed in the preceding section, actuaries choosing this method for reflecting future benefit indexing should be aware that there is no official guidance supporting this interpretation.²⁹ However, some actuaries who have considered this issue have concluded that given the existing regulatory language, along with informal guidance, this method currently poses a lower degree of regulatory risk than the “single assumption” approach, and that even if the IRS clarifies its guidance in the future to support the “single assumption” approach, it is reasonable to expect it would be unlikely to disallow the use of the independent assumption approach retroactively.

Interest Rate Stabilization Issues

With the exception of plans using the full YC, MAP-21, HATFA, and BBA 2015 require the actuary to determine benefit obligations for various purposes using either stabilized or non-stabilized rates, while not changing other assumptions. If stabilized and non-stabilized interest rates differ, and the expected return or benefit adjustment assumption is the same for the stabilized and non-stabilized calculations (the “Independent Expected Return” approach), then the resulting reported liabilities will be different under these different measures.

If the expected return is changed when the discount rates are changed (the “single assumption” approach), liabilities disclosed using stabilized and non-stabilized rates would be the same. The actuary may want to include a statement in the assumptions and methods disclosures in the valuation report and Schedule SB filing that the variable benefit liabilities are not sensitive to the discount rate as a means of explaining the selected non-prescribed assumptions.

Multiemployer Private Sector Funding

Multiemployer plans use the actuary’s reasonable estimate of the expected return to value plan liabilities for funding. Because: 1) plan liabilities are independent of future returns, 2) these plans are not subject to IRC Section 430, and 3) IRC Section 412 includes the “no gain or loss when assumptions are exactly realized” requirement, actuaries use the

²⁹ Treasury regulation §1.430(d)-1 covers the determination of the funding target and target normal cost. Example 13 of §1.430(d)-1(f)(9) describes this calculation for a market-based cash balance plan where the rate used to project benefits is based on a best estimate of return, rather than on the discount rate (the funding segment rates). Some cite this as indicative of the view that the IRS is likely to take on variable annuity plans. It is worth noting, however, that the plan in Example 13 adjusts the account balance based on an outside index, rather than on the return on plan assets.

hurdle rate for this purpose when valuing a pure variable annuity plan.³⁰ Alternatively, the same result can be obtained using any expected return to adjust benefits and then discounting benefits at the expected return. Either method of expressing the plan's benefit obligation produces the same result.

Multiemployer plans are able to select one of six actuarial cost methods to determine plan liabilities and normal cost. Funding 100% of the unit credit liability is the method that minimizes investment gains or losses, but the unit credit method can produce increasing contribution patterns for maturing plans. Some sponsors prefer the more level contribution requirements of other methods.

Multiemployer plans must also calculate a current liability. The discount rate used to calculate the current liability is mandated by law. As a result, some of the same considerations discussed above for choosing between the two approaches under the PPA would apply when calculating current liability. However, because only IRC sections 412 and 431 apply, and not IRC Section 430, actuaries may be more likely to consider the "single assumption" methodology described in the "Expected Return and Discount are a Single Assumption" section under *Single-Employer Private Sector Funding* as appropriate.

Alternatively, the actuary may consider using the "Independent Expected Return" methodology described in the "Expected Return Independent of Discount Assumption" section above.

Public Sector Funding

Public sector pension plans do not have a single, common set of funding requirements. The traditional method or any of the techniques described in other sections may be considered for valuing liabilities. To the extent that local legislation may dictate a discount rate to be used, the analysis in the other sections may prove useful in determining how to approach the calculation of the plan's benefit obligation.

Variable annuity designs may be more common in the public sector than in the private sector, but still not common overall. More significant is the fact that most public sector variable annuity designs are not pure variable annuities, and some have significant asymmetric design features.

³⁰ Although the funding rules for multiemployer plans were moved from IRC Section 412 to IRC Section 431, the Section 431 rules parallel the old Section 412 rules and many of the regulations under Section 412 are applied to Section 431 calculations.

Deviation From the Pure Variable Design

No variable annuity plan precisely fits the fully funded pure variable model. Some sources of deviation include:

- frequency of benefit adjustments that do not match the frequency of benefit payment;
- administrative delay in making a benefit adjustment beyond the end of the period for which asset performance is measured;
- demographic gains or losses that produce a mismatch between assets and liabilities;
- other more significant embedded options, such as floors or caps on benefit adjustments; and
- other plan features, such as a subsidized early retirement or disability benefit or the absence of an actuarial increase after normal retirement age.

The closer the design is to the pure variable model, the closer the liability will likely be to the pure variable liability. Plans with features that introduce a small increase or decrease in costs but do not substantially affect liability behavior may still be valued as pure variable plans, but with an appropriate load applied to capture the value of the feature.

Significant embedded options call for more substantial adjustments. Depending on the nature of the option, these features might be valued most appropriately by a) valuing all benefits as variable and adding a load to reflect the deviation, b) valuing all benefits as fixed and adding a load to reflect the variable features, or c) valuing the benefit directly with an options pricing model.

Benefits Indexed to a Portion of Plan Assets

Not all variable benefit plans index the benefit to the return on all plan assets. Qualified plans often have both fixed and variable benefits. Many of these plans split the total plan assets into two accounts—a fixed benefit account and a variable benefit account. Variable benefits are generally indexed to the return on the variable benefit account. This allows a plan sponsor to implement different investment policies for funding fixed and variable benefits. Fixed benefits are generally paid from the fixed account and variable benefits from the variable account, although all assets are available for the payment of any benefits. Final statutory hybrid plan regulations issued in 2014 make it clear that using a subset of plan assets is permissible provided the assets meet certain diversification requirements and the assets that generate the return on which the indexing is based approximately equal the liabilities for the variable benefits.

