Considerations in the Evaluation of Gain Sharing Designs

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GAIN SHARING ABSTRACT

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Gain sharing is generally used to describe provisions of retirement programs that use investment earnings over a target level to provide additional benefits. Gain sharing provisions have existed in public plans for many years as a method of sharing higher than anticipated investment earnings with retirees and employees. Gain sharing provisions vary widely. For instance, benefits may be provided in a variety of forms including "13th checks" (one-time payments to retired participants), permanently increased monthly payments and benefits contingent on reserves set aside from these "excess earnings". The term "excess earnings" is often criticized as misleading since it is expected that returns above the assumption will be needed to cover returns below the assumption in different years. The term is used here to describe the funds skimmed off to provide benefit increases.

Gain sharing programs have been in the news recently, and changes in accounting and actuarial standards are highlighting the importance of a well-defined method to reflect these programs when determining actuarial liabilities and annual contributions.

In particular, two recent developments (and the MVL debate) may require public plan pension actuaries to rethink how and whether they are valuing gain sharing provisions in pension plans. These developments include the Government Accounting Standards Board's (GASB) proposed revisions to government accounting for pensions, proposed revisions to Actuarial Standard of Practice (ASOP) No. 4 and possible Market Value of Liability measurements:

(1) The June 2011 GASB Exposure Drafts require valuing benefits provided by most gain sharing programs.

(2) The January 2012 ASOP No. 4 exposure draft specifically addresses gain sharing designs and would require for the first time a rationale for any significant benefits not included in the valuation.

(3) The value of benefits provided by gain sharing provisions would likely have to be included in any Market Value of Liability (MVL) measurement, should one be required.

Recently, some plans have substantially revised their gain sharing provisions to reduce the value of the benefit provided to retirees. These reductions have taken different forms, including suspending gain sharing until funded ratios improve. When design changes are being considered, accurate costing of the existing provisions is particularly important. If the current actuarial assumptions and methods do not accurately reflect the costs of the current gain sharing provisions, determining the potential additional cost or savings from the proposed changes may require additional changes to the assumptions or methods used, obscuring the effect of the proposed change to the gain sharing provisions. The purpose of this paper is to provide actuaries with ideas and a tool on how to value these designs.

Nothing in this paper should be construed as creating a standard.

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Executive Summary

Gain sharing provisions have been in effect in governmental pension plans for many years. While these provisions may have been accounted for in some indirect fashion, recent proposed changes in accounting and actuarial standards may require a much more rigorous approach to measuring these programs. We discuss a number of design issues along with methods for analyzing the likely cost of these provisions, either directly or indirectly assigning a cost to these provisions.

We describe ways that plan actuaries could value gain sharing provisions. In the past, many gain sharing provisions have not been directly valued. The reason may have been that the gain sharing benefit was de minimis (usually not the case) or some other reason specific to the plan[1]. However, proposed changes in ASOPs and GASB statements and increased scrutiny have caused actuaries to look at ways to value (and potentially, prefund) these benefits. We will discuss further issues raised in the ASOPs and proposed GASB revisions. We will also discuss the MVL issue. Nothing in this paper should be considered authorized guidance on how GASB and the ASOPs should be interpreted either in the past or the future.

There are some gain sharing provisions that the actuary may easily model using simple actuarial methods (see, for example, Design 1 below). However, we conclude that for most gain sharing provisions actuaries may use one of two reasonable approaches to value most gain sharing provisions. The first method, the Net Discount Rate method, models the amount of future investment returns that will be used to provide for gain sharing benefits, and reduces the assumed investment return to semi-deterministically reflect the assets skimmed off to provide gain sharing benefits. This method often uses stochastic modeling to determine the effect of gain sharing on investment returns (which is then placed back into a deterministic model). The second method, the Projected Benefit method, uses stochastic modeling to determine the likely effect of the gain sharing provisions on members' benefits. Then, either through a deterministic or stochastic valuation, these adjusted benefits are discounted using the actuary's unadjusted assumed investment return.

I. Framework

Many public sector plans include a plan provision called a gain sharing plan[2]. Gain sharing provisions were not typically part of the plans when the plans were created, but were added

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[1] The assumptions used often depend on the purpose. For funding purposes the plan may choose to ignore the cost of the gain sharing feature. However, this does not mean there is no value. See ASOP and GASB discussions in Sections XIV and XV below.

[2] These are sometimes referred to as skim funds. While some might not choose the word "skim" because it has a negative connotation, we use it in this paper as a descriptive adjective. We will refer to the "skim rate" as the difference between the gross discount rate and the net discount rate after factoring in the value of the gain sharing provision.

along the way to allow retirees to share in the good investment performance. The concept is to use "excess earnings[3]," *i.e.*, earnings over a certain target, to provide additional benefits to retired participants. These designs tend to affect benefits asymmetrically as benefits can only be increased and not decreased. Thus, gain sharing provisions are different from traditional variable annuities because variable annuities also allow for annuity reductions. In some ways gain sharing plans are more like stock options since additional gain sharing benefits are contingent on meeting a target, with the value of the gain sharing benefits being limited to a minimum of $0.

We believe that actuaries need to adapt the methods outlined in this paper to actual plan designs, as different gain sharing designs require different adjustments to the actuarial models to better reflect the cost of the provisions. Examples of such benefit provisions include:

1. Gain Sharing Target - If the investment rate target is the actuary's investment return assumption, then if the actuary wants to value these benefits indirectly by using a slightly lower rate to discount future benefits reflecting that part of the expected return that will fund these future contingent benefits, the choice of a lower investment return assumption could increase the value of the gain sharing benefits (which is unlikely to be the intent of the designer). Said another way, an important part of the design of a gain sharing program may be to separate the investment return rate (gain sharing target) that must be met before gains are shared from the investment return rate used to discount future plan benefits. This could be done simply if the actuary can project the future benefits associated with the gain sharing provision. However, actuaries may choose to use a net rate to value the gain sharing provisions. Using different rates for the gain sharing target rate and for discounting future payments also greatly simplifies the discussion of valuing these programs.

2. Asset Base vs. Retiree Liabilities (Generational Equity) - Increases are generally only provided to retirees. However, the dollars of excess investment return may be based on either all assets or on just assets equal to the benefit liability for retired participants. When based on all assets, it raises intergenerational equity issues.

3. Benefit Conversion – Gain sharing benefits are often distributed either in the form of a lump sum distribution (the so-called 13th check), or in the form of an increased annuity. Determining the increase in the annuity may be done either at the valuation investment return assumption or at a lower, annuity-market investment return assumption. From an MVL (Market Value of Liability) perspective, using the expected investment return

[3] While a return may be "excess" above a target rate (e.g. 7.5%), it is not truly "excess" because if it is skimmed off in good years, it will not be there to cover losses in bad years, reducing the overall return to the fund. However, we accept that it is used as a shorthand to describe what is happening in a given year of good returns.

assumption provides a significant subsidy to the participant, and an equivalent risk to the plan sponsor.

4. Multiple uses of funds skimmed off - Under some designs, a portion of segregated returns may be used in the future to reduce the unfunded liability or employer contribution (sometimes referred to as a clawback provision). Our focus is generally only on those funds used to increase benefits. Models may have to be adapted to separate these different uses and such models may need to reflect the dollar amounts that were skimmed off and later clawed back. We believe that the simpler approach of adjusting the investment return will likely not be sufficient to address these designs.

5. Plan Funding Status is a critical part of the design of a gain sharing provision, and affects how the actuary reflects the liabilities for the provision in many ways:

   - Since, in many designs, the amount of the gain sharing depends on asset returns, the level of funding impacts the amount of the benefit increases and the cost of the provision. A plan that stays 0% funded has no additional cost due to the gain sharing provision and one that is 200% funded may provide twice the gain sharing benefit as one that is 100% funded. This implies that the cost increases as the funding level improves. We will further discuss this effect from a prefunding perspective where the funded ratio is expected to increase over time.

   - Some designs are tied to the return only on the current retirees' reserves so one funding key is simply if there are enough assets to cover current retiree reserves.

   - Some designs are based only on the investment return percentage and not the dollar amount of actual earnings (or excess earnings).

   - Some designs share part of the return only when the plan is fully funded, or nearly so. These designs often suspend increases until funded ratios reach a certain level.

   - Some designs use an averaging period to reduce the effect of gain sharing on a plan's funding, by reflecting excess returns (net of losses) only over a period of years. While this approach does not directly reflect the plan funding levels, this approach reduces the risk (cost) to the plan of gain sharing.

The core of our paper is Section XI (Modeling) and the accompanying spreadsheet. While we could have started with Section XI, we believe that it is important to give the readers a common background and understanding of the issues, prior to addressing the approaches to determining the value of the gain sharing provisions. Valuing the plan liability for gain sharing provisions frequently requires the actuary to apply first principles to specific designs.

