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Quantifying Defined Benefit Retirement Plan Risk

You Can't Manage What You Don't Measure

The last issue of Segal Consulting's *Ideas*, "[Identifying Retirement Plan Risk](#)," described how various risk factors could affect retirement plans. Understanding those risks is the first step to being able to measure them, toward the goal of effectively managing plan risk to achieve the retirement plans' goals. This *Ideas* discusses how those risks can be analyzed and quantified.

When considering defined benefit (DB) retirement plan risks, it can be helpful to think about them as falling into three categories:

- ***Risks that Are Easier to Foresee with Outcomes that Can Be Measured***
Lower- or higher-than-projected investment returns have a direct impact on a retirement plan's funding, and there are tools that can measure investment volatility. Another example is employment risk because a change in the number of active participants covered under a plan or changes in the units of work on which contributions are made (e.g., hours) will have an impact on contributions and plan costs. For these types of risks, the amount of plan funding expected from contributions and investment income sources in the future can be varied to see how the variations change the plan's funding benchmarks.
- ***Risks that Are Harder to Evaluate, but Have Measurable Outcomes***
Whether a given employer will withdraw from a plan can be difficult to predict, but assuming that an employer withdraws, the impact of that withdrawal on the plan's projected funded status can be measured. Changing benefit eligibility provisions can alter participants' behavior in unanticipated ways, but once the change has been in effect for a few years, the experience of the plan can be reviewed, and the impact on the plan's liabilities can be more accurately measured. Understanding how these types of risks will change the plan's financial status before the event happens can be difficult. However, after the event does occur, the way in which it changed the plan's funding benchmarks can be better quantified.

- **Risks and Outcomes that Cannot Be Foreseen** Such risks include changes in laws and regulations, which can have unexpected consequences. For example, the Multiemployer Pension Reform Act (MPRA) allows plans going insolvent to apply to suspend benefits and/or partition the plan, provided certain criteria are met. Until MPRA was enacted in December 2014, those approaches were simply not available. Today, while the statute is clear, it is difficult to assess whether the regulatory agencies will approve such applications. Also, changes in accounting rules can affect employers' views of the value of participating in a retirement plan. For example, a change in accounting rules might require employers to report more or less liability on their books, making the employer more or less willing to remain in the retirement plan.

This *Ideas*, the second in a series, focuses on how to quantify measurable risks and outcomes. Subsequent pieces in the series will identify risk-management strategies (including plan design alternatives) and outline the major components of running a well-managed plan.

Approaches to Quantifying Risk

This section describes the two primary approaches to quantifying risk: deterministic projections and stochastic projections. There are other methods that can be used to quantify risks for pension plans; however, deterministic and stochastic projections provide the most effective and efficient method for displaying how the various risk factors affect the two major funding metrics, the credit balance in the Funding Standard Account and the Funded Percentage, for multiemployer pension plans.

Deterministic Projections Help Trustees Understand Possible Outcomes and Options

Deterministic projections are based on the hypothesis that a particular event will occur — such as that plan assets will return 7.5 percent next year, and perhaps the same in every year thereafter. Or, the returns could be set assuming lower near-term returns, followed by higher returns based on expectations that the investment environment will change. Therefore, each variable in the projection, like expected investment return or the inflation rate on administrative expenses, is predetermined for each future year.

Individual variables within the deterministic projections can be changed to measure how the change could affect financial results like plan solvency, funded ratios, withdrawal liability, minimum funding requirements under the Employee Retirement Income Security Act (ERISA) and zone status under the Pension Protection Act of 2006 (PPA'06). Deterministic projections are invaluable for exploring multiple “what if” scenarios, varying such inputs as employment levels, investment returns, contribution rates and benefit levels.

A typical conclusion based on deterministic projections might be, assuming that the investments earn the projected rate of return each year in the future, that the plan will continue to be certified in “the green zone.” This type of projection is valuable for sensitivity testing of how varying inputs may affect where the plan is headed.