The indexing of the benefits to the return on part of the fund does not change any aspect of the liability calculation for variable benefits.³¹

Benefits Indexed to an External Rate of Return

Some variable benefits are indexed to returns other than the plan return. Examples include an investment index (e.g., the S&P 500 index) or a specific mutual fund. In such a plan, the variable benefits will change based on the return of the investment index or mutual fund, which is referred to here as the external fund.

The plan sponsor can fully hedge the plan's liability by fully funding the plan and investing the assets to mimic the external fund. The amount needed to fully hedge the variable benefit obligation is L_0 (see the *Single-Employer Private Sector Funding* section), determined under either the traditional method or the alternative method where the assumed indexation is consistent with the discount rate (described in the *Financial Accounting in the Private Sector* section).

If the sponsor in fact invests to match the external fund, then the plan behaves like a pure variable plan. Specifically, the plan would avoid any funded status gain or loss due to a mismatch between the assets backing the obligation and those used to adjust benefits. Accordingly, it would seem logical to value the obligation in the same manner.

If the plan sponsor chooses to invest in assets that do not mimic the external fund, asset/liability mismatch is introduced and the actuary may want to consider whether a value needs to be assigned to this mismatch. To illustrate, consider the following examples of three plans that are identical in all respects except for the indexing methods. The obligation of each plan determined using the hurdle rate is \$1 million and each plan has \$1 million in assets.

Plan A: Indexing is based on the actual return on plan assets compared to a hurdle rate of 5%.

Plan B: Indexing is based on an S&P 500 index fund and all assets are invested in an S&P 500 index fund.

Plan C: Indexing is based on an S&P 500 index fund and all assets are invested in fixed income securities.

Plan A's benefits are driven by the asset returns regardless of how assets are invested. Regardless of whether the assets are invested in equities or fixed income, the current assets will be sufficient to fund the benefits. There is no asset/liability mismatch.

³¹ §1.411(b)(5)-1 (d)(5)(ii) (B)

Plan B's benefits are driven by the S&P 500 index fund and assets are invested in that same fund. There is no asset/liability mismatch and the assets will be sufficient to fund the benefits, as long as the sponsor continues to invest in a manner that matches the benefit indexing promised by the plan.

Plan C's benefits are also driven by the S&P 500 index fund and will grow exactly the same as Plan B's benefits, but there is currently an asset/liability mismatch and a potential for investment gains and losses.

Question: Should Plan C's funding target be different than Plan B's because of the additional risk of the asset/liability mismatch?

In Plan C, increases in benefits due to returns in excess of the hurdle rate (or decreases due to returns lower than the hurdle rate) are not automatically offset by corresponding increases or decreases in the plan assets based on the plan's current investment policy.

Some actuaries suggest that the additional risk introduced by this mismatch should be quantified and added to the funding target. This adjustment might be accomplished by a load to the liabilities or by determining an expected return on the actual portfolio and indexing future benefits to the difference between that expected return and the hurdle rate. This approach is similar to the "Independent Expected Return" approach discussed under *Single-Employer Private Sector Funding* and may produce a substantially different liability than valuing the obligations as a pure variable plan.

Other actuaries suggest the plan should be valued as a pure variable plan and point to the basic objective of accounting rules and PPA funding rules:³² determining the amount required to secure or settle the obligation. The fact that a sponsor may choose to invest in a manner that introduces risk should be irrelevant to the determination of the amount required to secure the benefit obligation, which is determined by valuing a fixed annuity at the hurdle rate. The obligation can only be secured by investing this amount in the index fund used to adjust benefits, but investing differently does not change the amount that would be needed. This view would parallel the treatment of traditional plans, where the benefit obligation and PPA liability are independent of the sponsor's choice of investment. Investing in a manner that creates a mismatch would be regarded as simply an investment choice made by the plan sponsor—one that could be changed at any point to eliminate the mismatch (assuming the plan was fully funded at that point) and have the plan behave just like plans A and B.

In essence, two main arguments support valuing this type of plan in the same manner as a pure variable annuity plan:

³² Some actuaries suggest that the MAP-21, HATFA, and BBA 2015 modifications to the funding rules fundamentally change the objective of PPA funding. Others point to the gradual phase-out of these rules and conclude that the objective is only temporarily, if at all, changed.

- 1) From both a participant and sponsor or insurer point of view, the obligations of this plan still behave like those of a pure variable annuity plan. The only difference is that there is only one portfolio that avoids introducing investment risk (the external fund that indexes the benefits), instead of an infinite choice of portfolios (when indexing is based on actual plan assets, any portfolio is possible). However, if the plan obligations are fundamentally equivalent to a pure variable plan, the plan should be valued as such.
- 2) The rationale behind the PPA and accounting approach to discounting benefits using a fixed income yield curve is that bonds provide a good match to pension cash flows and thus the resulting liabilities represent a reasonable estimate of the amount needed to secure the pension obligation with low risk. In contrast to fixed benefits, fixed income investments cannot secure variable annuity benefits if the benefit adjustments are based on a non-fixed income index or return. Valuing the liability at the hurdle rate or projecting growth and discounting benefits at a consistent rate are the only approaches that are consistent with the PPA and accounting settlement liability rationale.

