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New Research on Pension Assumptions

By Vic Modugno

A Society of Actuaries (SOA) Project Oversight Group recently approved a research paper titled “Determining Discount Rates Required to Fund Defined Benefit Plans” by John Turner and three other economists. This should be available soon on the SOA website under Research.

The paper describes a new way to look at pension funding for ongoing plans that is a variant of using expected returns (currently used in public plans). The paper takes into account the risk that contributions will be needed in the future for this year’s benefit accruals. This risk arises from both asset returns and liability cash flows. Currently, both the expected return method and the bond rate method (used in private plans) assume the projected cash flows based upon actuarial assumptions are exactly realized.

This new approach (stochastic funding) has an explicit probability assumption that additional contributions for this year’s benefit accruals will not be needed (60 percent in models in this paper). It also assumes the existence of an employer to make additional contributions in the future. This could also be subject to a maximum amount of additional contributions. The expected return method used in public plans has fixed liability cash flows and a 50 percent chance of not requiring additional contributions. Both expected return and stochastic funding methods assume that the mean and standard deviation of returns for some historical period will apply in the future. Among other issues, they do not take into account parameter uncertainty in the projections.

The paper has a fairly complete literature review of all of the methods used in determining discount rates for defined benefit plans. It then goes through a mathematical analysis of the meth-

ods. The method proposed in the paper answers the question: “What is the discount rate needed for determining contributions to assure that current contributions will be sufficient c percent of the time so that future contributions will not be needed to pay off the liability?”

The models used for method in the paper begin with a simple two-period model where either assets or liabilities are risk-free, and move to a more complex, multi-period model where both assets and liabilities are risky. Using a 60 percent assumption of no additional contributions and other simplifying assumptions, the paper runs scenarios with varying investment strategies. One result in the scenarios tested is that increases in returns from increasing risk are offset by the 60 percent requirement and there is no increase in discount rates from moving into riskier investments. One of the perverse incentives in the current expected return method used for public plans is encouraging these plans to move into riskier investments to lower costs. This is happening at a time when plans are maturing with more retirees and an older workforce, which should be funded with more conservative investments.

The model is then generalized and tested where the 60 percent probability is modified such that contributions are needed if the assets fall below some amount (90 percent and 99 percent are used) such that there is a no more than a 10 percent chance that more than 10 percent additional contribution would be needed.

Politicians want to provide maximum benefits for minimal taxes. Deferred compensation valued using aggressive actuarial assumptions is one way to do this. Advocates of expected return methods argue that valuing benefits using bond rates and investing in risk assets would result in a windfall to future taxpayers when higher returns are realized. Bond rate advocates argue that a dollar in bonds equals a dollar in risk assets, and any gains in the future belong in the future since those taxpayers took the risk of losses. The paper proposes a method that produces a rate in the middle, by factoring risk into the expected return method. ■



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Defined Benefit Pension Plans: Gaining Definition and Clarity Through Technology

By David R. Cantor

Everywhere you turn, technology is making things easier, faster and cheaper.

Technological innovations are disrupting traditional business models, improving products, and enhancing the user experience. For example, in the retail investment space, technology across a wide range of companies now enables investors to enter a few pieces of information and come away with professionally designed, custom-created portfolios that can be continuously monitored, tracked and tax-loss harvested by online algorithms—all at a fraction of the price of traditional financial planners.

So why not use similar types of technology to better manage defined benefit (DB) pension plans?