However, while this method accurately illustrates the impact of a particular outcome (*i.e.*, the plan's exposure to that event occurring), it gives very little indication of the *likelihood* of that event occurring. That is where stochastic projections can be helpful.

Trustees Can Be in Control of Deterministic Projections

Segal Pulse®, an enhanced version of our Forecast tool, puts deterministic projections in trustees' hands.

Featuring an easy-to-use interface, the tool allows trustees to make real-time projections — including a review of funding issues — to increase their understanding of the direction their plans are heading and to learn what factors could change that direction.

Quantifying Risk through Stochastic Projections to Help with Planning

Stochastic projections aggregate thousands of deterministic projections to provide a range of results that can be used to determine likelihood or probability outcomes within a specified range. For example, using stochastic projections, one can determine, for a specific investment portfolio and set of capital market assumptions, what the probability of remaining in the green zone will be for each of the next 10 years.

Stochastic projections can also quantify the likely effects of plan design changes under consideration. By assessing the future impact of proposed benefit changes, stochastic projections can help identify which course of action is most consistent with the trustees' resources, strategies, and objectives for managing the plan. In particular, stochastic projections can show how plan design changes affect the investment or contribution risk to the plan. For example, two designs could appear to provide the same results when using deterministic projections. However, a stochastic projection could show that one design over another has a better probability of improving the funding status.

Which Approach to Use Depends on What Question You Want to Answer

The accompanying chart lists six concerns shared by many boards of trustees and notes related questions that deterministic and stochastic projections can answer.

Common Concerns and Key Questions Projections Can Answer

Issue	Questions Deterministic Projections Can Answer	Questions Stochastic Projections Can Answer
Funding Requirements	How would five years of 5 percent returns affect our plan's projected funding percentage?	Based on the plan's current asset allocation, what is the probability of the funding percentage increasing over the next 10 years?
Zone Status	What investment return this year will put our plan in the red zone next year?	How likely is our plan to enter the yellow or red zone in the next 10 years?
Rehabilitation Plans and Funding Improvement Plans	Is the plan on track to meet our Rehabilitation Plan benchmarks if everything turns out exactly as assumed?	What is the probability our Rehabilitation Plan will meet its funding benchmarks over the next 10 years?
Plan Solvency	Is our plan projected to become insolvent and, if so, by when?	What is the likelihood our plan will become insolvent in the next 10 years?
Withdrawal Liability	What investment returns would we need next year to eliminate unfunded vested benefits for withdrawal liability?	What is the probability that unfunded vested benefits for withdrawal liability will be eliminated within the next 10 years?
Plan Design Changes	If the benefit accrual rate is lowered, or the contribution rate is increased, will the plan be "green" in the next 5 years?	What level must the benefit accrual or contribution rate be, in order for the plan to become "green" within 5 years, with an 80 percent probability?

