Rather than focusing on which actuarial discount rate to use to gauge pension plan liabilities and needed contribution levels, the authors argue that plan trustees will arrive at the appropriate funding and investment strategies when they know how much risk the plan can take.

A BETTER ANSWER TO THE ACTUARIAL DISCOUNT RATE DEBATE

by | **Gene Kalwarski and Bill Hallmark**

In the midst of today's pension plan crises, accusations are flying in all directions over who is responsible: greedy plan participants, inept actuaries, litigious attorneys, frugal plan sponsors unwilling to pay up, investment industry shenanigans, ineffective regulatory guidelines or provisions, sensationalism in press reporting, misleading studies, etc. Depending on the pension plan in trouble, the answer could be any of the above.

Regardless of who is to blame, one school of thought, called *financial economics*, suggests these crises could have been largely mitigated, if not avoided, with one simple change: mandated use of a "risk-free" discount rate to disclose pension plan liabilities, as opposed to using the expected rate of return on investments.

A *risk-free discount rate* means a very low rate, like Treasury yields, which would greatly increase the plan's liabilities (and in many cases lead to increased contributions). This contrasts with the expected rate of return on assets, which generally reflects the pension portfolio's investment in equities that, while of course not "risk-free," are expected to deliver superior investment returns over time. Traditional actuarial proponents argue that this allows the use of a much higher discount rate, greatly reducing the size of the reported liabilities and the resulting contribution levels.

This article offers an alternative answer to that debate, which has been raging in the actuarial profession for more than a decade. The authors suggest that both opinions have serious flaws. The financial economists believe pensions must be measured as "risk-free," but pension plan trustees want to take investment risk in order to reduce the expected cost of the plan. The traditional actuaries who use only the expected earnings rate see no need to change. Yet clearly, if the two black swan markets of the last decade have taught us anything, it's that pension plans were taking far too much risk.

To focus on any single measurement of pension liabilities (traditional or financial economics) misses the range of potential future outcomes for a pension plan. Instead, trustees for any plan (single employer, multiemployer or public sector) should decide how much risk, if any, they are willing and can afford to take. Based on that risk appetite, the appropriate funding and investment strategies will emerge.
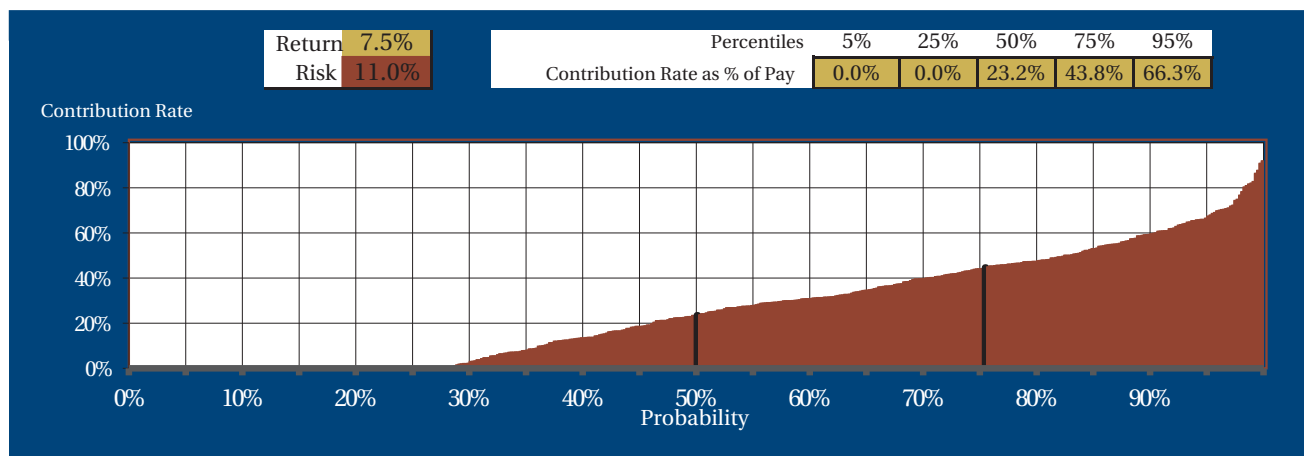
Inadequacy of Single-Point-in-Time Measurements

Actuarial valuations produce measurements as of a single point in time and are based on the expectation that every assumption will be exactly met over the next 75-plus years. However, we can state with 100% certainty that none of the assumptions will be exactly realized over that time frame. So, whether that valuation is based on a "risk-free" discount rate or an expected rate of return, how much reliance should be placed on that one valuation?

