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Aging and Retirement

Contribution Analysis: U.S. Single Employer Pension Plans

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Introduction and Executive Summary

Single employer pension plans are typically corporate pension plans. Funding them involves many intricate factors, including complex funding regulations, discount rates and other actuarial assumptions, investment returns and business objectives and constraints. Regardless of the intricacies, the goal is to provide the plan with enough assets to pay participants' benefits when they come due.

The Society of Actuaries (SOA) is pleased to provide an update to its longitudinal study of single employer pension plan contributions in the United States. The study compares employer contributions to benchmarks for measuring whether pension plan contributions—absent other influences—reduced unfunded liabilities or met other benchmarks, such as regulatory requirements. Because few plans involve employee contributions, for convenience the authors omit the adjective "employer" throughout this report.

This study presents results for 2009–2016 plan years, as well as preliminary results for 2017, based on a partial year of reporting. Data for 2017 include approximately 34,300 plans covering roughly 24 million participants, which represents about 89% of the plans that reported for 2016. Data are from publicly available Department of Labor Form 5500 filings as of Dec. 6, 2018.[1]

Highlights of the update include:

- In 2016, 27% of plan liabilities were in plans that had an unfunded liability when computed with the smoothed discount rates allowed under federal law.[2] This percentage is up from 11% in 2015.
- Of the 27% of plan liabilities associated with plans that had an unfunded liability in 2016, 16% is attributable to plans that contributed enough to reduce their unfunded liabilities, while 11% fell short.
- Only 21% of plan liabilities were associated with plans that had a 2016 Minimum Required Contribution (MRC) under federal law. Of the 21%, more than 20% was attributable to plans that contributed at least as much as the MRC, and less than 1% was associated with plans that contributed less than the MRC. Even though a plan may have an unfunded liability, it may have no MRC because of carryover and prefunding balances—mechanisms for recognizing that past contributions were greater than required.

[1] Refer to the Data and Methods section of this report for more information on the data as well as Form 5500 filing due dates.
[2] Internal Revenue Code §430 and accompanying regulations define funding rules for single employer pension plans, including the interest rates used to discount liabilities.

- Using unsmoothed discount rates, 78% of liabilities in 2016 were associated with plans with an unfunded liability.[3] Of the 78%, 32% was associated with plans whose contributions reduced their unfunded liabilities, while 46% was attributable to plans that fell short of preventing their unfunded liability from growing.

The smoothed interest rates allowed under current law are averaged over 25 years. During the period studied and the 25 preceding years, interest rates were generally falling.[4] During economic periods of generally falling interest rates, averaging historical interest rates to compute a rate for discounting liabilities results in a discount rate that is higher than the current market rate. When averaging over a period of generally rising interest rates, the opposite would be true. All else equal, higher discount rates produce lesser liabilities, hence lesser unfunded liabilities.

Contribution Ratios

This analysis considers the ratio of a plan's contributions to plan-specific benchmarks. A ratio that exceeds 1.0 means that the contribution exceeded the benchmark, while a ratio less than 1.0 means the contribution fell short of the benchmark. When a plan does not have an unfunded liability, it has neither a benchmark nor a contribution ratio.

Current funding laws allow smoothing of the corporate bond rates used to discount plan liabilities, but the smoothing is scheduled to lessen over time.[5] Consequently, this study looks at benchmarks computed with smoothed rates as well as benchmarks computed with unsmoothed rates. [6] In the current economic environment, smoothed discount rates are higher than the unsmoothed rates. Higher discount rates generate lesser liabilities and, hence, lesser unfunded liabilities, than unsmoothed rates.

This study considers five benchmarks that represent the contribution needed to:

- Satisfy the MRC as defined by Internal Revenue Code §430 after reflecting all allowable offsets.
- Reduce the unfunded liability (normal cost plus interest on the unfunded liability) using smoothed discount rates allowed by current law; contributions must exceed this level to reduce the unfunded liability.
- Eliminate the unfunded liability in 7 years (normal cost plus 7-year amortization of the unfunded liability) using smoothed discount rates allowed by current law.
- Reduce the unfunded liability using unsmoothed discount rates.
- Eliminate the unfunded liability in 7 years using unsmoothed discount rates.