II. Getting started with three sample designs

Because gain sharing designs do have variations, some first principles need to be applied to specific cases. We will look at examples of three different gain sharing designs. Each of the three is based on a real plan design with some simplifications. They are presented in order of increasing complexity. The third example is by far the most common type we have encountered. We chose these examples to make points about gain sharing designs, and these examples build on each other. The issues raised in Design 1 will likely exist in the other two examples and the issues in Design 2 will likely exist in Design 3; we have simply chosen not to repeat the issues addressed in earlier examples.

Design 1: The plan provides an annual cost-of-living adjustment (COLA) of 1% each year to retirees. However, if the investment return exceeds the valuation assumption, the annual COLA for that year is increased to 3%. Some may not consider this a gain sharing provision, but we do so consider it. The return could exceed the assumption by 0.01% and yet the increase of 3% would be provided (*i.e.*, we are providing a benefit whose value may be significantly in excess of the value of the investment gain). Also, the design is tied to investment returns and benefits can only increase and not decrease. Thus, we consider this a gain sharing program. The simplest way to value the benefit would be to assume the investment return is met 50% of the time and assume a 2% COLA is paid every year. However, even this basic valuation approach has some issues.

1. Is your investment return assumption really a median assumption? In Section X we discuss the choice of investment return assumptions that are arithmetic (that is, mean) and geometric (that is often like the median or a little higher) investment return assumptions. If your investment return assumption is an arithmetic average of expected returns, then the addition of 1% to the minimum cost-of-living adjustment is likely slightly overstating the value of the gain sharing provision since the mean return is achieved less than half of the time.

2. Also, note that two consecutive increases of the assumed 2% (1.02 x 1.02, or 1.0404) are slightly larger than an increase of 1% followed by an increase of 3% (1.01 x 1.03, or 1.0403). While the difference is trivial (*i.e.*, likely to add less than 0.2% to the expected COLA over a 15-year period) and could be ignored due to immateriality, the actuary should be aware of the potential effect of this slight difference.

Design 2: This design uses half of any year's investment return over a fixed rate (*e.g.*, 7.5% target rate) to provide additional benefits to retirees. The investment return is measured using the return on market value of assets, rather than the return on actuarial value of assets. The market value of assets used to determine the excess investment returns used to increase retirees' benefits is limited to the assets used to provide retired participants' benefits (i.e., the assets are limited to the liability for retired participants' benefits). The excess investment return for the year is divided by the liability for retirees, resulting in an increase percentage that is applied to all retirees' annual retirement benefits. Benefit increases are paid as an annuity with every retiree given the same percentage increase.

If the actuary's best estimate of the expected investment return (ignoring the gain sharing feature) was 7.5%, assuming a 7.5% investment return with the gain sharing program is expected to result in an accumulation of net investment losses. The accumulation of investment losses is caused by the use of half of any return in excess of 7.5% to increase benefits, reducing the actual investment returns available to pay for benefits (other than the increase in retiree benefits because of the gain sharing provision). Therefore, the net investment return assumption should be lowered (or the extra benefits valued in some other way). Given that only asset returns allocated to current retiree reserves are skimmed off, only the post retirement investment return assumption would need to be lowered. The question is by how much? ASOP 4 contemplates this in Section 3.9 as discussed in Section XIV below. ASOP 4 mentions stochastic modeling as one approach to determining the amount of the adjustment to estimate the cost of the gain sharing provision.

Our general approach, because of the practical limitations of most valuation systems, is to determine a net discount rate to reflect the cost of the gain sharing provision. However, the ideal approach is to create a model to project the benefits provided by the gain sharing provision. This allows a separation of the discount rate (investment return assumption) and the benefit payout projection. We encourage the modeling of these benefit increases as the best approach for valuing gain sharing provisions. However, for the reasons discussed in Section IV it is often easier to adjust the discount rate. Under either method there may be a need to describe the method and, if appropriate, include a statement that it is an approximation.

Stochastic Monte Carlo modeling is one approach to determining the net investment return available for the "base" benefits (that is, excluding the gain sharing benefit improvements). However, there is another approach. You could also plot the frequency of returns as shown in Chart 1 with some type of continuous formula. For this example we have assumed a log normal[4] distribution of annual returns. If the area under the graph represents a value of 1.000 (100% probability), then the sum of the various probabilities times the return values (expected values) represents the arithmetic (mean) return. The shaded area represents the excess returns allocated to the gain sharing benefit increase (via a lowering of the probability). The shaded area

[4] Please note that we assume that investment returns follow a log normal distribution, rather than the more common normal distribution. We did this because investment professionals widely assume that the log normal distribution is the more appropriate distribution, based on statistical analysis of investment returns. The model allows the use of an alternative normal distribution and some may wish to create other distributions reflecting things like "fat tails".

represents that amount that could be subtracted from the investment return assumption to derive the post retirement (net) discount rate[5]. However, there are also issues with this method:

1. Currently, we are focused on determining a net discount rate when using expected returns on the portfolio as the discount rate. Below we discuss how to model the benefits or adjust the discount rates when using MVL (Market Value of Liability) discount rates.

2. We often value benefits based on the plan as it existed as of the measurement date (see GASB 25 Section 10 a.). Generally, the cost of the gain sharing design will vary by the investment mix (as a mix with higher returns and higher variability will generate larger "excess earnings" to increase retiree benefits), funded level and the share of the funded level used to determine the excess returns. The impact of the funded level on the cost of the gain sharing benefits is covered in the Design 3 discussion below. We discuss the effect of the investment mix in Section XIII, below.

3. In this Design 2 we are focused on annual returns. The annual mean (arithmetic) and geometric average investment returns are identical (see point A on Chart 2). However, funding may very well be based on forward-looking long-term (multi-year) geometric returns which are lower than if the arithmetic (mean) average is used to determine the investment return assumption. If chart 1 produces an arithmetic offset, how would you adjust this offset to create a geometric offset? The focus would likely be on determining the geometric return based on the net return (the non-shaded part of the graph). However, the distribution of the non-shaded part of the graph is no longer the traditional log normal distribution (due to the asymmetric skimming). This creates some question about what the discount rate represents. We will discuss this in more detail in Sections X and XIII. The reader might also want to study the difference between cells M7 and M12[6] on the accompanying spreadsheet and think about the difference in the impact on the mean vs. average geometric rate.

4. How does the plan convert excess dollars to benefit increases? Some plans pay lump sums (13th checks) and others increase the annuity. If annuities are increased, the dollar amounts of excess earnings are often converted to annuities using the plan's funding assumptions as in this Design 2. However, other assumptions could be used (*e.g.*, 417(e) rates). The disadvantage of using the plan's funding assumptions is that these assumptions reflect significant investment risk to the plan sponsor, while use of a more risk-free rate reduces the potential risk to the plan sponsor of providing the increased benefits but provides smaller benefit increases. Some plans pay gain sharing benefits out

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5 The actual calculation would require summing up returns times the reduced probabilities. See Appendix 3 for more thoughts on this graph.

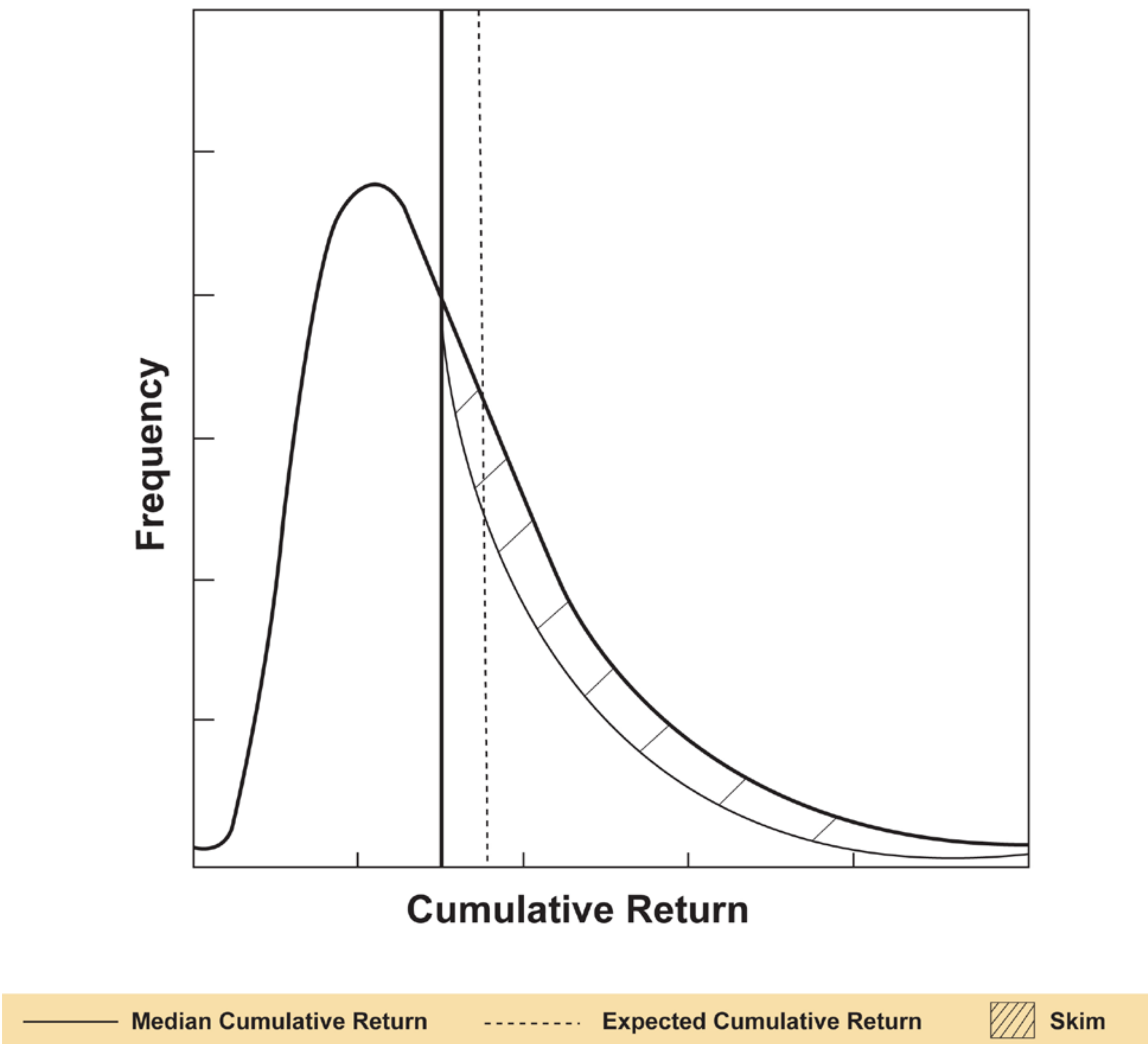
6 References in this paper to cells in the spreadsheet are to the "Monte Carlo Trials" sheet.