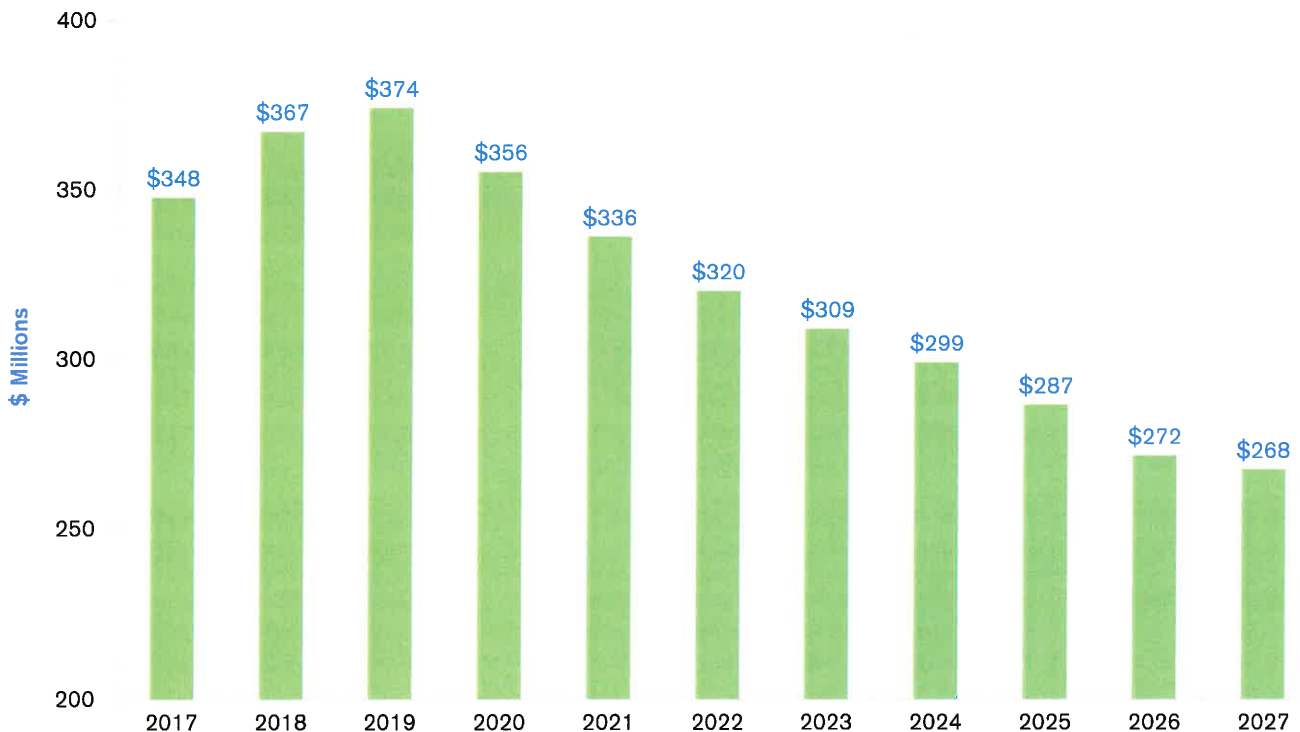
Source: Segal Consulting, 2017



Comparing Sample Deterministic and Stochastic Projections

Graph 1, which is based on an actual plan's actuarial valuation assumptions, shows a deterministic projection of the plan's credit balance in the Funding Standard Account. The credit balance is expected to erode very slowly, and range between \$266 million and \$374 million over the next 10 years and, as a consequence, remain in the green zone (hence the green color of the graph bars).