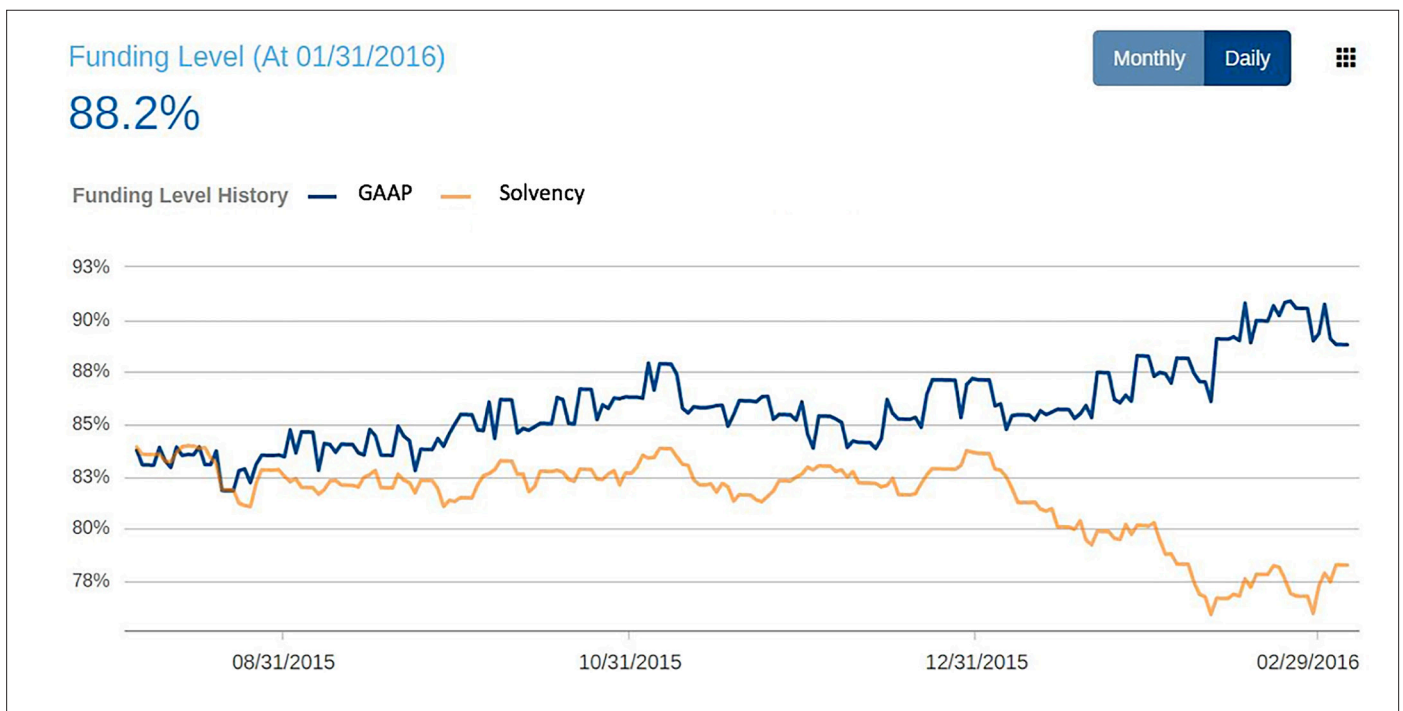
We see clear room for improvement. Consider that during the credit crunch of 2008, the S&P 500 companies that sponsored DB plans saw their aggregate \$94 billion pension surplus (the difference between their pension assets and their obligations) plummet to a \$219 billion deficit. For the last six years, these companies have been trying to improve their plans' funded status, yet despite contributing approximately \$300 billion to the plans, the shortfall has further increased to approximately \$500 billion,¹ all the while paying advisers, such as actuaries and asset managers.

DB plan underfunding has consequences. It's recognized both theoretically, by academics and advisers,² and practically, by analysts and rating agencies,³ as a form of debt that, like any other form of debt, can have adverse implications for the plan sponsor's market risk and cost of capital.⁴

Plan sponsors need to regain control and better manage their plans' costs and risks. Using technology, sponsors can finally have access to the real-time data imperative to informed decision-making and effective execution of overall strategy.

This is not a new revelation. Actuaries and investment advisers have been using technology to assist clients for years. But what has changed recently is the on-demand access to web-based technology platforms available via laptops, smartphones and apps. Each multi-platform access point offers aspects of pension

Figure 1 Funded Status—Monthly and Daily Tracking



plan management in quick, easy-to-use models, which can be accessed by C-suite members and their trusted advisers alike.

Bringing together data from different sources (pension asset, pension obligation and company-specific information) into a common platform has allowed for greater collaboration and helped sponsors make better and faster decisions based on up-to-date analytics and a holistic company view, while saving on costs and eliminating redundancies. Essentially, anyone associated with the plan can get online and get right to work using the same data and updated information.