The main concern with this approach is that the sponsor of Plan C has already demonstrated a willingness to invest in a manner that breaks the connection between assets and liabilities. If it is reasonable to presume that the sponsor will continue to invest in such a manner, then the actual cost of providing the promised benefits will, in fact, differ from that of a pure variable plan. As a result, many of the arguments in support of the pure variable annuity model may no longer hold. In particular, gains and losses are more likely to be avoided in this scenario if the discount rate is based on fixed income yields and benefit indexing is based on expected equity returns (i.e., the “Independent Expected Return” approach). In this example it is possible for both of these assumptions to be met simultaneously. In fact, the expected value of the gain or loss is likely smaller using the “Independent Expected Return” approach than would be the case if the discount rate and expected return were set to the same rate.

Having a liability that varies based on the plan’s investment policy may be troubling to some actuaries— especially given the fact that a reasonable settlement portfolio exists. However, it seems reasonable to many in this situation to reflect the additional cost attributable to the sponsor’s decision not to invest in that settlement portfolio.

The relevant regulatory bodies have not issued any guidance on this specific issue. The actuary and plan sponsor will need to agree on the appropriate treatment.

Valuing Variable Annuity Plan Variations

When a variable annuity plan provides caps, floors, or other features that depart from the pure variable design, the cost of those features are typically reflected in determining plan costs. Where a benefit is predominantly variable (i.e., the variable mechanism is likely to

drive the benefit actually paid), it may be reasonable to value the benefit as a pure variable benefit, and then apply an appropriate load to adjust for the value of the other features. An example of this type of benefit might be a variable benefit with a current face amount of \$100, adjusted based on a 5% hurdle rate, with a floor benefit level of \$90. In this case, the benefit paid in any given year will most likely be the adjusted variable benefit, but the floor benefit likely has a non-trivial value.

Where a benefit is predominantly fixed (i.e., there is a variable mechanism, but it is not expected to drive the benefit ultimately paid in most years), it may be reasonable to value this benefit as a fixed benefit, with an appropriate load for the value of the variable feature. An example of this type of benefit might be a variable benefit with a current face amount of \$100, adjusted based on a 5% hurdle rate, but where the floor benefit is \$125. In this case, the floor benefit will drive payments, at least in the near-term, but in the longer term the variable feature may come into play.

Following is a discussion of how some caps, floors, or other features may affect the valuation of a variable benefit promise.

Separate non-variable floor benefit formula: In the typical situation, this plan is designed to be predominantly variable. The benefit may be valued as a pure variable benefit with a load for the value of the fixed feature. The value of the fixed feature will vary depending on factors such as:

- The ratio of the variable benefit to the floor benefit
- The hurdle rate
- The asset mix underlying the variable adjustment
- The expected starting date of payments
- The annuity form
- The age of the participant (and beneficiary)

Stochastic modeling or other approaches may be used to estimate the likelihood of the floor benefit applying and the expected magnitude of the adjustment to the benefit (excess of floor benefit over variable benefit). Detailed discussion of these valuation approaches is beyond the scope of this practice note.

A grandfathered frozen benefit is an example of a fixed floor benefit. After a period of time, the likelihood of the fixed benefit applying may become *de minimis* as its value is worn away by additional variable accruals. At some point the value of the grandfathering may be disregarded. Until then, it may be taken into account as an adjustment to the variable benefit liability.

Where the benefit is predominantly fixed, the benefit may be valued in the same manner as a fixed promise, but with an adjustment for the expected value of the excess of the variable feature over the fixed promise. For example, this situation may arise after a period of poor asset returns that result in repeated downward adjustments to the variable

benefit, leading the fixed benefit to prevail. Similar techniques may be used to estimate this value as are used to determine a fixed benefit adjustment to a predominantly variable benefit design.

Minimum or maximum benefits can be viewed as establishing bounds for the liability calculation. For example, if a plan provides a variable benefit that is subject to a minimum benefit, the plan liability would never be less than the liability of the minimum benefit evaluated as a fixed benefit. Similarly, if the plan provides that benefits cannot exceed a certain level, the liability will likely never exceed the liability of the maximum benefit evaluated as a fixed benefit.

Limit on the annual benefit adjustment: In some plans the full variable adjustment is not applied, but rather the upward or downward adjustment to the benefit is limited. For example, a plan might have a hurdle rate of 5%, but the variable adjustment in any given year is limited to +/- 5% (i.e., returns in excess of 10% or below 0% are disregarded). This type of plan would typically be valued as a variable benefit, but again, with an adjustment for the difference between the benefit adjustment that would apply in the pure variable situation and the benefit adjustment that applies based on plan terms. Stochastic modeling or similar techniques may be used to estimate the appropriate load to the pure variable liability.

In an extreme case, the variable adjustment may be so constrained that the benefit behaves more like a fixed promise, rather than a variable promise, in which case the benefit would be treated as predominantly fixed, with an appropriate load for the value of the variable feature.

Conversion from variable to fixed at retirement with appropriate charge for the cost of annuitization: A plan may offer the participant the option to convert some or all of the variable benefit to a fixed benefit at retirement. If this plan feature is designed to be cost-neutral, the conversion will vary with changes in market yields. If market yields are lower than the hurdle rate, the benefit will be adjusted downward to reflect the additional cost of settling a fixed obligation. If market yields exceed the hurdle rate, the benefit is adjusted upward at conversion. If the conversion is cost-neutral, then there is no need to reflect anticipated conversion in calculating obligations. Once benefits are converted, they would be valued in the same manner as any other fixed obligation. If the conversion is subsidized in some manner, or could be subsidized in certain interest rate environments, the expected cost of the subsidy (including the effect of anti-selection) and the portion of benefits expected to be converted are typically reflected in the obligation.