Graph 1: Projected Year-End Credit Balance for Plan Years Beginning January 1

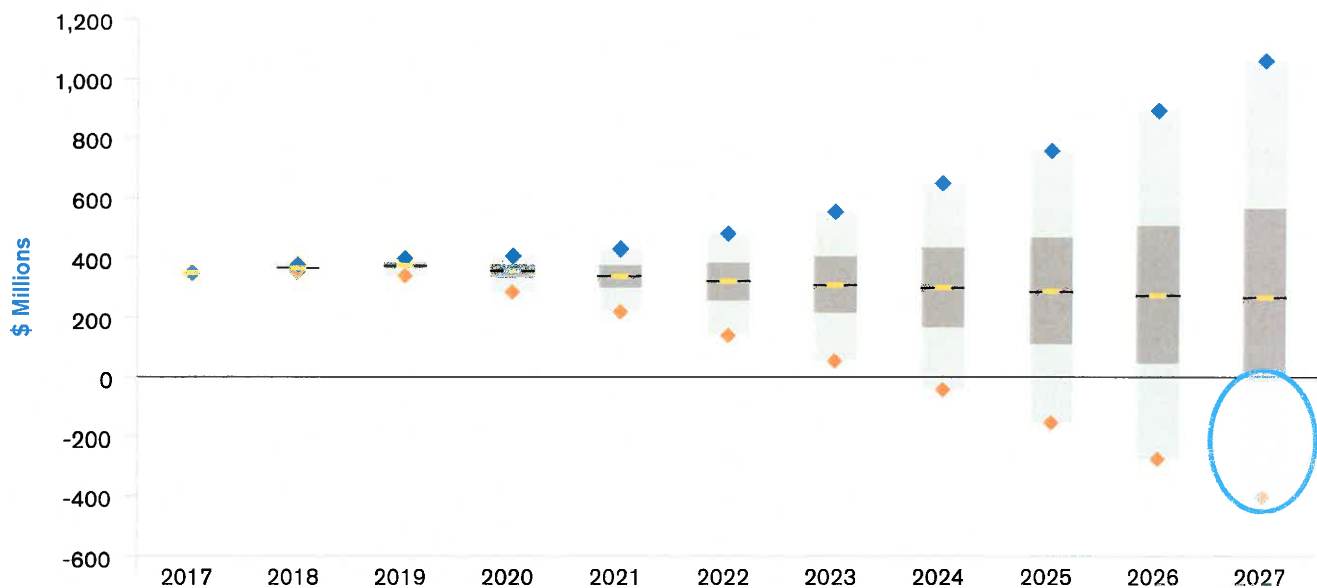


Source: Segal Consulting, 2017



Graph 2 shows a stochastic projection of the same plan's credit balance in the Funding Standard Account. The blue diamond represents the 95th percentile, which means only 5 percent of the time better results are expected to occur. The orange diamond represents the 5th percentile, which means 5 percent of the time worse results are expected to occur. The yellow bar represents the 50th percentile where half the results are expected to be better and half are expected to be worse. The dark grey boxes represent the 25th to 75th percentile where half the results will occur. Graph 2 shows the plan has a 25 percent probability of a funding deficiency occurring by the end of the 2027 plan year, which is an outcome not shown with the deterministic projection shown in Graph 1.

