U.S. Pension Plan Discount Rate Comparison 2009–2014

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When it comes to funding defined benefit pension plans, it is commonly understood that the discount rate used to compute liabilities plays a significant role. For any given pension plan, a lower discount rate results in a higher liability, which means a lower funded status. Discount rates, however, are only one of a multitude of factors involved in pension funding. Other factors include the approach to plan and risk management, methods for computing assets and liabilities, the length of time and methods for amortizing unfunded liabilities, and the way that contributions are determined.

This article compares the recent historical relationship between pension plan funded status and discount rates used to compute liabilities *for funding purposes.*[1] Comparisons include all three major categories of defined benefit pension plans in the United States: single employer (SE) plans, multiemployer (ME) plans, and state and large city public plans (PP).[2] Reflection is limited to the question of whether discount rates were driving the differences in funded status, without any attempt to explain why funded status differs. Nor does this article explore the reverse question of whether funded status was driving the choice of discount rates for funding purposes.

Note that discount rates, liabilities and assets computed for other purposes may be determined and reported differently. Presentation of reported funding discount rates and associated values constitutes neither advocacy nor opposition, neither agreement nor disagreement, by the Society of Actuaries (SOA) with these or any other approaches to selecting discount rates and computing liabilities and unfunded liabilities.

Here is a summary of key findings from 2009–2014:

- In general, funding discount rates for PP and ME plans were significantly greater than those for SE plans, with PP discount rates having been somewhat greater than ME rates.
- Although the category with the greatest discount rates (PP) was the least well funded, statistical analysis reveals that discount rates were probably not driving the differences in funding levels. While they are not explored in this article, many other factors involved in pension plan funding also differed among and within pension plan categories, including methods for computing unfunded liabilities, overall approaches to plan and risk management, and the way that contributions are determined.
- At the top of the next page is an overview of the three categories' aggregate reported funding values for 2013, the most recent complete year of reporting. The discount rates and methods used to compute

[1] For this article, "discount rate" refers to the interest rate used to compute the present value of future benefit payments.
[2] This article tabulates values reported on publicly available databases, cited at the end of the article.

liabilities and assets varied across plan categories, and they varied by plan within ME and PP categories. If values were computed on a consistent basis, results would likely differ.

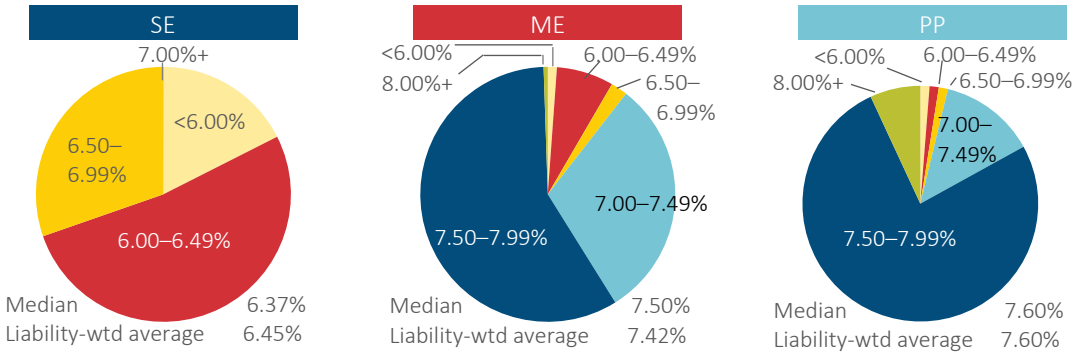
Reported 2013 Values for Funding Purposes[3]	SE	ME	PP
Liability-weighted average discount rate[4]	6.38%	7.44%	7.64%
Liability-weighted average funded ratio[5]	110%	77%	72%
Approximate values(rounded):			
▪ Total liabilities (billions)	$1,900	$500	$4,100
▪ Total unfunded liabilities (billions)	$53	$130	$1,200
▪ Number of participants (millions)	31	10	26
▪ Number of plans	37,000	1,200	160