of a separate gain sharing pool, which is accounted for separately from other plan assets. In these cases the actuary may need to consider whether this requires or implies any special treatment of the gain sharing benefits that will be paid from this pool (e.g. difference in level of employer commitment to guarantee the benefit).

5. Impact of volatility with a "good" year followed by a "bad" year (i.e. a year with the investment returns exceeding the target return after a year when the investment return failed to meet the target): This is a common criticism of gain sharing plans. In a design like Design 2, in a good year the increase could be large followed by a year with no increases, yet the return over the two years could equal the investment return assumption, resulting in actuarial losses and increased plan costs.

As noted above, some of the same issues with Design 1 apply to Design 2.

CHART 1: Log Normal Graph



Design 3: This design is far more common than either of the first two designs. As with Design 2, the gain sharing provision provides for a pool of excess investment return dollars that will be converted to benefit increases. However, we will make the following changes to the facts in Design 2:

1. Excess returns will be based on an average return over five years (the asset smoothing period used for funding). Averaging returns materially reduces the cost of a gain sharing design. The cost, reflected in a reduction in the investment return assumption, of this gain sharing design (assuming similar targets) might be equivalent to an 80 basis point gain sharing cost as compared to the roughly 200 basis point gain sharing cost in Design 2. Design 3 also reduces the effect of a "good year" followed by a "bad year" (or vice versa), by replacing it with a "good" five-year period followed by a "bad" five-year period. However, how average returns in excess of the target return are converted into dollars of excess assets still needs to be defined.

2. The benefit of the gain sharing provision is still asymmetric (benefits can only increase), even if the funding allows for a gain in one year to be used to cover an investment loss in the next year.

3. These designs (perhaps because the design reflects the asset smoothing method) are also typically tied to the actuary's investment return assumption. This creates a dilemma. How do you lower the return assumption to reflect the cost of the gain sharing design, without increasing the cost of the design? One possible answer is that you ignore the cost and assume the gain sharing design is free. However, this is not a reasonable approach to determining the value of the gain sharing provision. An alternative is to create a recursive formula to solve for the net rate, reflecting that lowering the investment return assumption lowers the target and increases the value of the gain sharing provision. A second alternative is to continue to assume that the gross investment return assumption is 7.5% (as an example) and, if the actuary's analysis shows that the gain sharing provision is skimming off 80 basis points, effectively discount post-retirement benefit payments at 6.7% (i.e. the 7.5% investment return assumption, reduced 80 basis points for the effect of the gain sharing provision). Portions of the actuarial calculations, such as amortization payments, which are not affected by the gain sharing provision, would still be discounted at the gross investment return rate. In this example we will assume that (1) the gain sharing target is designed so that we do not need to lower it to the net post-gain sharing rate and (2) the target rate equals an arithmetic mean return expectation of 7.5%.

4. These designs are often based on total plan asset returns. This can be a generational equity[7] plan design issue (discussed below in Section XVI) since assets often exceed

[7] How much of a generational design issue you have will be dampened if excess reserves are not all allocated in the initial year.

retiree liabilities but only current retirees receive increases due to the gain sharing provision from current returns on "active" funds in excess of the target return. In these cases (unlike Design 2) you could be effectively reducing the discount rate both pre- and post-retirement[8].

So how would you value this type of design? Stochastic modeling of the investment return assumption may be the easiest approach. You could simply average returns over a five-year period within the stochastic model and with each average get the "net" rate of return that can be used to fund the core benefits (i.e. all benefits other than the gain sharing benefit). The fact that cash flow within each five-year period will affect the results might not be material.

If you did use a stochastic model, how would you deal with the concept that the funding assumption would likely change under the different market environments which the model would likely be generating? An excellent question for which we have no easy answer. Likely it helps make the point that like other benefits the cost of gain sharing plans (and the assumptions used) may need to change over time and is impacted by changes in expected rates of return, expected volatility and funded percentage.

How much of a reduction would be applied to create a net discount rate? Below we will discuss the models we have created to answer this question. However, if we assume that the arithmetic mean return is 7.5% and the standard deviation is 13%, the answer for Design 3 (skimming off half the five year average return over 7.5%) is about 0.96% under our models (and about a 6.5% net rate). If we used historical returns which are higher and historical volatility, the answer could be 2% (but also likely with a higher net rate). If the target were tied to the lower median return of 6.7%, an adjustment from the gross rate to the net rate of about 1.15% would be appropriate.

What if the plan is more or less than 100% funded? Gain sharing plans are generally asset based[9]. However, the idea of creating a net assumption to value gain sharing plan cost focuses on measuring liabilities and not assets. If we lower the 7.5% gross rate by 96 basis points but the plan is virtually unfunded, we would be overstating liabilities by assuming increases that cannot occur when the assets needed to support the increases in liabilities assumed are not present in the plan.

Term funding: One approach to dealing with plans that are not 100% funded is to determine stochastically the rate being skimmed off (*e.g.*, 96 basis points) but not to discount future benefit

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[8] The reason for the adjustment to the post-retirement discount rate is discussed immediately above. The need to reduce the discount rate for active liabilities is because a portion of the return on assets providing for active liabilities is used to provide for larger gain sharing increases to current retirees.

[9] There are exceptions. Some gain sharing designs may apply excess returns to other measures (e.g. an excess return percentage times retiree liabilities) and not actual (dollars of) plan investment returns to increment the gain sharing reserve. Note that Design 1 is not tied to asset levels.

payments to reflect this lower discount rate. In this approach, the 96 basis points would be multiplied by the existing asset values and added to the normal cost. This approach is certainly better than ignoring the cost of the gain sharing provision, but is not really prefunding, because the approach only reflects the expected cost for the current year, and doesn't reflect a portion of the cost expected in future years. Also, this approach uses a funding method for the gain sharing benefits that is different from the funding method chosen to allocate costs to funding years for all other benefits in the plan. This approach more closely reflects the term cost method than any funding method currently used for determining annual costs for pension plans[10]. The cost of the gain sharing benefits using this approach is also not going to be level as a percentage of payroll, as the cost will increase or decrease with the value of plan assets.

Pre-funding and GASB: If GASB requires benefits to be accounted for (although not necessarily funded) under an entry age normal method, how might we comply with this requirement and how might we prefund? One (complicated) concept would be to project the plan's funding level. For example, the plan might be 80% funded on the valuation date and projected to improve by 1%/year until reaching 100% funding in year 21, at which time it would stay 100% funded (in our simplified scenario). So if the gain sharing plan were skimming off 96 basis points, we could reduce the discount rate in year 1 by 80% x 0.96% and in year two by 81% x 0.96% and so on. This would allow the benefits to be prefunded under any selected funding method. Assume that we have a 20-year amortization schedule and start with the plan 70% funded. The discount rate (based on a 7.5% gross assumption and 0.96% skim) might look something like this:

Year 1:	7.5% - 0.96% x 80% funded = 6.73%
Year 2:	7.5% - 0.96% x (80% + 20% x (1/20)) = 6.72%
Year 3:	7.5% - 0.96% x (80% + 20% x (2/20)) = 6.71%
Year 21:	6.54%

This could be modified to reflect expected cash flow adjustments (such as for employer and employee contributions and expected benefit payments) since the funding ratio is unlikely to increase linearly between 80% and 100% over 20 years. Stochastic modeling could also be done to measure the impact over time.