Except for the MRC, unfunded liabilities are determined by comparing liabilities to the market value of assets.

A plan's unfunded liability may increase even though its contributions exceeded its benchmark for reducing the unfunded liability. As previously mentioned, many factors affect unfunded liabilities, and contributions are only one of them.

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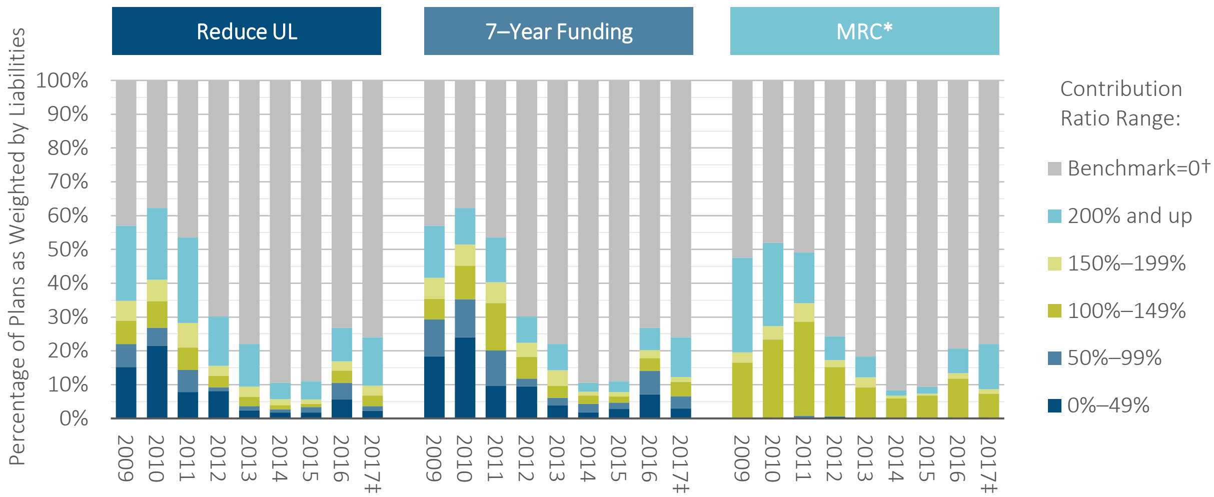
[3] For this study, unsmoothed corporate bond rates refer to monthly average spot rates published by Internal Revenue Service as the Treasury High Quality Market Corporate Bond Yield Curve. As monthly averages, these rates are slightly smoothed, but they are essentially unsmoothed relative to the 25-year averaging allowed under current law. In the current economic environment, smoothed rates are higher than unsmoothed rates.
[4] U.S. Department of the Treasury, Daily Treasury Yield Curve Rates, https://www.treasury.gov/resource-center/data-chart-center/interest-rates/pages/TextView.aspx?data=yieldAll.
[5] Internal Revenue Code §430 and accompanying regulations define funding rules for single employer pension plans, including the interest rates used to discount liabilities.
[6] See footnote 3.

Figure 1 illustrates the percentage of plans, weighted by liabilities, with contribution ratios that fall within given ranges. The contribution ratios in Figure 1 use benchmarks that are based on the smoothed discount rates allowed under current law. For readers who prefer numerical data to graphs, refer to Table 3 in the Appendix. Refer to the Discount Rates section of this report for more details about the discount rates.

Figure 1
CONTRIBUTION RATIOS USING SMOOTHED DISCOUNT RATES



Note: All distributions presented in this study are weighted by plan liabilities, providing a more informative view of the impact as experienced by plan participants across the system as a whole. Refer to the Discount Rates section of this report for further information about the discount rates used in this study.