Graph 2: Projected Year-End Credit Balance for Plan Years Beginning January 1

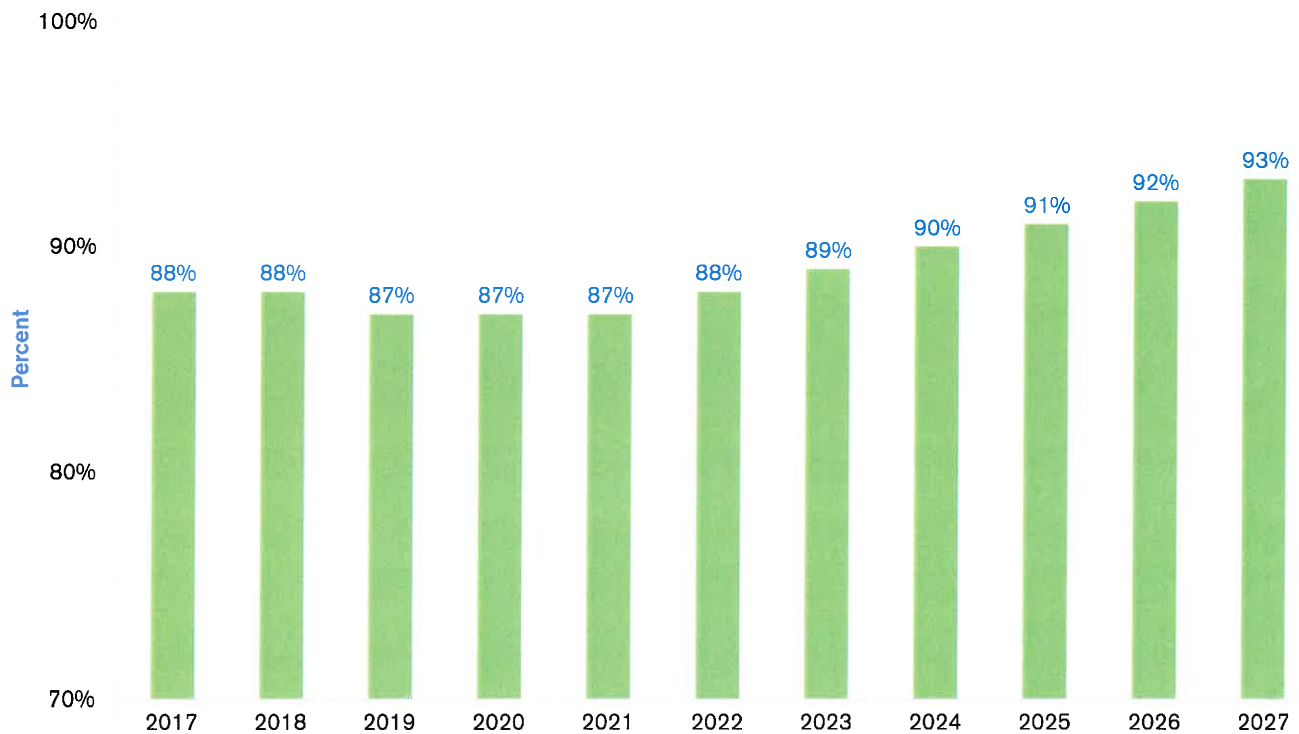


Source: Segal Consulting, 2017



A deterministic projection of the plan's Pension Protection Act of 2006 (PPA'06) funded percentage, which like Graph 1 is based on the plan's actuarial valuation assumptions, is shown in Graph 3. The graph indicates the plan's funded percentage is stable, decreasing in the short term, but increasing over the long term and it is expected to stay above 85 percent. Consequently, the plan is expected to be certified in the green zone (again, represented by green bars).

Graph 3: Projected PPA'06 Funded Percentage as of January 1

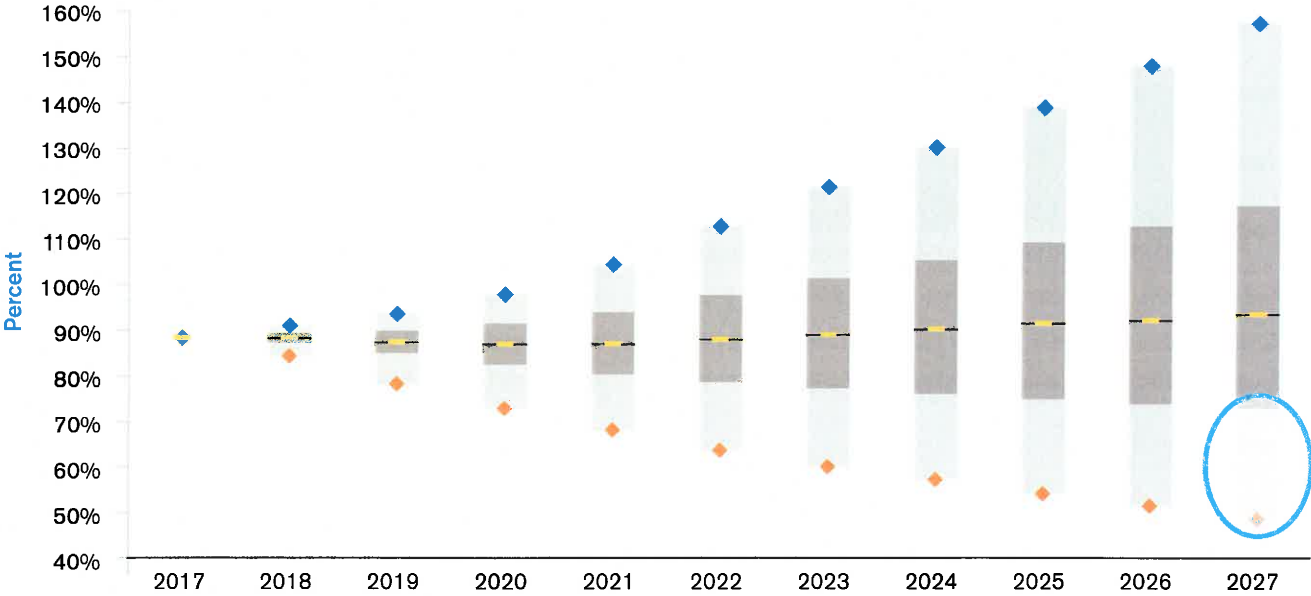


Source: Segal Consulting, 2017



Graph 4 shows a stochastic projection of the sample plan's PPA'06 funded percentage. The plan has a little more than a 50 percent probability of being more than 90 percent funded by 2027 and a 25 percent chance of having a funded percentage lower than 80 percent in 2021. Again, the stochastic projections paint a different picture of the same plan from that of the deterministic projections.