Discount Rates for 2014

The theoretical basis for selecting discount rates to calculate funding liabilities differs among plan categories and is subject to ongoing debate. SE plans are legally required to use a modified market-based discount rate, while ME and PP actuaries typically use an expected-return approach to set the discount rate.[6,7] Usually, expected-return discount rates are greater than market-based discount rates, resulting in lesser liabilities for a given plan.[8]

The following graph compares the frequency of discount rates for funding purposes for 2014, the most recent year available for all three categories of plans.[3] Note that when the liability-weighted average differs significantly from the median, it is usually because the rates of the largest plans differ significantly from those of most plans.

Frequency of Funding Discount Rates for 2014



The difference in discount rates among plan categories is obvious. For 2014, three-quarters of the public plans were using a discount rate between 7.50% and 7.99%, while three out of five ME plans were using a rate in the

[3] The most recent year of reporting available for all three plan categories is 2014; the most recent *complete* year is 2013. SE and ME reporting for 2014 represent approximately 90% of plans; complete data will become available after October 15, 2016. PP reporting for 2014 is complete.
[4] *Supra*, note 1.
[5] In addition to varying discount rates, the liabilities and assets used for funding reflect varying actuarial methods across categories as well as within some categories.
[6] Effective beginning 2008, Internal Revenue Code §430 and its accompanying regulations govern SE plan funding requirements. Effective for 2012, the rules changed to allow smoothing and limitation of market discount rates, resulting in above-market rates under current economic conditions.
[7] For additional information on the various approaches used to measure pension obligations, see American Academy of Actuaries, "Measuring Pension Obligations: Discount Rates Serve Various Purposes," *Issue Brief*, November 2013, (https://www.actuary.org/files/IB_Measuring-Pension-Obligations_Nov-21-2013.pdf). For a comprehensive summary of pension valuation methods and assumptions, see Timothy R. Leier, *Pension Valuation Methods and Assumptions*, 2nd Edition, April 2015, (http://www.soa.org/Research/Research-Projects/Pension/research-pen-valuation-methods.aspx).
[8] The 1980s provides an example of an economic environment during which expected-return discount rates were less than market-based discount rates.

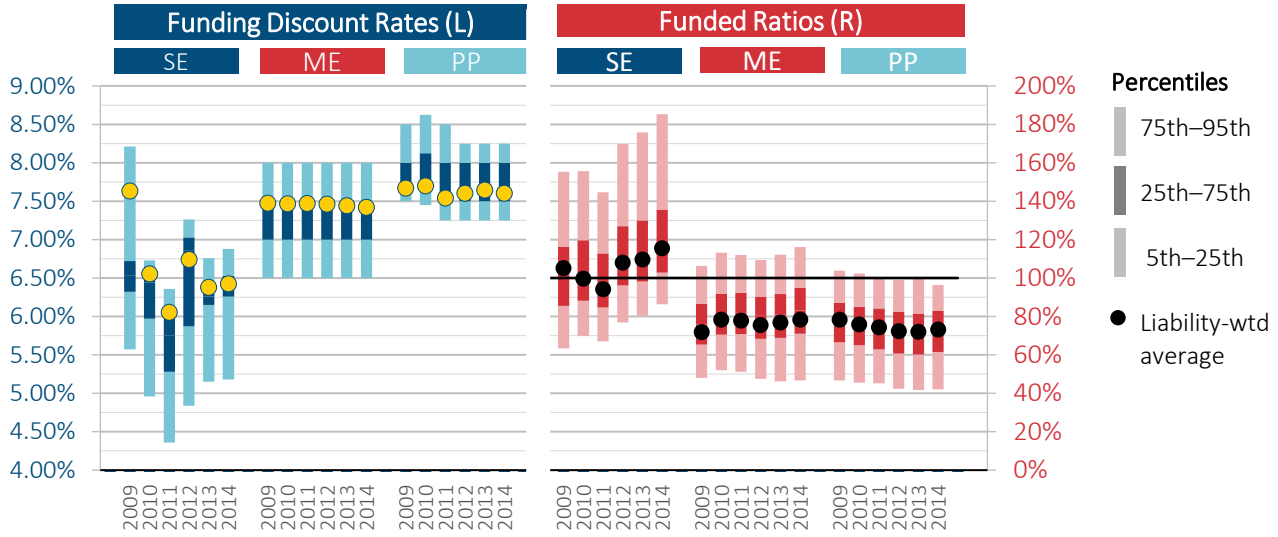
same range, but virtually none of the SE plans were using rates that high. One in 14 public plans (7%) was using a discount rate of 8.00% or greater, compared to only 1% of ME plans using a discount rate that high.