* After offsetting carryover and prefunding balances

† Indicates either no MRC or no unfunded liability.

‡ Compared to 2016, 2017 data reflect approximately 89% of plans reporting.

Using the smoothed rates allowed under current law, the share of total plan liabilities in plans that had unfunded liabilities increased from 2015 to 2016, as Figure 1 shows. Hence the share of plan liabilities with benchmarks for contribution ratios increased. In 2015, 11% of total plan liabilities were attributable to plans that had unfunded liabilities. The percentage increased to 27% in 2016, largely because of a combination of low asset returns during 2015 and lower discount rates to compute liabilities for 2016 than for 2015.

Of the 27% of plan liabilities that had a benchmark in 2016, 16% is attributable to plans that contributed enough to reduce their unfunded liabilities and the remaining 11% is attributable to plans that failed to do so. When assessed using a 7-year funding pace, of the 27% of plan liabilities that had a benchmark, about 13% is from plans with contributions that exceeded their benchmarks and the remaining 14% is from plans that fell short.

The remaining 73% of liabilities in 2016 were associated with plans that did not have an unfunded liability; hence they had no benchmark.

While 27% of liabilities were associated with an unfunded liability in 2016, only 21% of plan liabilities were associated with plans that had a MRC for 2016 under federal law. That 21% was split between more than 20% of liabilities that were attributable to plans that contributed at least as much as the MRC, and less than 1% of liabilities associated with plans that did not.

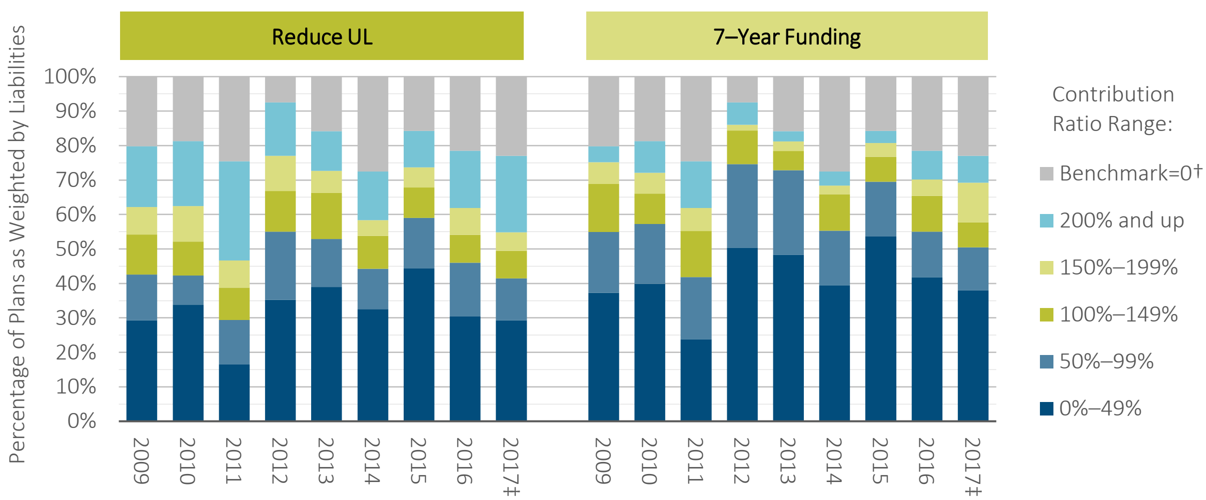
Based on a partial year of reporting, preliminary results for 2017 indicate fewer plans had unfunded liabilities at the start of 2017 than at the start of 2016.