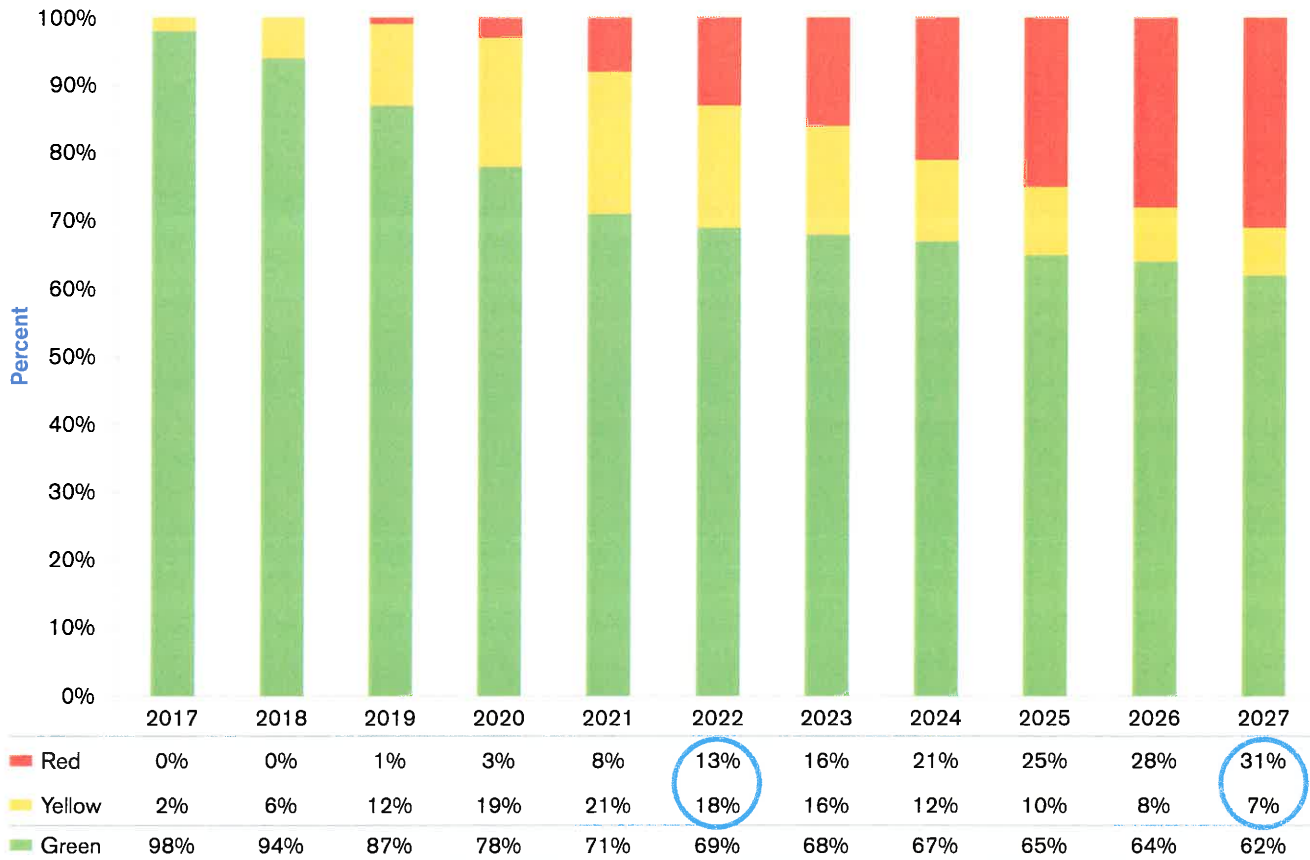
Graph 4: Projected PPA'06 Funded Percentage as of January 1



Source: Segal Consulting, 2017

Graph 5 shows the probability of the same plan being in the green, yellow or red zones. By 2022, there is a 31 percent chance the plan will *not* be green. That chance increases to 38 percent by 2027. Compare this to the deterministic projections that show the plan always in the green zone.