Pension plans are long-term commitments. The measurements today affect current budgets, but are not the right basis for the long-term policy decisions required to manage the pension plan. Instead, trustees need to examine and stress test projections of future measurements of the pension plan under a variety of conditions. Policies can then be crafted to minimize future costs without taking unaffordable or unacceptable risks.

FIGURE 1

Example of Monte Carlo Output

	Return	7.5%		Percentiles	5%	25%	50%	75%	95%
	Risk	11.0%		Contribution Rate as % of Pay	0.0%	0.0%	23.2%	43.8%	66.3%

Contribution Rate

[Graph: X-axis labeled "Probability" from 0% to 90%; Y-axis labeled with Contribution Rate from 0% to 100%. Curve rises from near 0% staying low until about 30% probability, then increasing steadily to nearly 100% at the right.]

Defining Risk Appetite

The risk appetite for any plan sponsor or trustee is likely to vary significantly from plan to plan based on the plan's size, maturity level, current funded status, plan sponsor financial health, membership expectations and other factors. But in all cases, the ultimate risk to any defined benefit pension plan is the inability to pay promised benefits without having to increase contributions to unsustainable levels. If that risk is realized, benefits may be cut. Or worse yet, the plan may be terminated.

In addition to the absolute level of contributions, significant and volatile changes in contribution levels from year to year are usually painful, particularly if increases in contribution amounts occur when revenue sources are scarce.

How Much Can Contributions Be Increased?

The first step in defining the trustees' risk appetite is to assess both the level at which contributions would be considered unsustainable and the max-

imum annual increase in contributions that employers could afford.

In making this assessment, trustees need to examine actuarial projections of the plan based on Monte Carlo (i.e., stochastic) forecasts as opposed to the deterministic projections trustees are typically exposed to (and upon which policy decisions are usually based). A *deterministic projection* is a single projection based on one set of assumptions, including one investment earnings scenario. Monte Carlo forecasts represent hundreds or thousands of projections, usually based on varying investment returns reflecting the expected earnings and standard deviation of the existing pool of assets. (S*tandard deviation* measures how much variation there could be from the expected earnings.) The end result of a Monte Carlo forecast can be a range of probabilities and percentiles that enable a trustee to examine the likelihood of the plan having to make contributions at various levels. Figure 1 shows one example of a Monte Carlo output.

Based on an expected return of 7.5% and a standard deviation of 11.0% (i.e., there is a one in three chance that the returns could be greater than 11% above 7.5% or less than 11% below 7.5%), both the table on the upper right in Figure 1 and the graph below it indicate the likelihood of contribution rates being at different levels for this plan.

The table, for example, indicates that the expected or median (50th percentile) contribution rate is 23.2% of payroll, but that there is a 50% chance that the rate could be between 0% (25th percentile) and 43.8% (75th percentile). The graph may be more informative as it shows all the results from the Monte Carlo forecast. It indicates there is nearly a 30% chance that there are no contributions, and just under 75% of the time contributions are less than 40%.

Let's assume that this plan's trustees assessed their unsustainable contribution level at 40% of payroll. This analysis means there is more than a one in four chance that contributions will exceed that level.

So, the second step in defining a risk appetite is to determine what likelihood of exceeding unsustainable contributions the trustees are willing to accept. For example, if the trustees want to be 99% "sure" that contribution levels will not exceed 40% of pay in this case, what options do they have?

There are essentially three policies available to reduce this risk:

- Increase contributions in the short run
- Modify the asset allocation and lower the risk (standard deviation) of the investment portfolio; and/or
- Reduce benefits.

One way to directly increase contributions in the short run is to simply lower the discount rate used to calculate contributions (but not change the investments). While this would increase contributions in the short run, over time it is likely there will be more investment gains than investment losses and contribution rates will decline. More importantly, however, the probability of exceeding the maximum sustainable contribution threshold will be reduced.

Reducing the amount of risk inherent in the investment policy may also result in the use of a lower discount rate and greater contributions in the short term. However, the emphasis of this strategy is to reduce the swings in contribution rates caused by investment returns, thereby reducing the probability of exceeding the maximum sustainable contribution threshold.

Finally, the level of benefits promised affects both the amount of assets that need to be accumulated and the margin between the maximum sustainable contribution level and the cost of the benefits employees accrue each year (the *normal cost*). Increasing this margin also reduces the probability of exceeding the maximum threshold.

Risk Measures

In addition to the Monte Carlo analysis described above, there are some key metrics that indicate the ability of a plan to tolerate risk. These metrics are simple and useful for understanding why a specific plan may have a greater or lesser appetite for risk than another plan.