As Figure 1 shows, a plan sponsor can contribute the MRC or more yet fail to meet the benchmark for reducing its unfunded liability. This is primarily because of three provisions in current law, all of which help to smooth contribution fluctuations over time:[7]

- Contribution requirements may be reduced for carryover and prefunding balances, which recognize that previous contributions exceeded the minimum amount required.
- Asset fluctuations may be smoothed for determining funded status under current law, whereas the authors' benchmarks use the unsmoothed market value of assets. Consequently, assets used to determine funded status for minimum funding purposes may be greater or less than market value.
- Amortization for the Minimum Required Contribution uses a layered approach, which can result in an amortization payment that is less than (or greater than) the benchmark approach of a straight amortization of the current unfunded liability.

Figure 2 shows contribution ratios for benchmarks that use unsmoothed discount rates. Readers who prefer numerical data to graphs may refer to Table 4 in the Appendix. Refer to the Discount Rates section of this report for more specific data on the discount rates.

Figure 2
CONTRIBUTION RATIOS USING UNSMOOTHED DISCOUNT RATES



Note: All distributions presented in this study are weighted by plan liabilities, providing a more informative view of the impact as experienced by plan participants across the system as a whole. Refer to the Discount Rates section of this report for further information about the discount rates used in this study.
* After offsetting carryover and prefunding balances
† Indicates either no MRC or no unfunded liability.
‡ Compared to 2016, 2017 data reflect approximately 89% of plans reporting.

Comparing Figure 1 and Figure 2, unsmoothed discount rates result in a much larger share of liabilities associated with plans that have an unfunded liability than do the smoothed discount rates allowed under current law.

Using unsmoothed rates, 78% of liabilities in 2016 were associated with plans with an unfunded liability. The 78% was split between about 32% of liabilities associated with plans whose contributions exceeded their benchmarks for reducing their unfunded liability and 46% of liabilities associated with plans whose contributions fell short of preventing their unfunded liability from growing. Figure 2 also shows that the 78% was split between about 23% of

[7] Internal Revenue Code §430 and accompanying regulations define funding rules for single employer pension plans.

liabilities attributable to plans that contributed enough to eliminate their unfunded liability within 7 years and 55% of liabilities associated with plans that fell short of the 7-year funding pace benchmark.

The smoothed interest rates allowed under current law are averaged over 25 years.[8] During the period studied and the 25 preceding years, interest rates were generally falling.[9] During economic periods of generally falling interest rates, averaging historical interest rates to compute a rate for discounting liabilities results in a discount rate that is higher than the current market rate. When averaging over a period of generally rising interest rates, the opposite would be true. All else equal, higher discount rates produce lesser liabilities, hence lesser unfunded liabilities.

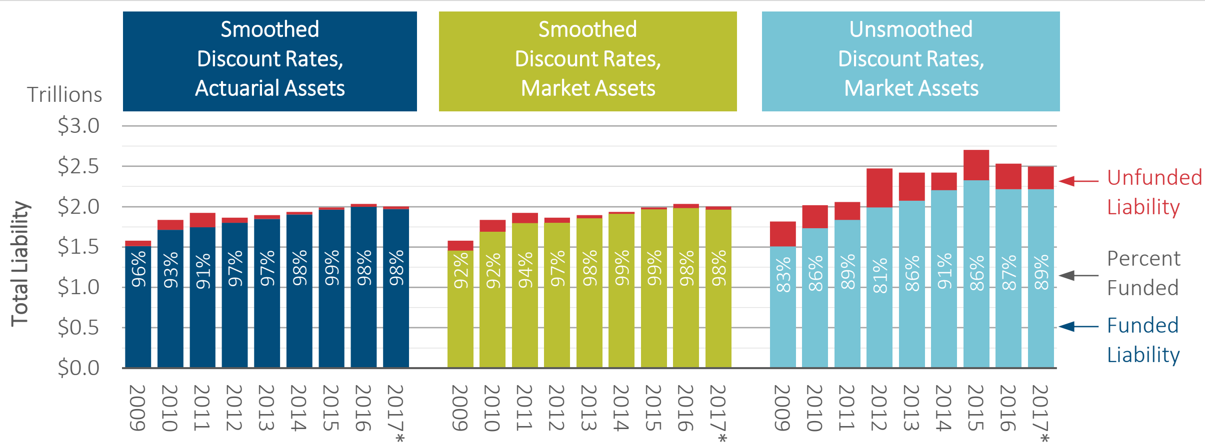
Current law lessens the smoothing of discount rates beginning in 2021. In the current economic environment, if all other items are equal, as the smoothing of discount rates lessens, liabilities will increase significantly, and contributions will tend to increase accordingly. Refer to the Discount Rates section of this report for further information about the discount rates used in this study.