Graph 5: Projected PPA'06 Zone Status as of January 1



Source: Segal Consulting, 2017

All of the graphs above focus on the effect of market returns on various funding metrics of a pension plan. Stochastic projections are better suited to show how investment risk measures like the volatility (standard deviation of expected returns) of each asset class, as provided by the investment consultants, affect the various funding metrics of the plan. Deterministic projections are better suited to show how different investment return assumptions will affect the plan's funding. Stochastic projections excel at displaying a range of results and measuring the probability of the plan's various funding metrics changing over time. Both types of projections can be used to make decisions, and it depends on the question asked as to which type will provide the best answer.

Assumptions Matter

It is important to keep in mind that projections, whether deterministic or stochastic, are only as valid as their underlying assumptions and the methods used to build them. Consequently, the assumptions for projections must be chosen carefully, with internal consistency and with input from professional advisors and the board of trustees.

Quantifying Risks to Help Manage Future Events

All projections are based on assumptions about unknown future events and, as a result, what actually occurs will almost always differ from what was projected. However, in conjunction with other strategic planning information, such as projected industry employment patterns, quantifying risks through deterministic and stochastic projections can help retirement plan trustees answer questions based on a range of results and help them make more informed decisions.

The ability to quantify risk enables plan sponsors to plan for possible future events that may not be readily evident from a standard deterministic projection or an actuarial valuation. Once armed with the ability to quantify certain risks (*i.e.*, investment risk, longevity risk, contribution risk), trustees can manage their plans to improve the plans' long-term financial health and stability.

The next issue of *Ideas* will explore strategies for managing retirement plan risks. Refer to the [Managing Pension Risk](#) page on Segal's website for links to past and future *Ideas* in this series as they are published, as well as links to videos on related topics.



Questions? Feedback? Contact Us.

To discuss how Segal Consulting can help you identify the risks associated with your fund's defined benefit and defined contribution retirement plans, contact your Segal benefits consultant, or one of the experts listed below.

Strategic Consulting Services for Multiemployer Retirement Plans

Consultants and actuaries from Segal Consulting, together with investment consultants from Segal Marco Advisors (the SEC-registered investment solutions member of [The Segal Group](#)), can be of assistance in developing the appropriate strategies for maintaining and enhancing benefit security. Our strategic consulting services for multiemployer pension plans include the following:

- Performing forward-looking projections of the plan's funded status,
- Updating current Funding Improvement Plans or Rehabilitation Plans to stay on target,
- Investigating the potential for benefit suspensions and partitions, and
- Assessing risks and evaluating options for reducing or eliminating them.

For information about these strategic consulting services, contact your Segal consultant, [the nearest Segal office](#) or one of our experts.

To receive *Ideas* and other Segal publications of interest to sponsors of multiemployer plans, [join our email list](#).

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Segal Understands Multiemployer Plans



Since our founding in 1939, Segal Consulting has been a trusted advisor to multiemployer benefit plans. Working with hundreds of multiemployer plans enables us to understand and provide innovative, cost-effective solutions to the challenges facing funds. We firmly believe that the “right” course of action for each client depends on many variables.

In other words, in our experience, “one size” does not fit all multiemployer plans. Segal helps trustees assess their plan's situation objectively. We draw on a number of projection approaches along with a risk-profiler tool, which helps trustees to narrow their choices based on their own experience and objectives.

In working with us, you will have access to professionals who have deep multiemployer subject matter experience and can bring the full resources of Segal to help address your issues. We give unbiased advice to help you make decisions in the broader context of other multiemployer plans.

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