III. Thoughts on prefunding

One key issue is the impact of funding on the cost of gain sharing designs. Depending on the design of the gain sharing program, funding for future gain sharing costs may increase the value of the gain sharing benefits and the cost of the plan. This is something that the actuary is likely

10 Also see issue under real life example number 1 in Section XII.

to want to disclose (and may impact employer funding decisions). Preferences for prefunding may depend on design. The following are some thoughts regarding funding and plan design[11]:

1. In Design #1 above, prefunding is likely to be considered, because the design is so similar to a standard cost-of-living adjustment.

2. If the gain sharing is tied just to retiree funds (e.g. Design #2), there is likely a prefunding preference as this is also similar to funding a COLA, and for many plans the retiree liability is 100% funded. However, there is still a cost impact depending on whether the retired life reserves includes or excludes the cost of expected future gain sharing benefits (skim cost). Thus, if the retired life reserves are determined using the interest rate net of the gain sharing adjustment, then gain sharing increases are provided on the value of the gain sharing benefit itself.

3. If the gain sharing benefits are determined using all funds, not just the retired life reserve, more consideration must be given to the expected funding levels in order to determine the cost of gain sharing.

The rest of the discussion in this Section focuses on the choice of funding or not funding the expected gain sharing benefits and not on accounting for these benefits. Accounting liabilities should include the value of all future increases.

Assume we have a design like Design #3, which skims off returns on all assets of the plan.

1. If we do not prefund, we minimize the cost of the gain sharing benefits but should expect to have net actuarial losses due to the skimming of a portion of the investment returns.

2. If we prefund, we expect to get no net actuarial losses due to the valuation of the gain sharing benefits, but we increase the value of the gain sharing benefits since the asset levels will be higher.

3. If we fund under a term cost approach, (1) we have no expected net actuarial losses, (2) we have a pattern of gain sharing cost tied to changes in asset value and not payroll and (3) we neither prefund nor incur net actuarial losses. Point (2) often means that we fail to meet two common funding goals: (i) level cost as a percentage of payroll and (ii) funding benefits over an employee's working lifetime. However we do recognize the program as having a cost and do fund each year's expected cost rather than funding losses due to gain sharing after the fact over the period used to amortize the plan's gains and losses. In addition, under some designs we avoid lowering the target rate.

[11] In addition, we can distinguish between the impact of funded ratio and the separate issue when the Target rate is impacted by selecting a "net discount rate" as defined in Section IV.

Section IV below will provide more discussion on the valuation method of reducing the discount rate to reflect the cost of a gain sharing design under a prefunding approach. Using this "net discount rate" approach we can ask the question: What is the difference in contributions between (1) a load of say 1% of market value of assets (term cost approach) or (2) a reduction in the discount rate of 1%? An actuary can easily figure this out depending on plan specifics (e.g. funding level). It is a bit like the choice to pay for investment fees by using a discount rate net of fees or adding a load to the Normal Cost. Only the second approach has an impact on the measurement of the Actuarial Liability. Lowering the discount rate may increase the contribution by twice as much as a load (although this varies by plan).

Two final considerations when prefunding:

1. Prefunding would require assuming some pattern of future funding and new entrants.
2. Events such as increased funding from pension obligation bonds may increase the cost of a gain sharing provision (unless the gain sharing provision is specifically modified).

IV. Reducing Discount Rate (Net Discount Rate method) or Projecting Benefit Increases?

Our strong preference in valuing gain sharing provisions is to project the correct stream of benefit payments (including those provided by the gain sharing provision) and select the discount rate reflecting the actuary's assumed investment return assumption[12]. However, this is not always easily done; therefore, we believe that the more practical approach for most actuaries will be the net discount rate approach, and this approach can be used without a material bias. This "reducing the discount rate" approach may also be driven by plan design or funding issues. Actuaries need to think about whether such an approach is consistent with ASOP 27's "cost effectiveness" allowance. Below are some thoughts that may be helpful in considering issues specific to the design we are trying to value.

1. Design #1 above is clearly easier to value as a 1% + 1% COLA, valuing the expected stream of benefit payments.
2. As previously noted, many plans tie their target rate to the gross investment return assumption. If the plan uses the net investment return assumption to determine the gain sharing, use of the lower rate increases the value of the benefit; which may not be what was intended. This can be avoided by measuring higher benefits (i.e., reflecting the

[12] We will refer to the gross investment return assumption (or gross return) as the investment return used without adjustment for the effect of skimming to provide for gain sharing benefits. We will call the investment return assumption net of any adjustment for skimming the net investment return assumption (or net return).

effect on benefit payments of the gain sharing provision) and not reducing the discount rate. Alternatively, the gross investment return assumption may be used for some purposes (e.g. target rate and amortization payments) while the net return is used for discounting benefits to determine their present values, and related liabilities.

3. Excess funds set aside are not always immediately allocated to provide benefit increases. Sometimes they are accounted for separately from other funds (known as segregated funds) but only gradually used to provide benefit increases. The release of these funds may be controlled by a Board of Trustees. The "cost" event to the plan is often the allocation (segregation) of the assets after a good investment year(s). In this situation the use of a net return assumption may be a more accurate representation of the cost to the plan even if the present value is not based on explicit benefit payouts that reflect the higher payments (since it may take some years for the segregated funds to be allocated to increasing retirees' benefits). However, as noted elsewhere, it is also possible that the segregated funds may be used for purposes other than benefit payments including being reverted back to the status of plan assets.

4. Plans that base the gain sharing on excess returns of the total fund should reflect future expected changes in the funded ratio. As discussed in Section I, the better funded a plan, the more valuable the gain sharing provision. The end of Section II shows how we might handle this using a net discount rate.

5. Plans that base the gain sharing benefits on excess returns of the total fund have intergenerational equity issues. If our valuations are to be based on "closed plans" (i.e., not reflecting new entrants), how should we value the benefit under either the reducing discount rate or projecting benefit increase approach? Under a closed plan valuation the declining ratio of *all liabilities to retiree liabilities* will arbitrarily reduce the expected cost of the gain sharing provision. The best approach appears to be to prepare a closed valuation of the liabilities, except for the value of the gain sharing benefit which will assume asset growth based on contributions for new entrants. This is the approach we have used throughout the paper except for the discussion of term cost funding. (Of course the new entrant discussion does not apply if the plan is actually closed to new entrants).

<u>V. Stochastic vs. Deterministic modeling</u>

Most pension valuations are based on deterministic modeling. The concept is that there is one single result (based on one discount rate, one mortality table, one employee turnover assumption, etc). Sections III and IV above discuss ways to value gain share provisions by taking a stochastic approach to modeling the cost of the gain sharing benefit and placing that result back into a deterministic model. For example, we might lower the discount rate to account for a gain sharing provision and still end up with a single result.

However, we wanted to point out that more complex stochastic models are often more informative even if the concept of a single result is replaced with the more complicated result showing probabilities of outcomes. For example, assume the following:

1. Gain sharing does not begin until the plan is 90% funded
2. The funding policy is not to get the funded ratio over 90%
3. If the funded ratio exceeds 90%, employer contributions stop, but any funds in excess of the 90% target do not revert to the employer.

As was noted earlier, the funded ratio has an impact on the cost of a gain sharing benefit. Using these three conditions, some might conclude that the approach discussed earlier will result in no additional cost for this gain sharing design with this funding approach. However, there is a cost and under a stochastic model, the cost will appear because there will be a non-zero probability that the funded ratio will exceed 90% in at least some years.

Another example of when additional thought and more extensive stochastic modeling is required, is what we call “clawback” provisions in a gain sharing program. Most common is a design that provides a portion of “excess returns” be set aside to pay for current and future benefit increases. However, if certain conditions are met (for example, if the contributions increase by more than say 5%, because of an inability to achieve the investment return assumed by the actuary) a portion of the funds set aside are released back to the general plan assets.

These two examples clearly require a more sophisticated approach to valuing a gain sharing provision than is discussed in this paper, although the same principals apply.

VI. Special Consideration under the Entry Age Normal Method

Methods like Aggregate and Projected Unit Credit (PUC) are easier to deal with than EAN when considering gain sharing funding. Only EAN requires that (1) we value benefits in the past for decrements that did not occur and (2) we consider discount rates in the past back to entry age. Both can be impacted by gain sharing benefits.