As previously noted, funding defined benefit pension plans involves many intricate factors that affect funding levels, including complex funding regulations; discount rates and other actuarial assumptions; investment returns; changes among the plan population; and business objectives and constraints. This study presents a means for measuring only the impact contributions in isolation from other factors.

Aggregate Analysis

Figure 3

AGGREGATE LIABILITIES AND FUNDED STATUS



Note: Internal Revenue Code §430 and accompanying regulations define funding rules for single employer pension plans, including the interest rates used to discount liabilities. Refer to the Discount Rates section of this report for further information about the discount rates used in this study.

* 2017 values are extrapolated from a partial year of reporting.

[8] Internal Revenue Code §430 and accompanying regulations define funding rules for single employer pension plans, including the interest rates used to discount liabilities. IRC §430 was amended by the 2012 Moving Ahead for Progress in the 21st Century Act to provide funding relief in the form of smoothed discount rates. IRC §430 was further amended by the Highway and Transportation Funding Act of 2014 and the Bipartisan Budget Act of 2015.
[9] U.S. Department of the Treasury, Daily Treasury Yield Curve Rates, https://www.treasury.gov/resource-center/data-chart-center/interest-rates/pages/TextView.aspx?data=yieldAll.

Figure 3 shows aggregate liabilities and funded status of the plans studied. Aggregate funded liabilities ignore plan assets that exceed plan liabilities, because one plan's assets cannot be used to meet another plan's liabilities. Further analysis of funded status is beyond the scope of this study.

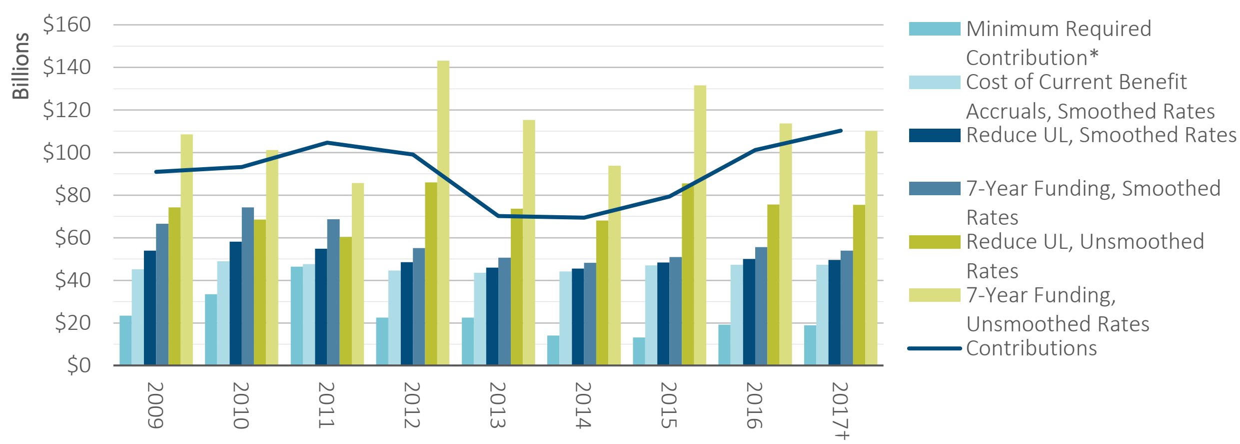
Using the smoothed discount rates available under current law, single employer pension plans are generally well funded. For 2016, the most recent year of complete reporting, total liabilities of $2.03 trillion were 98% funded with a total unfunded liability of about $32 billion. Unfunded liabilities increased from 2015 when total liabilities of about $1.99 trillion were 99% funded with an aggregate unfunded liability of about $25 billion.