Monthly benefit payments with annual adjustment: The analysis of the pure variable benefit assumes that each benefit payment is subject to adjustment (e.g., monthly benefit payments are subject to adjustment each month). If payments are made monthly but adjusted once per year, some investment gain or loss can be introduced even if the plan is precisely funded at 100% of the calculated liability.

In this case, if the actual return is higher than the hurdle rate, gains will generally occur. If the actual return is less than the hurdle rate, losses will generally occur. There can be exceptions to this general rule, for example if the return is less than the hurdle rate for 11 months, and then is positive enough in the 12th month to just exceed the hurdle rate. In theory, the plan could incorporate a mechanism to adjust participant benefits for these gains or losses, in which case the liabilities would behave in the same way as for a pure variable plan. In practice, variable annuity plans are not typically designed this way, and the plan sponsor bears the risk associated with these gains or losses.

The actuary may want to consider the degree to which these gains or losses are anticipated and make adjustments to the liability if, in the actuary's judgment, doing so is appropriate. Such an adjustment may be appropriate if there is a significant difference between the hurdle rate and the rate of return expected to be earned by the portfolio of assets.³³

Maximum benefits: Plans that are subject to IRC Section 415 are not permitted to pay a benefit (expressed as a straight life annuity) in excess of the dollar limitation in Section 415(b). For this purpose, a variable benefit plan is not considered a straight life annuity because the amount of the benefit may vary—a straight life annuity always pays the same benefit.

IRC Section 415(b)(2)(B) provides that the maximum benefit must be adjusted so that it is equivalent to the maximum benefit payable as a straight life annuity. Treasury regulation³⁴ provides that the adjustment to the benefit should be:

$$B' = B \times a_5/a_h, \text{ where}$$

- B is the limit in 415(b)(1),
- B' is the adjusted limit,
- h is the hurdle rate defined by the plan,
- a_h is the annuity factor for a straight life annuity using h as the interest rate and the applicable mortality table, and
- a_5 is the annuity factor for a straight life annuity using 5% as the interest rate assumption and the applicable mortality table.

³³ Note that it is possible to invest the plan's assets in such a way as to completely immunize this risk. For example, suppose there are two funds, the "variable fund" and the "temporary fund." On each Jan. 1, the plan sponsor transfers sufficient funds from the variable fund to the temporary fund to cover benefit payments for that calendar year. The variable annuity is tied to the variable fund. The sponsor then invests the temporary fund in short-term fixed income investments, matching the duration of the 12 months of benefit payments.

³⁴ Treasury regulation §1.415(b)-1(c)(6), Example 10.

Further adjustments may be necessary for age at benefit commencement, optional form of payment (e.g., years' certain guarantees), or other factors.³⁵ If the benefit payable is properly limited at commencement, future benefits may vary as the plan provides, even if the benefit payable exceeds B' or B.

Lump Sum Distributions

In general, lump sum distributions are calculated in accordance with plan provisions. To avoid ambiguity and to ensure that benefits are definitely determinable and not subject to employer discretion, the plan should describe all elements of a lump sum calculation. If the plan calls for lump sums to be calculated as an actuarial equivalent value to the normal annuity form but does not give further guidance, the actuary and the plan administrator may need to make decisions regarding the actuarial assumptions and how they differ from the calculation of a lump sum for a fixed benefit. The plan document may need to be amended to reflect these decisions. The following discussion assumes the variable benefit is a pure variable benefit. To the extent the benefit varies from the pure form, the actuary and the plan administrator should consider whether and how such variation should be reflected.

There are two general categories to consider:

Plans Not Subject to IRC Section 417(e)

The lump sum may be determined using an appropriate mortality table and the hurdle rate of interest defined by the plan. This calculation yields the same present value as the sponsor's obligation.

Plans not subject to IRC Section 417(e) may also consider the methods described for plans that are subject to that IRC section.

Plans Subject to IRC Section 417(e)

Plans subject to the requirements of IRC Section 417(e) must determine the minimum lump sum using the applicable interest rates and applicable mortality table required by the IRC and regulations thereunder to discount the periodic benefits otherwise expected to be paid in future years. A plan offering an indexed benefit must also use an assumption regarding future indexation. For example, a plan providing a benefit subject to cost-of-

³⁵ Some examples include participant contributions, benefits from a prior plan that are required to be aggregated, and prior distributions.

living indexation must make a reasonable assumption regarding future inflation in determining the lump sum value of that benefit.

A plan would typically specify the method for determining the estimated benefit indexation. While a cost-of-living adjustment clearly has positive value, a variable benefit feature can result in increases or decreases in the benefit and may therefore be more or less valuable than a fixed benefit of the same amount. Clearly, a variable benefit that is based on a lower hurdle rate is more valuable than one that uses a higher hurdle rate, all other things being equal. For benefits to be definitely determinable, the terms of the plan should specify how the lump sum value of the benefit is calculated.

The pertinent question in defining the terms of a lump sum option is: How should future periodic benefits be estimated? In the absence of any official guidance on this question, this section considers three possible methods.

Method A: Future Indexation Consistent With Segment Rates

A variable annuity is an indexed benefit and the lump sum calculation can reflect a reasonable assumption concerning future indexation similar to a lump sum calculation for a non-variable annuity that is indexed for cost of living. The lump sum calculation for a cost-of-living indexed benefit will generally reflect an estimate of future inflation that is consistent with economic conditions at the time of the calculation. That estimate might vary as economic conditions change.