At the low end of the scale, nearly one in five (18%) SE plans was using a discount rate less than 6.00%, compared to only 1% of ME plans and 2% of public plans using a discount rate that low.

Discount Rates and Funded Ratios

Because discount rates significantly affect the magnitude of a pension plan's liabilities, they significantly affect a plan's funded status. For any given plan, lower discount rates produce higher liabilities (assuming all other variables are equal), which results in a lower funded status.

The following graph looks side by side at discount rates and funded ratios across categories of plans from 2009–2014, as reported *for funding purposes*. Methodologies for computing liabilities and assets differ across categories and, within a category, may differ across plans; funded ratios computed on a consistent basis would likely differ.



As expected with a market-based approach, SE discount rates were more volatile and generally lower than ME and PP rates.[9] Note that SE rate increases in 2012 resulted from legislative changes rather than increases in market rates.[10] In general, SE funded ratios were generally higher than ME and PP funded ratios.

Among plans typically using an expected-return approach to selecting discount rates, the range of PP rates varied more than ME rates. The range and liability-weighted average of ME discount rates was almost static across this period. Analysis of ME and PP investment allocations, which may have affected the choice of discount rates under the expected-return approach, is beyond the scope of this article.

[9] For 2008 (not shown) and 2009, lack of clarity about implementation of the legislated market-based approach resulted for many plans in lower discount rates than would have resulted had more complete guidance been available at that time.
[10] *Supra*, note 6.

Strikingly, in general, the category of plans that had the greatest discount rates (PP) also had the lowest funded ratios. And, conversely, in general, the category that had the lowest discount rates (SE) generally had the greatest funded ratios. These observations call for further analysis.[11]

The following table shows linear correlation coefficients between discount rates and funded ratios within each category of plans as well as across all three categories. Cross-category calculations are weighted to neutralize category size in the resulting correlation coefficients.

Correlation Coefficients: Discount Rates and Funded Ratios

	SE	ME	PP	Cross-Category
2009	−0.007	−0.259	0.076	0.009
2010	0.002	−0.184	0.129	0.007
2011	−0.027	−0.185	0.082	0.002
2012	0.000	−0.090	0.039	0.006
2013	−0.014	−0.082	0.070	0.006
2014	0.023	−0.092	0.104	0.092

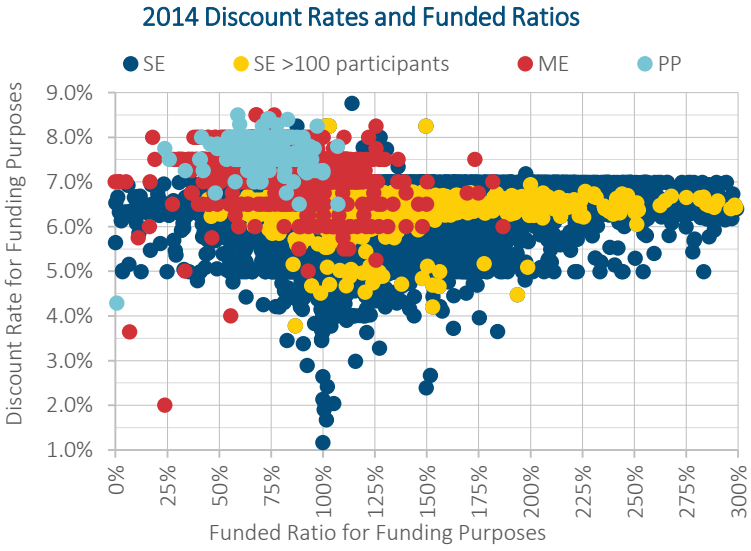
Extremely weak correlation coefficients within as well as across categories indicate that discount rates are probably not the primary drivers of funded status.