TECHNOLOGY USES: MEASURE IT TO MANAGE IT

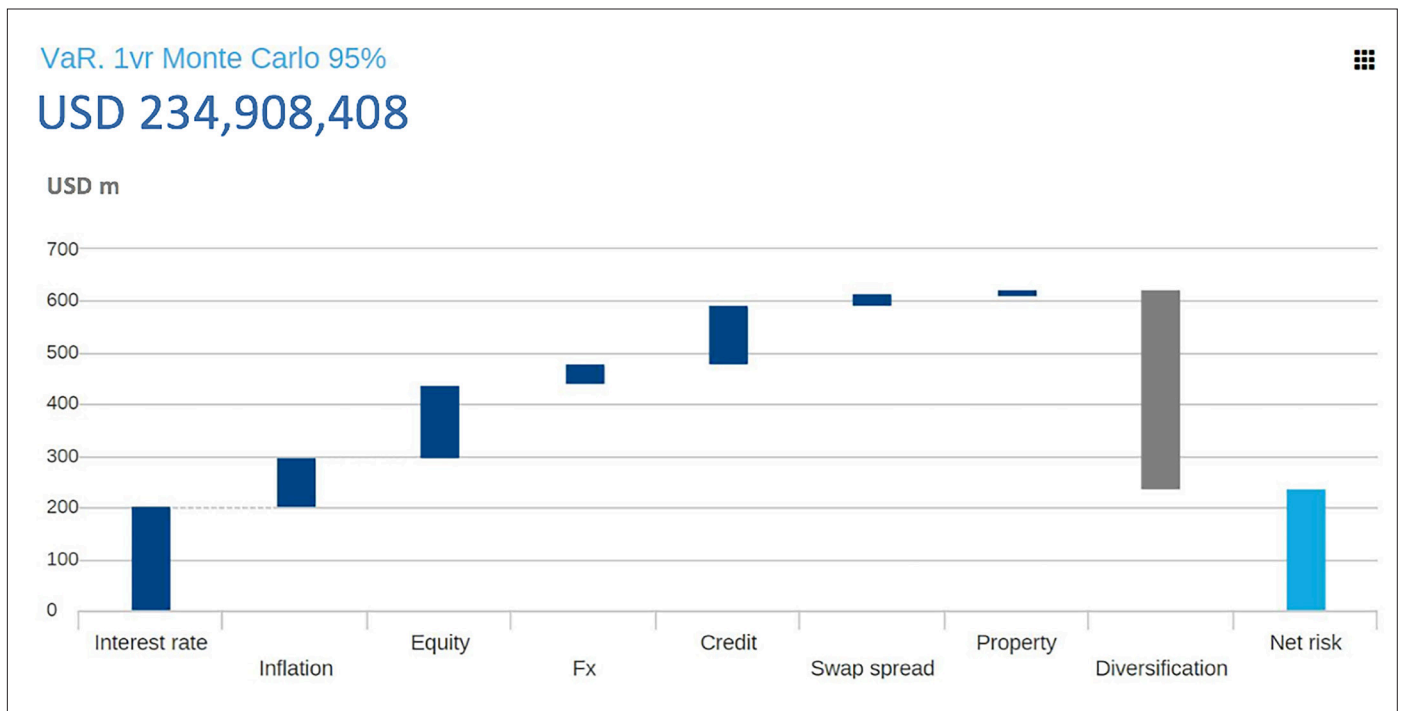
You can't manage what you don't measure. This is an old adage that is certainly relevant for managing pension programs. In the past, pension managers might have needed to wait months for their advisers to calculate the value of pension obligations. Then, the information provided was outdated and no longer relevant. But with the technology now available, pension valuations

can be performed in real time and under a variety of bases (e.g., statutory funding, GAAP and solvency). Pension asset information can also be collected in real time.

By tracking the change in both obligations and assets, the funded status of the pension program can be determined and monitored (Figure 1). Importantly, many plan sponsors adopt investment strategies based on funded status levels, so monitoring this ratio is critical to successful execution of such strategies. Additionally, plan sponsors who are actively looking to transfer their obligations to insurance carriers need a real-time monitoring solution to know when best to execute a transaction.

Technology systems can be set to send email alerts to key pension decision-makers when pension metrics are triggered to notify of a required decision or action. An attribution analysis is also part of the technology, showing what factors contributed to the movement in assets and liabilities and what factors may contribute in the future (Figure 2).

Figure 2 Risk Attribution



Source: Sample pension risk model; PwC

Source: Sample pension risk model; PwC

Figure 3 Stress Test Events

Name of Event	Start of Event (peak)	End of Event (trough)	Duration (days)
Asian financial crisis	01-Jul-97	05-Oct-98	461
Black Monday	19-Oct-87	20-Oct-87	1
Black Wednesday	16-Sep-92	22-Sep-92	6
Bursting of dot-com bubble	21-Mar-00	20-Sep-01	548
Credit crunch	16-Jul-07	06-Nov-08	479
Japanese asset bubble collapse	29-Dec-89	01-Oct-90	276
Russian financial crisis	17-Aug-98	08-Oct-98	52
Scandinavian banking crisis	05-Jul-91	08-Sep-92	431
U.S. savings and loan crisis	02-Jan-87	04-Jan-88	367

Source: PwC

Sponsors can also project funded status and expense under a variety of scenarios in anticipation of year-end results. The technology allows the quick quantification of the impact on key pension metrics of certain “what-if” scenarios and helps the sponsors understand the true risks they are bearing. For example, what would be the impact on key financial variables of one-time shocks, such as a 20 percent drop in equity markets? Other variables, such as changes in interest rates, mortality rates and inflation, can also be evaluated for their impact on assets and liabilities. Sponsors can run the “what-if” scenarios under different investment or de-risking strategies in order to perform a cost-benefit analysis.