Without the smoothing of discount rates, total liabilities are significantly higher, as are unfunded liabilities. Using unsmoothed discount rates, total liabilities decreased from about $2.7 trillion in 2015 to $2.5 trillion in 2016. However, aggregate unfunded liabilities also decreased from about $380 billion to roughly $320 billion. Consequently, the aggregate funded ratio increased from 86% to 87%.

Refer to the Discount Rates section of this report for additional information about the discount rates used to compute liabilities for this study.

Aggregate funded status provides general context for the single employer plan system as a whole. Analysis of aggregate contributions and benchmarks provides similar context (Figure 4). Because one plan's contributions cannot be used to meet another plan's benchmarks, the context that aggregate comparisons provide is limited.

Figure 4
AGGREGATE CONTRIBUTIONS AND BENCHMARKS



Refer to the Discount Rates section of this report for further information about the discount rates used in this study.
* After offsetting carryover and prefunding balances.
† 2017 values are extrapolated from a partial year of reporting.

In aggregate, contributions significantly exceeded all benchmarks that use smoothed discount rates. Except for 2013 and 2015, aggregate contributions also exceeded aggregate benchmarks for reducing unfunded liabilities based on unsmoothed discount rates.

Under both discount rates, the ratio of aggregate contributions to benchmarks for 7-year funding has been increasing since 2013, as Table 1 shows. The reason behind the trend is beyond the scope of this study. However, the authors note that Pension Benefit Guaranty Corporation (PBGC) variable-rate premium rates began increasing significantly in 2014, and it is likely that PBGC premium increases played a role in increased contributions.

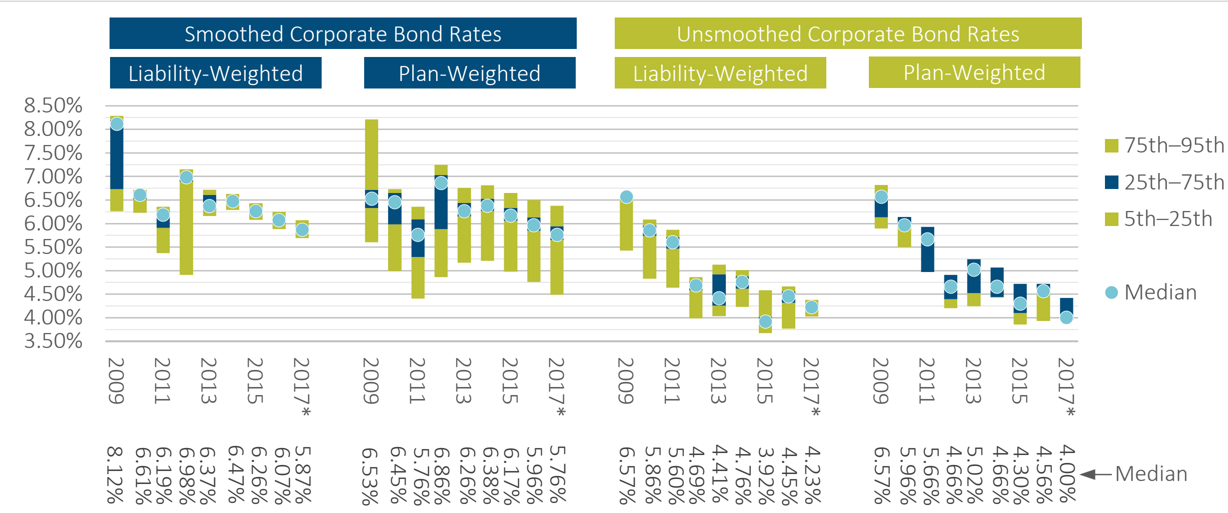
Table 1
SELECTED AGGREGATE CONTRIBUTION RATIOS