The purpose of using the EAN method is often to produce a level Normal Cost (often with the desire that this be level from generation to generation if the benefits do not change). However, the cost of gain sharing depends on the funded level, which is assumed to change in the future. The result might be that new hires have a higher normal cost (as a percentage of payroll) than current employees, if the plan is expected to become better funded, increasing the value of the gain sharing benefits. This could be avoided by using the net discount rate for all periods of time as if the plan were always 100% funded. While this could overstate the value of the gain sharing benefit, a further adjustment should be made to lower the EAN Actuarial Liability so that the sum of the present value of the future normal cost and the actuarial liability equals the present value of future benefits (where the present value of future benefits reflects the actual projected funded ratios). This has some similarities to the "Aggregate Entry Age" method. Because of the difficulties in reflecting the possible change (either increase or decrease[13]) in the value of gain sharing benefits over time, due to the level of plan funding, our paper takes no position on how best to use the EAN method to reflect gain sharing benefits.

Let's look at the issue in the prior paragraph from a slightly different angle. Under the Entry Age Normal method we need to be concerned not only about future benefits and discount rates but benefits and discount rates for the period of time between entry age and the measurement date. Assume you wanted to use the net discount rate method. Plans that base the gain sharing on excess returns of the total fund (not just current retiree funds) must first consider whether to discount during the time between entry age and the measurement date at the gross return or the net return (we suggest using the net return). These plans must then consider how this would compare to a more explicit modeling of benefit increases (since discounting at the gross investment return assumption understates the liability for the individual, if the skimmed amount during their period of employment is used to increase the benefit for other, retired participants). Our preference for the use of the net return is to create a level normal cost and avoid creating gains and losses just because a participant ages.

VII. How would we apply these principles in a Market Value of Liability (MVL) framework?

How might you factor in the cost of a gain sharing design in a market value measurement of liabilities[14]? We suggest that actuaries consider the following approach:

1. We would apply the GASB 45 concept of a substantive plan to determine the appropriate investment return assumption for estimating the amount of the gain sharing benefit. In this context, that includes considering the current investment mix as part of the substantive plan and assuming that the investment mix remains unchanged in the future, unless the plan has specific plans to revise the asset mix.

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13 For example, the value of the gain sharing benefit increases along with plan funding, if the plan funding is less than the retiree liability and the gain sharing is based on investment returns on the lesser of assets or retiree liabilities. The value of the gain sharing benefit decreases along with increases in plan funding if the plan's retiree liability is less than plan assets, gain sharing is based on all plan assets and the retiree share of liabilities increases over time.

14 As noted above, some would argue that the off market nature of these designs creates measurement problems and argue for not adopting these provisions. However, we assume that actuaries will still need to measure these benefits, because these gain sharing provisions do provide a benefit which cannot be ignored in valuing the plan's liabilities and may be legally protected.

2. We would then project future benefit payments. These would include the expected future gain sharing benefits due to potential investment returns in excess of the investment target. We would make these projections using a stochastic model to determine the amount of the likely benefit increases, reflecting the assumed investment mix as discussed above. However, instead of determining that an adjustment should be made to the gross investment return assumption (as described in Section IV), we would suggest determining an adjustment that should be applied to plan benefits.

3. Then, the risk-free discount rates would be applied to the projected benefits, reflecting the expected increases in benefits due to gain sharing, to determine the market related value of liabilities.

This would be an example of an MVL calculation that does depend on investment mix since the gain sharing benefits are linked to the investments and the expected investment return (not the risk free investment return). Even more unusual than tying MVL to investments (solely because benefits are tied to investment mix) is the need to tie MVL to future contributions since the funded level will impact the benefits paid.

Like any attempt to determine an MVL, we have the issue of default risk, which would be reflected in determining the appropriate adjustment to the risk free rate. The history of plans abandoning gain sharing designs and the contractual nature of each individual plan's design make this a factor beyond the scope of our paper, although we suggest that the actuary must consider this in determining the appropriate MVL discount rates to use.

VIII. Are these benefit provisions permanent and does that impact whether and how to value these benefits?

Many gain sharing plans have been abandoned (*e.g.*, New Hampshire and Baltimore City) or replaced with other COLA designs. The abandonment of these designs often follows:

1. a realization that the gain sharing provision does have a cost,

2. the lack of, or insufficient amount of, any prior cost recognition in the plan funding or accounting expense,

3. a substantial increase in overall plan cost, or

4. a period of negative press targeting the benefits provided, including the gain sharing benefits.

The actuary has a limited role in the adoption or abandonment of gain sharing as actuaries are not fiduciaries or settlors. However, gain sharing benefits should never be considered as a free benefit (even if not prefunded). If gain sharing benefits are not prefunded, the actuary may want to suggest they be prefunded, in the interests of more appropriate funding and to help protect the rights of the current participants to the gain sharing benefits. However, the decision to prefund gain sharing benefits is the responsibility of the plan sponsor, or trustees, not the plan actuary. Proposed changes in the GASB Statements and ASOPs should help create the opportunity to make the case for prefunding.

Some plan features do not have the automatic permanency of core benefits. For example, many DROP benefits were not added as a permanent feature of a plan but rather with a sunset provision. In these situations the term cost approach previously discussed may be acceptable for funding. However, under a "substantive plan" rule a more conservative permanent (prefunding style) approach to measuring liabilities may be required.

IX. Is gain sharing simply a terrible idea that should be abandoned?

There are those who believe that gain sharing provisions were a terrible idea and should be abolished. However, we believe that all that is terrible is assuming that gain sharing benefits are "free" (i.e. have no cost) and not recognizing the cost (just as it would be wrong to give an executive a stock option and assume there is no cost to the corporation).

Is Design 1 any more expensive than simply providing a 3% COLA? Obviously, no. Gain sharing plans give the employer the opportunity to provide increases only when the pension fund's investment returns are better than expected. However, having a good year in the market and having a high funded ratio are not the same thing. Many groups have considered suspending gain sharing plans until funded ratios improve. However, this should not be an excuse to ignore the current value of the gain sharing design in terms of future increases when funding improves.

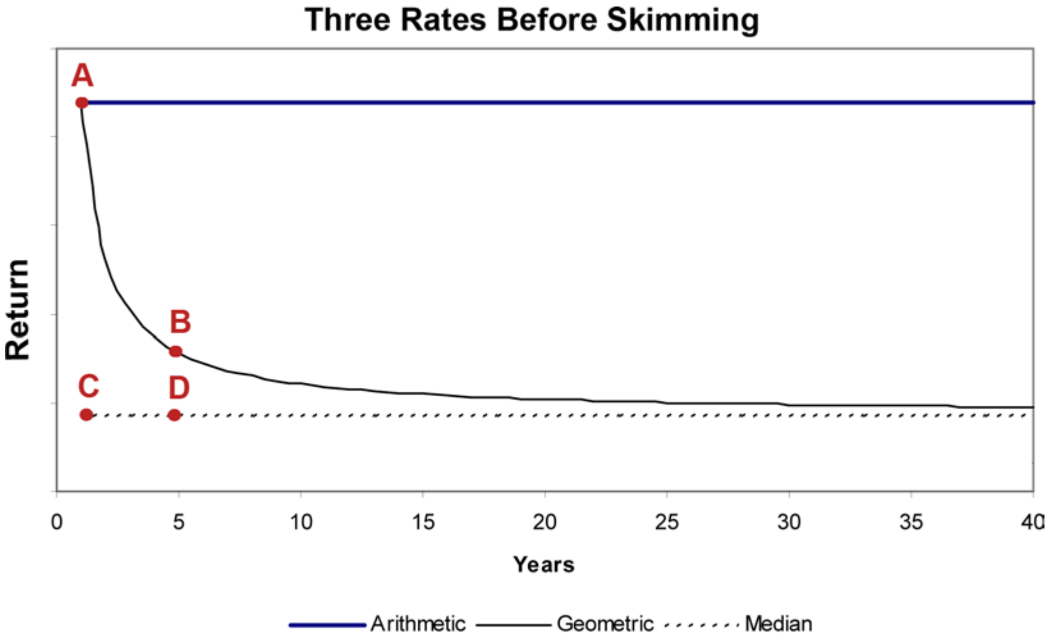
The perspective of the plan sponsor and plan participants will obviously differ. Where retirees are not in Social Security and have no other COLA source, the need and politics will likely be different and are beyond the scope of this paper.

X. Geometric vs. Arithmetic rates of return

Some models of future expected returns assume one-year investment return distributions that have a mean and a variance and are symmetric around the mean (mean equals median). However, most investment advisors assume that the mean and median are not the same. The accompanying model allows you to select either distribution, but we will focus on the non-symmetric log normal model (cell B5 = 1 on the Monte Carlo Trails page of the accompanying worksheet). We focus on the log normal distribution because virtually all investment advisors assume this distribution in their work.