When considering various methods of estimating the future indexation, the plan administrator may choose to consider how the lump sum determinations are made for fixed benefits. The lump sum amount calculated for a fixed benefit uses a discount rate assumption that is based on high-quality corporate bond yields, a practice that is generally consistent with the underlying basis used for the determination of the plan sponsor's funding target for that benefit (before considering interest rate stabilization provisions), although the implementation of that underlying basis differs between lump sum and funding target calculations. In both cases, the resulting amount represents an estimate of the amount required to secure or replicate the promised benefits based on a low-risk portfolio.

Accordingly, a method that determines a lump sum value for a variable annuity using a discount rate assumption reflecting the same underlying basis as the sponsor's funding target might be considered a reasonable method. If the funding target is determined using the "single assumption" methodology as described above in the section titled *Expected Return and Discount Rate Are a Single Assumption under Single-Employer Private Sector Funding*, this can be accomplished by assuming that the actual return on the assets for all years to which the benefit is indexed will be equal to:

1. the first segment rate for all payments discounted at the first segment rate,
 2. the second segment rate for all payments discounted at the second segment rate,
- and

3. the third segment rate for all payments discounted at the third segment rate.

The resulting benefit stream is then discounted using the applicable interest rates and mortality table. This method will produce the same lump sum amount as would be determined by valuing the nominal benefit at the hurdle rate and the applicable mortality table. As in the case of other liabilities discussed earlier in this practice note, once again the mandated basis (in this case, lump sum segment rates) would serve as the “return scenario” for the calculation under this approach.

This method produces a lump sum consistent with the “amount needed today” view of a present value discussed earlier. The minimum lump sum amount is a present value of promised benefits. In order for the present value to provide these benefits, it must grow at a rate of return equal to the discount rate. This suggests that the return on assets is not a separate assumption, but by definition must be the same as the discount rate and therefore is a prescribed assumption.

There are other advantages of this method:

- The lump sum is comparable to the premium an insurance company would charge for a variable annuity with the same hurdle rate (and assuming the same mortality assumption).
- All assumptions used are published and not subject to the discretion of the plan sponsor, thus meeting the definitely determinable rule.
- The lump sum does not fluctuate as interest rates change, and this lack of fluctuation is consistent with the fact that variable annuities are generally not sensitive to interest rate changes.
- The lump sum is consistent with the economic value of the periodic benefits.

Participants electing a lump sum are not necessarily giving up the right to future benefit indexing, and therefore do not need to be compensated for it by building differences between anticipated plan returns and fixed income returns into the present value calculation. Although the participants may not be able to invest in identical assets, they may be able to invest in a similar manner as the plan assets (e.g., assets with similar risk/reward characteristics), and thereby achieve a similar level of adjustment relative to the hurdle rate that the participant would have had if assets had been left in the plan. However, to require payment of a premium for the anticipated difference between expected equity returns and expected fixed income returns effectively pays participants an equity risk premium without any actual exposure to risk. That is, the payment (increased to reflect a risk premium) could be invested in high-quality corporate securities and would accumulate at normal retirement age to the amount expected from equity returns without any exposure to the additional equity risk. Alternatively, participants might choose to benefit twice from the equity premium by investing in equities and earning the equity risk premium a second time. It is worth noting that the equity risk premium has a market value of \$0—that is, one dollar of equity assets has the same market value as one dollar of fixed income assets, despite the potential for higher returns on the equity investment.

Market-based cash balance plans, which are similar to variable benefit plans, are not required to build in a premium for potential future investment returns, but instead pay out the account balance if they meet the definition of a lump sum-based benefit formula under the final hybrid plan regulations issued in 2014. This result is equivalent to Method A, which would pay out the market value of the variable annuity benefit.

Concerns raised about this method include:

- The segment rates may not reflect actual expected returns on the plan assets (or the applicable index), and the theoretical basis behind the IRC Section 417(e) rules is irrelevant to the application of those rules.
- The discount rates are set by statute and are not necessarily reasonable as assumed future investment returns.
- The ability to pay the account balance in a market-based cash balance plan was not established until the law was clarified, and no similar clarification has been made for variable annuity plans.
- The plan may have access to investments that an individual does not, such as hedge funds or private debt or equity. Thus, while a cashout based on the hurdle rate might represent the cost of providing the benefit from the plan perspective, it may not represent the full value of the benefit from the participant perspective. Some adjustment for the difference between what a plan might reasonably expect to earn and what an individual might expect to earn from investments available in the retail market might therefore be appropriate. The appropriate adjustment for such a difference, if any, is unlikely to be comparable to the difference between an expected return on plan investments and the 417(e) rates
- The parallel to market-based cash balance plans is not perfect. Those plans may for example, impose a cap on future returns, but must nevertheless still pay out the full account balance, despite any loss in value attributable to a cap.

Method B: Future Indexation Based on Expected Return on Assets (or Index)

This method determines an estimated return on the actual assets based on the portfolio asset allocation (or the estimated return of the index in the case of a plan that bases changes on an index). The estimated return is used to calculate the future indexing of the benefit. The resulting benefit stream is then discounted with the applicable interest rates and mortality table.