Expected Long-Term Cost of Benefits—Normal Cost as a Percentage of Payroll or in Dollars per Hour Worked

The basis for the trustees' appetite for risk is the level at which contributions become unsustainable. The first component of the maximum sustainable level of contributions is the expected long-term cost of the benefits promised, which is measured by the normal cost.

For example, if the maximum sustainable level of contributions is 30% of payroll (or $6 per hour worked), and the normal cost is 10% of payroll (or $2 per hour), there is a margin of 20% of payroll (or $4 per hour) available to pay for the risks taken.

In this example, the plan can afford to have its current contribution triple (200% increase) before it reaches the unsustainable level. Compare this to a plan where the maximum sustainable contribution level was 15% of payroll (or $3 per hour). In this case, contributions could increase by only 50%, meaning the plan should not take on as much investment risk as the first plan.

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Gene Kalwarski is CEO and principal consulting actuary for Cheiron. For over 30 years, he has been an actuary to multibillion-dollar jointly trusteed pension and health and welfare funds in the Taft-Hartley and public sector arenas. Before forming Cheiron in 2002, he spent 21 years with Milliman as the managing partner of its Washington, D.C. office and five years as a chief policy actuary at the Pension Benefit Guaranty Corporation. Kalwarski graduated from St. Bonaventure University and is a fellow of the Society of Actuaries, a member of the American Academy of Actuaries and an enrolled actuary under ERISA.

Bill Hallmark is a consulting actuary with Cheiron. He joined the firm in 2009, opening Cheiron's Portland, Oregon office. Hallmark has over 25 years of experience providing actuarial consulting services for all types of retirement programs and currently serves as actuary for large, multibillion-dollar public pension funds. He is chair of the Public Plans Subcommittee of the American Academy of Actuaries Pension Practice Council and has written articles on pension plan design and investment risk in governmental pension plans for the Society of Actuaries.

FIGURE 2

Allocation of Maximum Sustainable Contribution

Legend:
- Available for Future Consequences of Risk
- Debt Transfer Payment
- Normal Cost
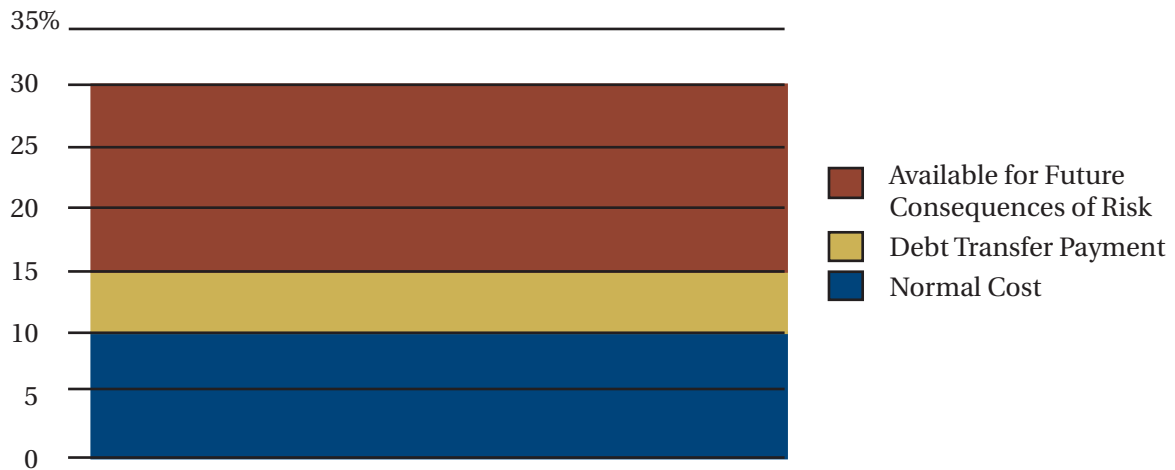
Debt Transfer—Unfunded Liability as a Percentage of Payroll or in Dollars per Hour Worked

The *unfunded liability* of a pension plan is a measure of how far behind a plan is from the assets it should have accumulated to date. It represents the amount that should have been paid in prior years that will now be charged to future years. The unfunded liability is almost always amortized over some future period, and it must be paid in addition to the cost of ongoing benefit accruals (i.e., normal cost). This means it consumes another portion of the maximum level of sustainable contributions established by the trustees.