Correlation coefficient values of zero indicate no statistical correlation, while values of 1.0 (−1.0) indicate perfect positive (negative) correlation—for every incremental increase in discount rate, there is a corresponding incremental increase (decrease) in funded ratio. Values between −0.50 and 0.50 indicate weak correlation.

The table at left shows that absolute values of all coefficients fall significantly below 0.50, indicating very weak correlations between discount rates and funded ratios. Further, coefficients across categories are very near zero, suggesting very little or no correlation. In other words, discount rates are probably not the primary drivers of funded status, whether within or across plan categories.

For a less technical approach, the graph at right illustrates for 2014 the lack of a clear link between discount rates and funded ratios.[12] Each dot represents a pension plan. If there were a clear relationship between discount rates and funded ratios, the dots would generally form a clear pattern such as a line. However, the graph shows no clear pattern that links discount rates and funded ratios.

The mass of SE plans falls within a clear horizontal range of discount rates because SE plans are legally required to use discount rates derived from a specific yield curve.[13] However, SE funded ratios extend across the graph, so there is no clear pattern linking discount rates and funded ratios.



Note: Plans with funded ratios greater than 300% are excluded; more than 99% of plans for 2014 are shown.

[11] Alicia H. Munnell, Jean-Pierre Aubry, and Kelly Haverstick at the Center for Retirement Research at Boston College examined relationships between actuarial funding methods and funded ratios in their May 2008 brief titled "Why Does Funding Status Vary Among State and Local Plans?" (http://crr.bc.edu/wp-content/uploads/2008/05/slp_6-508.pdf) but did not explore discount rates.
[12] *Supra*, note 3.
[13] *Supra*, note 6.

Conclusion

From 2009–2014, funded status varied among and within plan categories. At the same time, discount rates varied significantly among categories as well as within some categories. However, statistical analysis shows that discount rates are probably not the primary reason that funded status differed.

In addition to varying approaches among plan categories for choosing discount rates, methods varied significantly for computing liabilities, smoothing assets and general plan management. Some examples of these differences include the approach to risk management, the length of time and methods for determining and amortizing unfunded liabilities, and the way that contributions were determined.

The most variable of these factors may be the way that contributions were determined. While SE and ME plans are subject to very different federal regulation of minimum funding requirements, PP regulation of funding requirements, if any, varies by state.

Previous research by the SOA and others has explored some of these differences among or within pension plan categories. Previous SOA research that is particularly relevant looked at the levels of contributions among SE and ME plans. Those works and other previous SOA research are available on the SOA website under Research & Publications, Research Projects, Pension/Retirement (https://www.soa.org/research/research-projects/pension/default.aspx).

Data Sources

Tabulations presented in this article were generated from reported values in the following publicly available databases, without adjustment, except for minor editing or data removal in the case of obviously erroneous data.

- SE plans: U.S. Department of Labor (DOL) Form 5500, Schedule SB, as of early August 2016
- ME plans: DOL Form 5500, Schedule MB, as of late July 2016
- Public plans: Public Plans Data (PPD), as of mid-August 2016; produced by the Center for Retirement Research at Boston College in partnership with the Center for State and Local Government Excellence and the National Association of State Retirement Administrators. The PPD "includes 160 plans (115 state-run and 45 locally-run) which account for 95 percent of state/local pension assets and members in the US."[14]

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[14] Public Plans Data, September 2016, http://publicplansdata.org/public-plans-database.

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