This method could be viewed as reflecting the best estimate of the actual benefits expected to be paid in the future, consistent with the findings in the *Berger v. Xerox* case.³⁶ This case involved a cash balance plan in which the account balance for participants electing distribution prior to normal retirement age was projected at the same rate used for discounting the future benefit rather than the plan's stated interest crediting rate. The court ruled that this was inappropriate and that the cash balance should be projected at market rates and discounted at statutory rates, thus producing the result

³⁶ United States Court of Appeals, Seventh Circuit; August 1, 2003.

referred to as “whipsaw.” The court concluded that to do otherwise resulted in a distribution prior to normal retirement that is not the actuarial equivalent of the normal retirement benefit, because the future interest credits would be included through normal retirement age absent the voluntary early distribution. The whipsaw requirement for cash balance plans was explicitly removed by the PPA.

*Williams v. Rohm and Haas Pension Plan*³⁷ affirms the principle that future adjustments in benefits must be reflected in current lump sum values. The decision in this case required that a lump sum include the expected value of a plan’s cost-of-living adjustment (COLA). Some have argued that the right to an adjustment for expected returns in excess of 417(e) rates is comparable to a COLA and should similarly be reflected in the lump sum calculation.

Cash balance plans and variable annuity plans both adjust benefits in a manner that varies depending on economic conditions. Some might therefore conclude that lump sums from a variable annuity plan should be determined in similar fashion—by projecting future benefit amounts based on some assumption with respect to future values of the relevant economic factors and then discounting the resulting payment stream using 417(e) rates. However, some important considerations include:

- The whipsaw concept has never been applied to variable annuity plans historically. And with the statutory elimination of this concept for cash balance plans, there is likely little justification to begin extending the concept to variable annuity plans now.
- To apply the whipsaw concept, cash balance plans must project account balances to normal retirement in order to convert the benefit to an annuity that can then be discounted to the lump sum payment date. Variable annuity plan benefits are already expressed in the form of an annuity payable at normal retirement and thus do not have the same need to project and convert to define an annuity.
- Many have pointed out that the rate generally applied in whipsaw calculations—the plan’s current interest crediting rate—is not necessarily a reasonable estimate of future rates. This is particularly true where benefit adjustments are based on a return on assets, rather than on a fixed income yield. The application of the whipsaw concept using the most recently available rate of return as an estimate for all future returns would produce wildly varying benefit values for both cash balance and variable annuity plans. It is thus no surprise that the same legislation that formally supported the market rate cash balance plan design (PPA) also did away with the whipsaw requirement for these plans.

There are other potential concerns with this method:

³⁷ United States Court of Appeals, Seventh Circuit; August 14, 2007.

- If the benefit indexation is not consistent with the discount rate, the lump sum value will be either fall short of or exceed the amount needed to provide the annuity benefits.
- The expected return on assets is subject to judgment and may not meet the requirement of being definitely determinable.³⁸
- Asset allocation is generally controlled by the plan sponsor. By changing the asset allocation, the sponsor has influence over the amount of the lump sum that is paid. To the extent that the methodology defined in the plan for setting the return assumption reflects such changing allocations, it may not be deemed definitely determinable without employer discretion (for example, a plan sponsor might, in anticipation of plan termination, change the asset allocation and thereby affect the plan's assumption for future returns); to the extent it does not reflect such changing allocations, it may not produce a reasonable estimate of future returns.
- More aggressive portfolios are subject to higher risk, the cost of which is not reflected in the lump sum. Participants benefit from the riskier assets but receive the benefit immediately and are not subject to the risk. The price that financial markets would put on the risk would exactly offset the premium built into the lump sum calculations.
- IRC Section 417(e) bases lump sum calculations on published interest rates, not estimates made by plan sponsors. This method involves a degree of discretion and variation from plan to plan that mandated IRC Section 417(e) assumptions were intended to eliminate.
- The logic reflected in the *Williams v. Rohm and Haas* decision may not distinguish between methods A and B. An inflation-based cost-of-living adjustment clearly has a non-zero value as reasonable expectations for inflation are positive. By contrast, it can be argued that the excess of plan returns over 417(e) rates, which represent current market fixed income yields, has no current economic value.

With respect to the final two concerns listed above, it should be noted that certain other types of plans (e.g., those providing automatic post-retirement cost-of-living adjustments) require the use of non-prescribed assumptions to appropriately reflect the plan's provisions in valuing a lump sum benefit option.

Method C: No Change in the Nominal Benefit

This method is actually a special case of Method B in which the expected return on assets is always equal to the hurdle rate. Therefore, indexation based on the difference between the return and the hurdle rate does not change the anticipated benefit.

Applying the applicable interest rates and mortality table to the nominal benefit and determining a lump sum value as if the nominal benefit was unchanged in future years

³⁸ It is possible for the plan to define a methodology for determining a reasonable assumption in a manner that would meet the definitely determinable standard.

will produce a result that is the same as a fixed benefit of the same nominal amount. However, the lump sum will not reflect the potential indexation of the benefit.

One could argue that the indexation feature of a variable plan may have considerable value and that this value is not properly reflected in the lump sum under this method. This method would produce the same lump sum amount for a plan with a 3% hurdle rate as for a plan with a 7% hurdle rate despite the fact that future periodic benefits for the 3% hurdle rate plan would be significantly greater than for the plan with a 7% hurdle rate (assuming all other factors are the same) regardless of actual future returns on plan assets (or applicable index). Some might contend that the lump sum should reflect a reasonable assumption concerning future indexation and that assuming no change in benefits, regardless of the hurdle rate, is generally not reasonable.

With *Williams v. Rohm and Haas*, future adjustments take the form of an automatic cost-of-living adjustment. For variable annuity plans, future benefits are adjusted based on future investment performance as compared to a hurdle rate. These two sets of adjustments seem quite comparable with regard to the principle affirmed in this case. Accordingly, one of the other methods discussed may be preferable given the apparent conflict between Method C and the findings in *Williams v. Rohm and Haas*.