We can also use technology to quickly and efficiently examine the impact on key pension metrics of certain historical market stresses, such as a repeat of the 2008–2009 financial crisis. Figure 3 sets out the start and end points of some key events, as well as the duration of the stress event. Unfortunately, during these stress events, sponsors may often find that the company and the pension plan are highly correlated, in terms of their performance.

“What-if” scenario testing should also be complemented with stochastic projections, which model thousands of scenarios representing possible future economic outcomes and then quantify the distribution of outcomes associated with key pension metrics, such as statutory funding requirements and accounting pension expense. This type of analysis allows companies to evaluate a plan’s risk to their organization over specific time periods and various future economic scenarios. Importantly, downside outcomes and the chances that these outcomes may occur can be determined using a stochastic projection framework. It’s the closest thing we have to a crystal ball, albeit still an imperfect one.

Advisers have been using stochastic projections for many years to assist DB plan sponsors. By taking advantage of advances in computing power, however, the new technology is now accessible to the plan sponsor because it can run more quickly, more accurately and more cheaply than in the past.

Technology also allows for a variety of other uses, including the real-time testing of alternative investment strategies, the decomposition of pension risk into various economic factors, the evaluation of hedging strategies, and the assessment of other de-risking initiatives, such as lump sum transactions and annuity buyouts.

DASHBOARD DISPLAYS

Online dashboards help display vital information. They’re not a new technological development, as virtually any content management or data visualization program has come to rely on them in recent years. But visualization of output is key to demonstrating insights and communicating complex results to decision-makers, many of whom may not be familiar with the intricacies of DB pension plans.

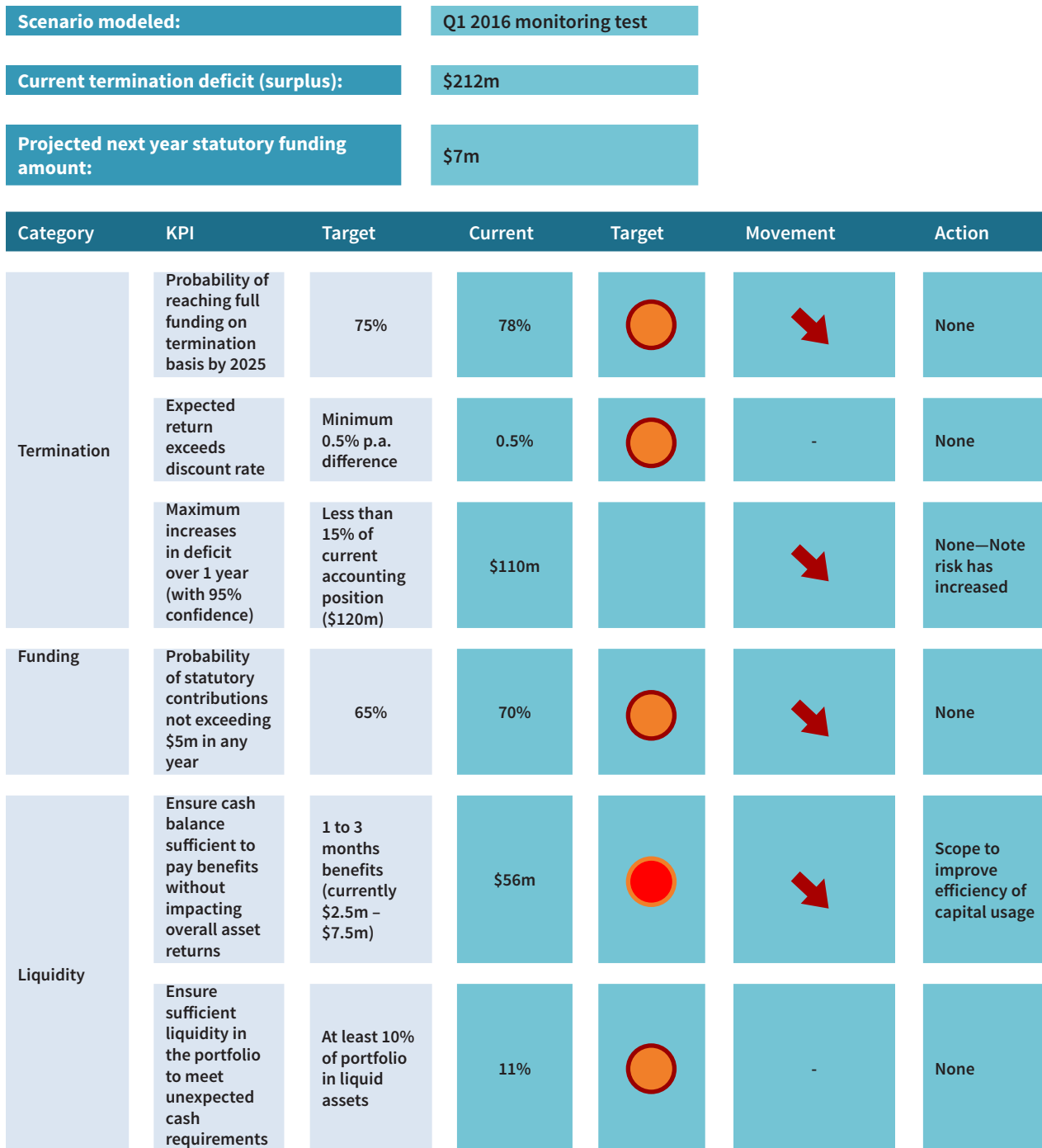
A good dashboard system includes at least the following features:

- Produces and monitors output automatically using real-time data
- Makes use of graphs and charts to display output in an easy-to-interpret manner
- Enables a variety of users to access similar information
- Provides a central repository for information collection
- Allows for drill-down into the results
- Has a controlled environment so that accuracy is maintained
- Is easy to access

Having pension information that is both reliable and conveyed in a useful manner allows for effective decision-making on a timely basis and helps improve pension fund management.

Technology can also be used to quickly link performance metrics to dashboards that can also be used by plan sponsors to track their performance against their goals (Figure 4).

Figure 4 Key Performance Indicator Dashboard



Source: PwC

CHALLENGES TO CONSIDER

We see numerous benefits to using technology to improve management of DB pension funds. There are, however, challenges to using this technology adequately.

Consider the amount of data requested, for example. Technology platforms need to strike a careful balance between the data that's requested versus data that's actually needed. Ease of use makes relying on technology a comfortable crutch, but this ease of use can be overshadowed if too much data is requested.

Other challenges relate to over-reliance on the models. Because new technology can run complex results quickly and display intricate details in a neat, graphical manner, there may not be enough focus on the underlying assumptions (e.g., capital market assumptions), methodology, and other details of the models.

Further, technology platforms aren't always so customizable. One of the trade-offs of being able to run models quickly is that algorithms and output are set beforehand. Therefore, to the extent that a plan sponsor may want to modify something in the technology, it may not be as easy as working with an adviser on a customized solution from the start.

GAINING A CLEAR VIEW

Online pension management tools can give plan sponsors a clear view of their DB plans' assets and liabilities, providing real-time valuations, financial reporting, risk analysis and cash-flow reporting.

Having instant access to plan information can help speed up the decision-making processes and support plan sponsors in confirming that plan assets and cash contributions are being managed effectively.

Technology dashboards can serve as a common platform, enabling sponsors to share the same data with various pension

stakeholders so that discussions surrounding the pension plan all start off with the same, accurate, reliable data. Effective dashboards also allow plan sponsors to grant access to other advisers, avoiding duplication of efforts, saving time, and enabling greater collaboration and better decisions—and, last but not least—reducing costs.

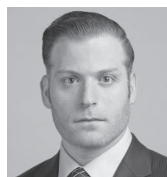
CONCLUSION

Companies that have access to accurate, real-time information in relation to their DB plans will be best equipped to manage their pension risks. These liabilities can often be highly significant so having tools that empower sponsors to monitor and execute in an effective manner can reap important economic and administrative benefits.

From a pension practice point of view, technology will probably also reduce adviser fees on non-value-added services. Advisers shouldn't fear this, but rather embrace technology and utilize it to improve their service offerings. ■

ENDNOTES

- 1 Deutsche Bank Markets Research. S&P 500 Pensions: End of cycles? US Equity Insights. July 31, 2013
- 2 Do a Firm's Equity Returns Reflect the Risk of Its Pension Plan? Jin, L., Merton R, Bodie. Z. *Journal of Financial Economics*, 2006
- 3 Deutsche Bank Markets Research. S&P 500 Pensions: End of cycles? US Equity Insights. July 31, 2013
- 4 When Is It Optimal to Derisk a Pension Plan? Morgan Stanley Pensions in Practice, May 2013



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