Many actuaries use expected long term forward-looking median geometric returns as the basis for their discount rates. We will refer to the long term forward-looking median geometric return simply as the median return (which by definition will be achieved or exceeded 50% of the time). It will depend on the investment mix, expected returns by investment class, variations in return by investment class, and correlations of returns between investment classes but not the duration being considered under a log normal distribution. The median return is expected to generate gains since the mean (a.k.a. forward-looking arithmetic) return is higher even if the mean is only expected to be reached less than 50% of the time. When returns are distributed log normally, the median return approximates the arithmetic return minus half of the variance. Others have written papers on the topic of Arithmetic and Geometric returns. Our focus is on how they apply in the case of gain sharing design. To understand this, we need to define not two but three types of forward-looking returns: Arithmetic (mean) return, Average Geometric return (not to be confused with what we call the median return) and Median return (Cells AA6, AC6 and AE6 define what we mean by these terms). The following graph shows how (and if) these three values vary over time:

Chart 2



The mean Arithmetic (no gain or loss line) does not vary by time horizon. In the accompanying spreadsheet, cell B3 or B7 (point A above) ties into the Arithmetic rate and after five years (cell W7) is unchanged except due to the randomness of the Monte Carlo model.

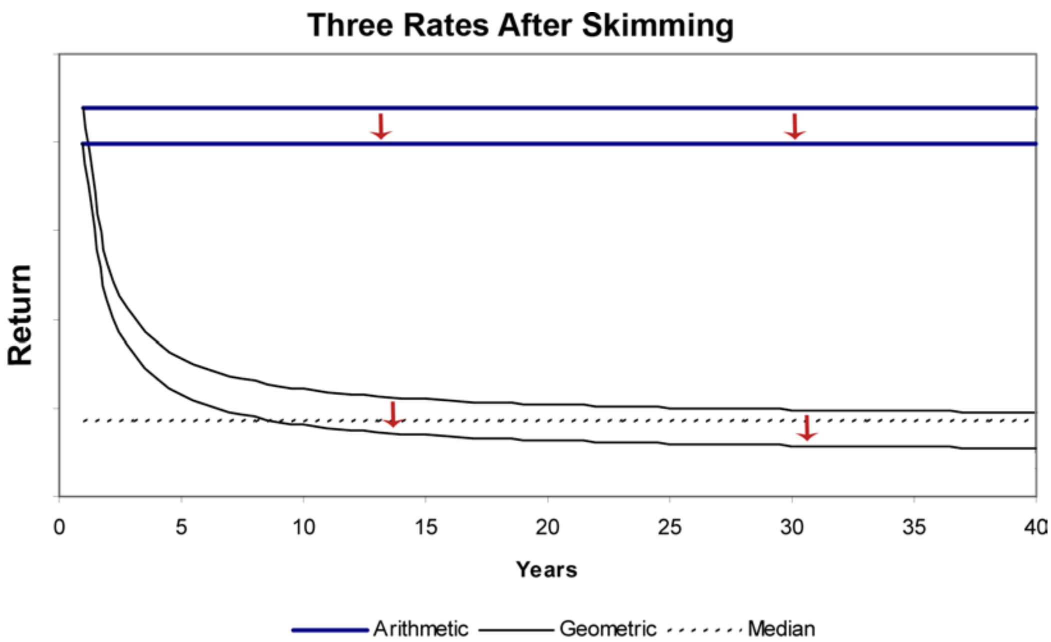
The Median line also does not vary by time horizon (this is only true with the log normal distribution and not the normal distribution). In the accompanying spreadsheet cell B12 represents point C and cell J12 (or Q12) represents point D (again subject to the randomness of the Monte Carlo model).

What is the “Geometric" line? It is the average of the annualized geometric rates and it does vary by time horizon. In the accompanying spreadsheet cell J7 contains the average forward-looking Geometric rate after five years (point B above) (subject to the randomness of the Monte Carlo model). Over time the line will converge to the Median rate which is why the terms Median and Geometric are often used interchangably even if they are different. There are formulas that connect the relationships of these three lines and create smooth results.

Most actuaries use the Median rate or the slightly higher average forward-looking Geometric average rate (usually determined looking out more than five years). The actual terms used for all three rates in different papers may differ but the math is basically the same.

How does a gain sharing plan impact the three types of returns? First, you need to understand the relationship of the gain sharing target to the distribution of returns. The target does not need to equal either the arithmetic or geometric return. However, the value of the gain sharing design will be somewhat higher if the target is tied to the geometric return than the arithmetic return (about 0.14% in the above example). If the gain sharing design is tied to the (five year) average forward-looking Geometric rate of return, what happens?

Chart 3



The net Mean (Arithmetic) rate drops (see cell N7). The Average Geometric rate drops (see cell L7). However, the Median rate after five years does not drop[15] (cell R12 is approximately zero). This is not a surprise since we picked the gain sharing target rate to be the Median gross return. Now the average Geometric rate may be below the Median rate. The point is that the "Median" is no longer a valid basis for an assumption unless we can find a way to value benefit increases and avoid using the net discount rate basis. The drop in the average Geometric Return after five years need not equal the drop in the forward-looking arithmetic return.

We would also point out that skimming off of returns also reduces the volatility of the net return we are generally trying to measure. This changes the shape of the net return distribution and the Geometric return.

[15] Our model is based on a gain sharing design tied to an average five year return. Point D in Chart 2 will be the same on Chart 3. However, the "median" values in later years will actually decline but require some definition as to what they represent. Actuaries need to think if they are mixing Median gross returns (expecting investment gains) and non-median based gain sharing cost (possibly no expected gain or loss).

We would also like to refer the reader to Appendix 3 of the January 2012 exposure draft of ASOP 27 which contains some additional educational material on arithmetic vs. geometric returns (independent of gain sharing issues).

XI. Modeling

We have included with our study an Excel spreadsheet which models Design 3 above. The model determines the amount skimmed off had the design existed in the past (back testing) and used a forward-looking stochastic model. The results of the two models are similar if the mean returns and standard deviations are similar. Samples of the output are shown in appendices 1 and 2.

Back testing:

Our backward testing model assumes investments are a combination of stocks and bonds (since historical returns for other asset classes are more complicated). We looked at years ending on June 30th since public plans are more likely to be measured over this period than on a calendar year basis. While the model allows different time periods to be considered, in this study we will focus on the period 1950 through 2010. We see the following results based on a 60/40 stock/bond mix and skimming off 50% of the return above 7.5%:

1. Arithmetic (mean) return = 9.98% (Cell E89 in Back Testing tab)

2. Geometric return = 9.37%

3. Standard Deviation = 11.74%

4. Average Skim rate =1.73%

The median skim rate is slightly lower. Since a return of 9.98% is high relative to current expectations, we also reran the model by reducing the return earned each year by 2% and received the following results:

1. Arithmetic (mean) return = 7.98%

2. Geometric return = 7.36%

3. Standard Deviation = 11.74%

4. Average Skim rate =1.18%

Not surprising, the skim rate reduction is less at lower rates of return (since we kept the target rate at 7.5%).

The model also shows results from 1980 to 2010. However, it should be noted that the average return for the individual years was 10.94% (cell E95) but the average of the five-year-averages was 11.30% (cell G95). Because of the spread between 10.94% and 11.30%, we used the 1950 – 2010 results when seeing how the forward model results (below) compared to the historical results.

Forward Testing (Monte Carlo):

The spreadsheet also contains a forward-looking model[16]. In place of historical returns and asset mixes, we assume (1) an expected arithmetic rate of return, (2) a standard deviation and (3) a log normal distribution of returns. The log normal distribution can be replaced with a normal distribution by changing the value in cell B5 from a 1 to a 2. If we assume the expected arithmetic rate of return and standard deviation match the 1950 - 2010 historical results, we get a 5 year gross median return of about 9.3% (cell J12 on the "Monte Carlo Trials" page of the Excel file) and a skim rate of about 1.6% (cell K7[17] on the "Monte Carlo Trials" page of the Excel file) (vs. 9.37% and 1.73% using back testing). Since this is a Monte Carlo model, the values of about 9.3% and 1.6% will vary[18].

Alternatively, if we assume the expected arithmetic rate of return is reduced by 2% (7.98%) and standard deviation matches the 1950 - 2010 historical results, we get a 5 year gross geometric return of about 7.45% and a skim rate of about 1.05%. The skim rate (and plan cost for gain sharing benefit) is lower (1.05% vs. 1.6%) but so is the net discount rate.

Columns P through U are similar to I through N except we change the target rate to match the five year average Geometric Return (cell Q7). These columns may be more important to the actuary.

Finally, column W is a calculation of the gross "no gain and loss" Arithmetic return. Its calculation varies from the average Geometric Return in the order in which you take values to the one-fifth return and average them. We show this to (1) illustrate how it approximates the input value in cell B3 and (2) allow us to calculate the arithmetic skim rate in cell X7.

XII. Real Life is messy

The following are some examples of real life issues.

Example 1: After many years of not valuing a gain sharing plan, the plan actuary recommends a cost be added to account for this benefit feature. The gain sharing design was similar to Design 3 above. The actuary recommends adding a load to the normal cost equal to a number of basis

[16] Cells B17-F2016 produce 2000 trails of annual returns. Columns I through N use these to create five year returns.