In the absence of clear regulatory guidance on the application of IRC Section 417(e) to variable annuity plans, the actuary and plan sponsor will likely want to examine this issue carefully. Legal counsel may also be helpful in determining the most appropriate method to calculate lump sum benefits from these plans.

Minimum Benefit Based on Prior Early Retirement Benefit

IRC Section 411(a)(9) provides that the normal retirement benefit is the greater of the early retirement benefit under the plan or the benefit under the plan commencing at normal retirement age. This raises some questions as to how to treat changes in the benefits resulting from investment experience.

Consider a variable annuity benefit in a defined benefit plan that has a normal retirement age of 65. This plan provides for unreduced benefits at age 62 for participants with more than 30 years of service.

A participant who has more than 30 years of service retires at age 62 and begins collecting an annual benefit of \$10,000. During the next three years, investment results are less than the hurdle rate of the plan and the annual payment declines to \$9,000 at age 65.

Next consider an identical participant who continues working until age 65. This participant experiences a similar decline in the age 62 benefit (from \$10,000 to \$9,000),

which is partially offset by additional accruals. This participant retires at age 65 with an annual benefit of \$9,500. Is the benefit payable to this second participant \$9,500 or \$10,000? Consider the following possible analyses:

1. The participant is entitled to no less than the benefit that would have been payable if the participant had retired at age 62. At age 62, the benefit would have been \$10,000, but subsequent investment results would have reduced the benefit to \$9,000 at age 65. At age 65, the participant is entitled to the better of the current benefit of \$9,500, or the age 62 benefit which is currently \$9,000.
2. The participant who retires at age 65 is entitled to \$10,000 per year because this is the amount that would have been payable at age 62, and the normal retirement benefit cannot be less than this amount.

Those who support the first analysis believe that the investment adjustments are an inherent part of the accrued benefit and that the \$9,500 benefit is greater than the early retirement benefit that would have been payable if the participant had retired at age 62. Those who support the second analysis believe that the dollar amount payable at age 62 is the effective minimum benefit and that application of the law would disregard subsequent investment adjustments. Under this second view, however, the accrual rules could also be problematic as it suggests that adjustments due to future investment returns are not part of the accrued benefit.

While there are regulations under IRC Section 411(a)(9), they do not address this particular issue. There are also apparently no legal decisions that have addressed this distinction. In the absence of regulatory guidance, the plan sponsor will likely want to examine this issue carefully and may elect to consult legal counsel in determining the most appropriate method to comply with this provision of the law.

Issues Beyond the Current Scope of This Practice Note

This practice note addresses some basic issues regarding the valuation of pension benefits that include a variable benefit feature. There are many other aspects of variable benefits that may require treatment different from that for traditional fixed benefits, including some in areas other than the valuation. Future revisions to this practice note may address some of these issues. Also, the IRS may provide future regulatory guidance relevant to the topics discussed in this practice note.

This section provides a partial list of issues that the actuary and plan sponsor may need to consider to determine whether a treatment different from that for traditional fixed benefits is appropriate.

Additional areas for consideration:

- Contributory plans

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- Nondiscrimination testing
- Statutory hybrid plan regulations
- Minimum distribution regulations
- Calculation of Pension Benefit Guaranty Corporation (PBGC) premiums
- Effect of gains and losses from noninvestment sources
- Relative value disclosures
- Actuarial equivalence for optional forms of benefit
- Treatment of expenses in determining investment return
- Unit versus dollar accounting
- Participant choice
- Qualified Domestic Relations Orders (QDROs)

Appendix

Consider a variable annuity plan that provides a series of benefit payments (not contingent on survival): $B_0, B_1, B_2, B_3, \dots, B_n$.

The plan has a hurdle rate of h . This hurdle rate can be considered the periodic return required to keep the benefit payments equal to B_0 . B_0 is defined based on the plan's provisions at the measurement date and is known. Subsequent benefit payments are determined by the formula:

$$B_n = B_{n-1} \times (1 + i_n) / (1 + h)$$

where i_n is the actual rate of return on plan assets during the period between payment $n-1$ and payment n . The demonstration that follows applies regardless of the type of investments or the asset allocation because the returns, i_n , reflect the actual return on whatever portfolio actually exists. Payments are made at the beginning of each period. If $i_n = h$ then $B_n = B_{n-1}$.

The asset needed to fund this benefit regardless of the actual return on plan assets or the rate of return on fixed income investments is:

$$A_0 = B_0 \times (1 + v^1 + v^2 + v^3 + \dots + v^{n-1})$$

where $v = 1 / (1 + h)$. Furthermore, the asset needed at any subsequent period is:

$$A_j = B_j \times (1 + v^1 + v^2 + v^3 + \dots + v^{n-1-j})$$

This is demonstrated as follows. The actual return on assets varies each period and is expressed as i_t where t represents the time period between payments $t-1$ and t .