	2009	2010	2011	2012	2013	2014	2015	2016	2017[10]
MRC	3.88	2.79	2.25	4.41	3.13	4.95	6.03	5.29	5.83
7-Yr Funding: Smoothed Rates	1.36	1.25	1.52	1.79	1.39	1.44	1.56	1.82	2.04
7-Yr Funding: Unsmoothed Rates	0.84	0.92	1.22	0.69	0.61	0.74	0.60	0.89	1.00

Discount Rates

The discount rates used to compute liabilities significantly affect funded status, and therefore, contribution ratios. Figure 5 shows distributions of the discount rates used to compute the liabilities and benchmarks in this study.[11]

Figure 5
PERCENTILE DISTRIBUTION OF DISCOUNT RATES



* 2017 data reflect a partial year of reporting.
Source: smoothed rates per data reported on Form 5500 Schedule SB; unsmoothed rates per authors' calculations.

Data and Methods

Tabulations and analyses are based on publicly available data from the Department of Labor Form 5500 as of Dec. 6, 2018, which reflects completed reporting for plan years through 2016 and a partial year of reporting for 2017. Data for 2017 include approximately 34,300 plans covering about 23.7 million participants. Compared to 2016 data, 2017 data represent about 89% of plans and approximately 89% of total single employer plan liabilities.

Refer to Table 2 for a summary of the plans included in this study, and note the following items about the data:

- With typical extensions, Form 5500 is generally due 9½ months after the end of the plan year. For example, for a plan year that runs from Jan. 1, 2017 through Dec. 31, 2017, Form 5500 is due Oct. 15, 2018. Most

[10] 2017 ratios reflect a partial year of reporting. Compared to 2016, data reflect approximately 89% of plans reporting.
[11] Internal Revenue Code §430 and accompanying regulations set forth funding requirements for single employer pension plans, including the interest rates used to discount liabilities.

plans file on or immediately before the deadline. Thus, the 2017 data included in our analysis reflects primarily plans with calendar year plan years plus any plans that filed earlier than required.

- Other than exclusions or adjustments for obvious errors, data were used as reported. The use of the reported values is not intended to provide commentary on the appropriateness of the underlying assumptions and methods for funding these plans or for any other purpose.
- Data in the DOL database for previous years may have changed, and authors' criteria for errors and missing data may differ slightly from some previous analyses. Consequently, results for previously published years may differ.

Table 2
SUMMARY OF DATA INCLUDED

	Excluded	Included in Study	
Plan Year	Number of Plans	Number of Plans	Number of Participants (Millions)
2009	2,427	38,314	32.94
2010	2,919	38,012	34.23
2011	2,724	37,231	33.11
2012	3,014	36,515	32.10
2013	4,336	35,887	34.19
2014	4,468	36,841	30.94
2015	4,231	37,791	28.81
2016	4,104	38,623	28.18
2017	3,797	34,326	23.71

The techniques and assumptions used were developed for the single employer sector as a whole and may not be appropriate for any given plan or small set of plans. Modifications to the assumptions and methods used may result in different numerical outcomes, but the overall conclusions are likely to be similar.

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- Thomas P. Clemens, FSA, EA
- Jason D. Melbye, FSA, EA

Appendix

For readers who prefer numerical details, Table 3 provides the percentages graphed in Figure 1, and Table 4 provides the percentages graphed in Figure 2. Percentages for a year may not add to 100% because of rounding.