[17] Why use K7 vs. K12? The answer might be best understood by looking at R7 vs. R12. R7 is usually zero which would be a questionable result having to do with no change in the median. The real focus should be on deciding whether R7 (the Geometric skim) or X7 (the Arithmetic skim) is the appropriate factor for a given purpose.

[18] Cell B1 under the Monte Carlo Trials tab allows the user to use a fixed set of random trials or to allow the random numbers to change (by hitting F9 or making other changes). The fixed and variable random numbers are stored on the Random Generator sheet. Setting Cell B1 to 1 often is easier when editing the formulas.

points times the current asset value. This is the "term cost" approach described earlier. This is clearly an improvement over including no cost for the gain sharing feature. However, in this plan the participants historically pay a share of the normal cost, through employee contributions. Assume that the regular funding method is Entry Age Normal, the skim rate is 0.4% and employees pay 50% of the Normal Cost rate. The change would increase the employer and employee contributions by a total of 0.4% of assets (since assets are usually a multiple of payroll, the cost as a percentage of payroll is higher). Now consider this from the employees' perspective:

1. Under the Entry Age Normal funding method (EAN) employees were funding their share of the base benefit cost (although not responsible for gains and losses and not previously funding their gain sharing benefits).

2. The 0.4% gain sharing cost is on a term cost basis and so is not based on funding their future benefit but rather funding the benefit of current retirees. Employees might think this is not equitable if they understood that their contributions would be increased to pay for benefits for employees who had retired in the past. On the other hand, their accumulated additional contributions on this basis may, or may not, be sufficient to fund the gain sharing benefits they are anticipated to receive at retirement. (On a side note: If gain sharing funds are used for lump sum payments and not annuity increases, no funds are expected to be retained by the fund, eliminating the reward/risk of future gains and losses. However, in these types of programs, experience would generally differ from expected and treatment of these gains and losses should be considered. For instance, gains and losses could be included in employer contributions on the same basis as other experience gains and losses. Alternatively, a separate reserve could be set up to hold these gains and losses.)

3. Since 0.4% is a term cost, it is not prefunding under an EAN funding method (or even a PUC funding method). Participants could ask to see the EAN cost (which will have both a normal cost and actuarial liability component) but it is not clear the result would be any better in terms of impact on current employee contributions. However, it would no longer be dependent on just the size of current assets.

Leaving the employee perspective, we still have the issue of compliance with the revised GASB rules raised earlier if the benefit is to be funded or accounted for under EAN.

The employer will, of course, have their own perspective and any adjustments to the current contribution rates may be a matter for the collective bargaining process.

Example 2: After more than a decade of actuaries complaining about the gain sharing plan not being funded, the plan sponsor amended the plan to suspend the gain sharing until after the plan reached a 95% funded ratio. The higher funded ratio was not expected to be reached for about

20 years. The change is a reduction in benefits for current retirees, even if not reflected in the measurement of liabilities. Given the complexity of measuring the residual (delayed until the 95% funded ratio is achieved) gain sharing plan and its minimal value, the actuary does not place a cost on it. However, when will the cost of the gain sharing program become material and how difficult will it be to add an explicit assumption to reflect the gain sharing program's cost later?

Example 3: Generally gain sharing plans provide annuity increases or lump sum payments (*e.g.*, 13th checks) to retirees. However, sometimes the "excess" earnings are used to provide OPEB benefits or reductions in employer contributions. Both of these situations often involve reductions in employer contributions to the pension fund. In the case where OPEB benefits are provided through a 401(h) account, pension money cannot currently be transferred directly to the 401(h) account. To get around this limitation, part of the employer pension contributions are diverted to the 401(h) account and the excess funds are used to reduce the pension contribution. However, it needs to be realized that the excess funds are part of the corpus of the fund and not new contributions. We believe that these excess earnings should not be treated as contributions. They are in essence a one-year amortization of investment gains.

XIII. What issues surround the impact of changes in investment mix or expectations?

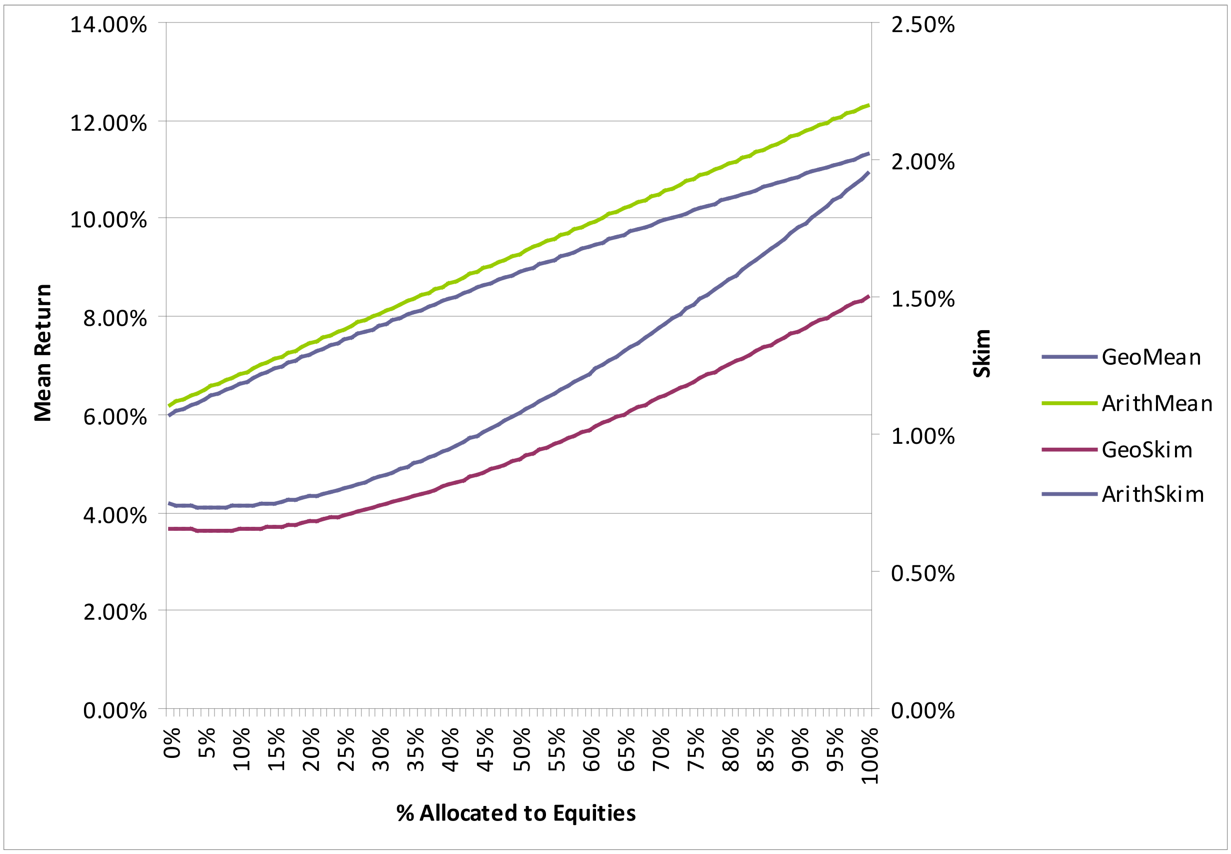
The value of a gain sharing benefit is clearly influenced by how the funds are invested. Not only is the expected return important but so is the volatility. Generally, the higher each of these two factors, the higher the value of the gain sharing benefit. These investment decisions are usually made by the Board of Trustees and not by the plan sponsor.

One question to ask is whether participants have any rights in how funds are invested. As this is a legal question, we will not try to answer it. However, we will point to an ERISA case (*Ruppert v. Alliant Energy Cash Balance Pension Plan,* 3:08-cv-00127-bbc, U.S. District Court for the Western District of Wisconsin). The plan benefit formula was a cash balance design with an interest crediting rate equal to the greater of 4% or 75% of the actual investment return. Interest credits were determined annually so that if the fund lost 10% in year 1 and made 10% in year 2, the credits were 4% and 7.5% respectively. During the period in question the investment mix was changed and the question was asked if the employees had an ERISA protected right to the return under the "better" investment choice (*i.e.*, the investment strategy most likely to provide a higher credit, not necessarily the one likely to result in the lowest overall cost or the most stable annual contributions). The judge in this case, ruled that changes in the investment strategy did not violate the reduction of the accrued benefit rules in IRC §411(d)(6).

As a practical matter, a plan sponsor might be able to influence the investment mix to minimize the value of the gain sharing feature but usually this is accomplished only by increasing the overall future cost of the plan. One possibility is that bonds could be valued on a book value basis to eliminate the impact of interest rate changes on bond prices. Modeling could be done to test specific investment alternatives. However, this could be taken as an additional reason to lower the investment risk associated with the plan.