Assets at $t = 1$ are:

$$A_1 = (A_0 - B_0) \times (1 + i_1) \quad \text{then substituting for } A_0,$$

$$A_1 = (B_0 \times (1 + v^1 + v^2 + v^3 + \dots + v^{n-1}) - B_0) \times (1 + i_1) \quad \text{next simplifying,}$$

$$A_1 = (B_0 \times (v^1 + v^2 + v^3 + \dots + v^{n-1})) \times (1 + i_1) \quad \text{factoring out } 1/(1 + h),$$

$$A_1 = (B_0 \times (1 + v^1 + v^2 + \dots + v^{n-2})) \times (1 + i_1) / (1 + h) \quad \text{and simplifying,}$$

$$A_1 = (B_1 \times (1 + v^1 + v^2 + \dots + v^{n-2}))$$

By repeating this procedure, it can be shown that:

$$A_j = B_j \times (1 + v^1 + v^2 + v^3 + \dots + v^{n-1-j}) \quad \text{and in particular,}$$

$$A_n = B_n$$

A_0 is precisely sufficient to fund all benefit payments regardless of the actual return on assets. While this may seem surprising at first glance, it is necessary because the periodic adjustment in benefits, $B_n = B_{n-1} \times (1 + i_n) / (1 + h)$, was defined in order to accomplish this intended result.

Furthermore, it can easily be demonstrated that if the initial asset is anything other than A_0 , say $A_0 + \Delta$, then at time n the assets will be:

$$A_n = B_n + \Delta \times (1 + i)^n$$

where i is the effective periodic rate of return over the entire period. In other words, if Δ is positive there will be surplus assets after the last payment and if Δ is negative there will be insufficient assets to make all payments.

The important principle from this demonstration is that the assets needed to adequately fund a variable benefit obligation are independent of both market fixed income rates and the expected return on the portfolio of assets upon which the variability is based. This principle is the basis for the “single assumption” valuation techniques described in this practice note, which base assumed future indexation on the discount rate assumption when faced with regulatory requirements to use certain discount rates.

Return Implied by a Bond Yield Curve

Discounting pension obligations using a yield curve is a common technique. The rationale behind this approach is that the yield curve describes yields that are consistent with the current pricing of bonds available in the market. All that a spot rate taken from a yield curve tells us is that a zero-coupon bond held to maturity should yield a compounded return consistent with the spot rate for that maturity. It is possible to derive forward rates that connect the spot yields. However, those forward rates are not necessarily a prediction of the return on the bond portfolio, or on any particular bond within the portfolio, for that given year. For example, the year 5 spot rate for time 5 might be 4%. This tells us that a zero-coupon bond that is priced consistent with the yield curve will yield an average annual return of 4% over its lifetime (assuming no default), or a compounded total return of 21.7%. An expectation for interim returns on that bond cannot be derived from the yield curve alone. The interim returns will depend on how the spot yield curve changes in the intervening years. There are different reasonable views of how yields might change. The 5-year bond might return a level 4% over its lifetime, or it might provide returns consistent with the forward rates, or it might provide a different pattern of returns. The only thing known with certainty (again, assuming no default) is that it will yield 21.7% over its lifetime. This is just a function of the price initially paid for the bond and the amount collected at redemption, and does not depend on intervening yields.

If one wanted to consider expected returns on a portfolio of bonds that are priced based on the yield curve, even though the current price and the maturity value of all of those bonds might be known, how that portfolio will grow in value is not known. However, an effective yield to maturity of the portfolio as a whole, which represents the expected return on the portfolio over its lifetime, can still be calculated, assuming that bond payments precisely match pension payments and therefore there is no need for reinvestment. This is the implicit assumption when pricing a pension obligation using a bond-based yield curve.

If the premise is accepted that a discount rate represents an expected return on a particular portfolio of assets, then if bond yield-based discount rates are being used, it is reasonable to assume that the expected return over the life of the obligation is the yield to maturity on a matching portfolio of zero-coupon bonds (again the implicit assumption behind discounting an obligation using a bond yield curve).

For a variable annuity plan, the actuary might also define a pattern of returns so that benefit adjustments can be projected and the resulting benefit payments can be discounted using the appropriate year's spot rate. As noted above, a yield curve specifies only the overall returns, but not the specific pattern. Using the forward rates implied by a

yield curve, or using a constant single equivalent rate, while differing in terms of structure, will provide the same answer in terms of the liability.

Segment rates represent an artificially smoothed set of discount rates (smoothed over time, as well as smoothed over time intervals for any given date). Nevertheless, a present value derived using these rates represents the amount necessary today to back the obligation assuming future returns consistent with those rates. If year-by-year returns are derived consistent with the forward rates implied by the segment rates, awkward results can be produced. For example, if the first segment rate is 3% and the second segment rate is 4%, the assumed compound annual return through year 4 is 3% and through year 5 is 4%. This implies that the “return” during year 4 is 8.09% ($1.04^5 / 1.03^4 - 1$). A similar discontinuity in the assumed return would occur at year 19.

However, all that any yield curve discloses is that a zero-coupon bond held to maturity should yield a compounded return consistent with the spot rate for that maturity. So if the spot rate for time 5 is 4%, a zero-coupon bond held for five years should return 4% compounded, or 21.7% in total over the life of the investment. Similarly, if the spot rate for time 4 is 3%, a zero-coupon bond held for four years should return 3% compounded, or 12.6% over the life of the investment. As discussed above, this is not enough information to give the precise pattern of return for either investment. Just because a 4-year bond earns 12.6% over its lifetime, doesn't mean that the cumulative return on the 5-year bond will be 12.6% for its first four years (which would result in an 8.1% return in the final year). It is possible, for example, that the term premium for holding the bond that extra year could result in a higher return for the first four years, which would reduce the final-year return. For example, the 5-year bond could return an even 4% per year for each of its five years.

If the actuary treats the discount rate as a prescribed return assumption, the actuary might simply define the returns as being consistent with the discount rates. But the actuary might also want to define the pattern of returns. Given the awkwardness of the segment rates, the actuary might define the return as an effective single return over the life of the portfolio that is equivalent to the discount rate.