Figure 2 illustrates one example of how these two measures may be used to assess the amount of risk the plan can afford. The maximum sustainable contribution (30% of pay or $6 per hour in this example) is allocated between the normal cost (10% of pay or $2 per hour in the example), the current payment on the unfunded liability (5% of pay or $1 per hour in the example), and the remaining amount available until the plan reaches its maximum sustainable contribution level (i.e., what margin is left to cover the future consequences of downside risk). Essentially, the plan in this example has 15% of pay or $3 per hour as a budget for future risk.

Affordability of Investment Risk— Assets Divided by Payroll

It stands to reason that the larger a plan is (measured by assets), the more that plan has to lose in a down market. So for example, if two plans each experience a 15% investment loss, and Plan A had $100 million in assets and Plan B had $60 million, Plan A would lose $15 million and Plan B would lose only $9 million.

Furthermore, if two plans (Plan A and Plan C) have the same amount of assets, but Plan A has payroll of $10 million and Plan C has payroll of $5 million, Plan C would be at greater risk of exceeding its maximum sustainable contribution rate. For a given investment loss that must ultimately be made up (i.e., amortized), the plan with the larger payroll can spread the annual cost to amortize that loss over a larger base.

Continuing with the example, assume both Plan A and Plan C experienced a 15% loss on $100 million or $15 million. Further, assume that $15 million investment loss must be made up over 15 years. Assuming no interest for this example, both plans must pay $1 million per year. But $1 million per year represents a contribution that is 10% of payroll ($1 million annual cost divided by $10 million payroll = 10%) for Plan A while it represents a contribution that is 20% of payroll ($1 million annual cost divided by $5 million payroll = 20%) for Plan B.

So, the higher a plan's assets-to-payroll ratio is, the more at risk the plan is of exceeding its maximum sustainable contribution rate. This ratio increases as assets grow (because the plan has more to lose) and as payroll declines (because there is a smaller base to make up or amortize any asset loss).

Funding Progression—Contributions Divided by Normal Cost Plus Interest on Unfunded Liability

To assess how well the plan is progressing toward its budgeted funding target based on its contribution strategy, the *funding progression measure* compares the actual contributions to the normal cost plus interest on the unfunded liability.

All else being equal, contributions to a plan must be at least equal to the normal cost plus interest on the unfunded liability, in order to keep the unfunded liability from increasing. Therefore, if this measure is less than 100% and the plan has an unfunded liability, the plan will either have to increase future contributions to pay off the unfunded liability, reduce benefits or hope for future investment gains to reduce the unfunded liability.

If such a plan is consistently under 100% using this measure, there is a risk that the contributions needed to cover the normal cost plus interest on the unfunded liability will exceed the sponsor's maximum sustainable contribution. That will cause the unfunded liability to continue to increase at an ever-increasing rate, and the plan may spiral into insolvency.

However, for a plan in surplus, a ratio of 100% or more indicates the plan is maintaining its surplus for future consequences of risk or for future benefit improvements.

Liquidity Risk—Assets Divided by Benefit Payments

If the funding level of a plan becomes too depleted, the requirement to make benefit payments can impact the ability to achieve the expected investment returns. A significant infusion of cash may be required to avoid insolvency. This liquidity risk index indicates the number of years that benefit payments (at the current level) can be made with current assets without any investment earnings or contributions.

Conclusion

The ongoing debate over what discount rate should be used to determine a plan's financial condition—risk-free rate or traditional expected earnings rate—can be viewed as the two opposite ends of the spectrum of measures used to assess a plan's financial condition. However, no single measurement of a plan's liabilities, at any discount rate, sufficiently represents a plan's financial condition. Plan trustees need first to assess their risk appetites. Only when they have done so can sound and effective funding and investment strategies emerge.

As actuaries, the pragmatic approach we propose is to increase the transparency of risk, focus on better pension plan risk measures, and revamp the traditional actuarial and investment models of reporting and analyses. By using the key risk measures described here, trustees will become more aware of the risks and potential consequences of those risks to their plans.

A focus on projections under a variety of scenarios (or *stochastic projections*) will enable trustees to establish realistic risk budgets and adopt policies to manage the pension plan's risks within those budgets. **◑**

takeaways >>

- Pension plans have been taking too much risk.
- Single-point-in-time measurements (traditional or financial economics) inadequately define risk.
- By stress testing projections of future measurements of a pension plan under a variety of conditions, trustees can develop policies to minimize future costs without taking unaffordable or unacceptable risks.
- The risk appetite for a plan sponsor or trustee will vary according to the plan's size, maturity level, current funded status, plan sponsor financial health and membership expectations.