Table 3
CONTRIBUTION RATIOS USING SMOOTHED DISCOUNT RATES (FIGURE 1)
PERCENTAGE OF PLANS AS WEIGHTED BY LIABILITIES

	Contribution Ratio Range					
Year	**0%–49%**	**50%–99%**	**100%–149%**	**150%–199%**	**200%+**	**Benchmark=0**
Reduce UL						
2009	15%	7%	7%	6%	22%	43%
2010	21%	5%	8%	6%	21%	38%
2011	8%	7%	7%	7%	25%	46%
2012	8%	1%	3%	3%	15%	70%
2013	2%	1%	3%	3%	13%	78%
2014	2%	1%	1%	2%	5%	89%
2015	2%	2%	1%	1%	5%	89%
2016	6%	5%	4%	3%	10%	73%
2017‡	2%	1%	3%	3%	14%	76%
7-Year Funding						
2009	18%	11%	6%	6%	15%	43%
2010	24%	11%	10%	6%	11%	38%
2011	10%	10%	14%	6%	13%	46%
2012	10%	2%	6%	4%	8%	70%
2013	4%	2%	4%	5%	8%	78%
2014	2%	2%	2%	1%	3%	89%
2015	3%	2%	2%	1%	3%	89%
2016	7%	7%	4%	2%	7%	73%
2017‡	3%	4%	4%	1%	12%	76%
MRC						
2009	0%	0%	16%	3%	28%	52%
2010	0%	0%	23%	4%	25%	48%
2011	0%	1%	28%	6%	15%	51%
2012	1%	0%	15%	2%	7%	76%
2013	0%	0%	9%	3%	6%	82%
2014	0%	0%	6%	1%	2%	92%
2015	0%	0%	7%	1%	2%	91%
2016	0%	0%	12%	2%	7%	79%
2017‡	0%	0%	7%	1%	13%	78%

Table 4

CONTRIBUTION RATIOS USING UNSMOOTHED DISCOUNT RATES (FIGURE 2)
PERCENTAGE OF PLANS AS WEIGHTED BY LIABILITIES

	Contribution Ratio Range					
Year	0%–49%	50%–99%	100%–149%	150%–199%	200%+	Benchmark=0
Reduce UL						
2009	29%	13%	12%	8%	18%	20%
2010	34%	8%	10%	10%	19%	19%
2011	16%	13%	9%	8%	29%	25%
2012	35%	20%	12%	10%	15%	8%
2013	39%	14%	13%	6%	11%	16%
2014	33%	12%	10%	5%	14%	28%
2015	44%	15%	9%	6%	11%	16%
2016	30%	16%	8%	8%	17%	22%
2017‡	29%	12%	8%	5%	22%	23%
7-Year Funding						
2009	37%	18%	14%	6%	5%	20%
2010	40%	17%	9%	6%	9%	19%
2011	24%	18%	13%	7%	14%	25%
2012	50%	24%	10%	2%	6%	8%
2013	48%	24%	6%	3%	3%	16%
2014	39%	16%	11%	3%	4%	28%
2015	54%	16%	7%	4%	4%	16%
2016	42%	13%	10%	5%	8%	22%
2017‡	38%	12%	7%	11%	8%	23%

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The Society of Actuaries (SOA), formed in 1949, is one of the largest actuarial professional organizations in the world, dedicated to serving 30,000 actuarial members and the public in the United States, Canada and worldwide. In line with the SOA Vision Statement, actuaries act as business leaders who develop and use mathematical models to measure and manage risk in support of financial security for individuals, organizations and the public.

The SOA supports actuaries and advances knowledge through research and education. As part of its work, the SOA seeks to inform public policy development and public understanding through research. The SOA aspires to be a trusted source of objective, data-driven research and analysis with an actuarial perspective for its members, industry, policymakers and the public. This distinct perspective comes from the SOA as an association of actuaries, who have a rigorous formal education and direct experience as practitioners as they perform applied research. The SOA also welcomes the opportunity to partner with other organizations in our work where appropriate.

The SOA has a history of working with public policymakers and regulators in developing historical experience studies and projection techniques as well as individual reports on health care, retirement and other topics. The SOA's research is intended to aid the work of policymakers and regulators and follow certain core principles:

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