Under the "substantive plan" concept, we might assume that the future investments will look like the current investment targets.

We would also like to give Graham Schmidt credit for taking our original spreadsheet and modeling the impact of investment mix on various key values. The following shows how these key values vary as the equity mix gradually increases from 0% to 100% in 5% increments.



XIV. What do the ASOPs require?

Starting in 2007, Section 3.9 of ASOP No. 4 states (we identified key points in bold):

> 3.9 Interrelationship Among Procedures, Assumptions, and Plan Provisions— **Some plan provisions** may create pension obligations that **are difficult to measure** using deterministic procedures and assumptions selected in accordance with ASOP Nos. 27 and 35. In such circumstances, **the actuary may consider using** alternative procedures, such as **stochastic modeling** or option-pricing techniques, or alternative assumptions that include adjustments to reflect the plan provisions that were not explicitly valued.
>
> **If, in the actuary's professional judgment, such plan provisions are significant and have not been reflected in the measurement, the actuary should so disclose in accordance with Section 4.1(d).**
>
> An example of such a plan provision is one that provides future benefits based on the actual experience of the plan that will vary asymmetrically relative to the estimated projected benefits based on a particular set of actuarial assumptions, such as the following:
>
> a. **the use of favorable investment returns to provide cost-of-living increases automatically to retirees**; or
>
> 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...

Section 4.1(d) requires: "an outline or summary of the benefits included in the actuarial valuation and of **any significant benefits not included in the actuarial valuation**".

Actuaries need to be sure they are in compliance with these standards.

An exposure draft containing changes to ASOP No. 4 was released in January 2012. What was Section 3.9 is now Section 3.5.3 of the exposure draft and the wording has been expanded. The words "gain sharing" are now used. Section 4.1(d) now says the following in the exposure draft: "an outline or summary of the benefits included in the actuarial valuation and of any significant benefits not included in the actuarial valuation, **along with the rationale for not including such significant plan provisions**". This may be the opportunity for actuaries to change their practice.

XV. What does GASB require?

In July 2011 GASB issued an exposure draft of amendments to GASB Statement Nos. 25 and 27. Relevant Sections include paragraphs 20 and (from Appendix B) 166 from the GASB 27 exposure draft. The key parts of paragraphs 20 and 166 are (highlights are added):

> 20. Projected benefit payments should include all pensions to be provided to employees in accordance with (a) the benefit terms and (b) any additional legal agreement(s) to provide pensions that are in force at the actuarial valuation date. Projected benefit payments should include the effects of automatic cost-of-living adjustments (COLAs) and **other automatic postemployment benefit changes**...
>
> 166. Automatic COLAs and other automatic postemployment benefit increases, such as automatic supplemental payments (for example, **"thirteenth checks" and automatic gain-sharing features**), are explicitly part of the terms of the pension plan and, therefore, constitute part of the employment exchange each period. Because automatic COLAs and similar postemployment benefit increases are part of the employment exchange, the Board believes that they are an integral part of an employer's present obligation to its employees to provide pensions. Therefore, the effects of such automatic benefit changes should be included in the projection of benefit payments for accounting and financial reporting purposes.

Paragraph 166 leaves little reason to believe that automatic gain sharing features can be excluded in the future. We also mention that paragraphs 167 and 168 deal with ad hoc COLAs that may or may not need to be included and may provide some guidance as to the criteria for determining whether a gain sharing feature is automatic. Paragraph 167 indicates that "ad hoc COLAs and other **ad hoc postemployment benefit changes** are discretionary in the sense that each occurrence requires a decision by a responsible authority. Accordingly the GASB generally believes that future ad hoc COLAs and similar postemployment benefit changes are not part of the plan terms under which employees exchange their benefits for services …". Paragraph 168 indicates that in order for ad hoc COLAs to be included "the actions of the employer need to create a level of expectation or understanding among the employees such that future ad hoc COLAs are an assumed part of the benefit terms to the degree that the employer has little or no discretion to avoid the sacrifice of resources associated with the COLAs that are attributed to past periods of service."

Paragraph 26 of the proposed amendments to GASB No. 27 requires the use of the entry age normal actuarial cost method and the service costs of all pensions should be attributed through all assumed exit ages, through retirement. This would seem to rule out the use of a separate method (*e.g.*, term cost) for valuing gain sharing benefits. A literal reading might also make you question if we can <u>reduce the discount rate or must project benefit increases. We suggest that the actuary disclose the method used and focus on materiality and cost effectiveness of the method chosen (with some preference toward projecting benefit increases if either method is equivalent from these perspectives).</u>

<u>XVI. Generational design considerations?</u>

One must ask that if the gain sharing plan is not reflected in the determination of the annual pension cost, will it survive? (The same question can, and has been, asked of OPEB plans.) Generally public sector plans are funded primarily to create a level cost pattern and less for solvency purposes. However, even in the public sector, a material pension benefit that is not prefunded may become a topic for elimination or reduction discussions just as OPEB benefits have become. Retirees may have more of a contractual claim than employees to gain sharing benefits. Poor funding puts current employees and future employees more at risk of losing gain sharing benefits than current retirees.

Appendix 1: Calculation of net and gross rates based on historical returns (Back testing)

The following are results based on a 60/40 stock/bond mix. They are based on Design 3 (skimming off 50% of the return in excess of 7.5%)

		S&P 500	Lehman Bros/Barclays	Blended	Five year Average	50% of excess above 7.5%	Return net of skim	Annual less Skim Blended
Since 1950	mean	12.47%	6.24%	9.98%	9.98%	1.73%	8.25%	8.25%
	geometric	11.09%	5.99%	9.37%	9.86%	1.71%	8.20%	*7.71%*
	stdev	17.49%	7.55%	11.74%	5.28%	2.10%	3.34%	10.91%
			$StDev^2/2$	0.69%	0.14%	0.02%	0.06%	0.59%
Since 1980	mean	10.90%	8.38%	9.89%	10.39%	2.04%	8.36%	7.85%
	geometric	9.51%	8.14%	9.25%	10.24%	2.01%	8.29%	*7.32%*
	stdev	17.64%	7.37%	12.17%	5.97%	2.35%	3.75%	11.05%
			$StDev^2/2$	0.74%	0.18%	0.03%	0.07%	0.61%

Appendix 2: Calculation of net and gross rates based on stochastic modeling of future returns

Random or Fixed Fixed

Key Inputs

Mean	**9.98%**
Std Dev	**11.74%**
Distribution Type	1

1 = Log Normal, 2 = Normal

Log Normal factors:	
mu	8.94%
sigma	10.65%

9.37% 1.65%

Threshold tied to 7.5%

	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Compounded Five Year**	**Skim tied to mean**	**Net**
Calc Mean	9.59%	9.83%	10.51%	9.81%	9.82%	9.42%	1.56%	7.86%
Calc Std Dev	11.66%	11.72%	11.85%	11.37%	11.44%	11.40%	4.08%	
Percentile								
10	24.64%	24.73%	25.77%	24.74%	24.90%	15.97%	4.23%	
25	16.87%	17.54%	17.93%	16.95%	17.19%	12.86%	2.68%	
50	9.07%	9.37%	9.75%	8.94%	9.42%	9.25%	0.87%	
75	1.73%	1.62%	2.28%	2.09%	1.84%	5.91%	0.00%	
90	-5.27%	-5.15%	-3.71%	-4.05%	-4.61%	3.04%	0.00%	

Appendix 3: Thoughts on Chart 1

The graph is idealized. Even though this graph was introduced in the Design 2 discussion, it is more likely to look like a Design 3 distribution graph. A Design 2 graph based on annual returns (not a multi-year average) is likely to be flatter and more bell shaped.

You might think of it as the distribution of returns over a five year period of time and assume that the gain sharing plan is likewise based on a five year average return. The height of the line represents the probability of return. Assume the area under the curve equals 1.000. It might be interesting to plot the probability times the returns (negative and positive) since the area under those curves would equal the returns (gross and net of skim). The design used is basically Design 3 where half of the return above the geometric return is used for the gain sharing benefit increase. The shaded area represents that portion of the return (times its probability of being achieved) skimmed off. Below the target rate there is nothing skimmed off. If the return is only one basis point above the target rate only half of a basis point is skimmed off (not half of the total return). Ultimately, the skim line (skimming off the probability in this case) asymptotically approaches one-half of the probability.

It is important that this distribution time period tie into the gain sharing time period.

Bibliography:

Dimitry Mindlin, ASA. MAAA, PhD. (2011, September). Present Values, Investment Returns and Discount Rates.

Brian McCulloch. (2003, December). Geometric Return and Portfolio Analysis. New Zealand.

Also see (1) ASOP4 and (2) the January 2012 Exposure Drafts of ASOP 4 (Sections 3.5.3 and 4.1(d)) and ASOP 27 Appendix 3. Appendix 3 would not be an official part of the actual Actuarial Standards of Practice even if the Exposure Draft is adopted.

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