PUBLIC SECTOR PENSION PLANS AND DISCOUNT RATES UNDER GASB STANDARDS: THE VALUATION DEBATE

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ABSTRACT

In Statements 25, 27, and 50, the Governmental Accounting Standards Board (GASB) requires state and local governments to disclose the funded status of their defined benefit pension plans in footnote disclosures and required supplemental information. The funded status of these plans is the difference between the actuarial value of plan assets and the actuarial accrued liability, calculated using the investment rate of return. Critics find that the rate used to value the pension liability is unrealistic and understates the actuarial accrued liability. In 2011 the Actuarial Standards Board (ASB) and GASB issued exposure drafts that propose fundamental changes in the selection of the discount rate. This paper uses the proposed discount rate guidance to recalculate the accrued liabilities of state pension plans.

INTRODUCTION

The issue of state and local defined pension plans has attracted interest in recent years. While some observers criticize these plans as overly generous to employees in the public sector, others worry that these pensions are severely underfunded and liable to cost taxpayers far more in the future than financial statement disclosures indicate. At issue is the discount rate used to value the actuarial accrued liability. Current GASB standards specify that the investment rate of return used to calculate plan asset values should also be used to compute the actuarial present value of the pension liability. This rate is typically around 8% and results in a lower liability than a lower, risk-free rate.

This paper first summarizes current GASB standards and required disclosures. It then reviews the position of critics who recommend the use of a discount rate that reflects the very low risk that governments will default on their pension obligations. The lower discount rates will increase the reported liabilities under most plans. The Actuarial Standards Board and GASB have both issued exposure drafts proposing changes in the selection of the discount rate. These changes are presented in the next sections of the paper. Finally, the proposed composite discount rates are applied to current pension data reported by 46 state pension plans to determine the effect of the exposure drafts on funded status of the plans.

PUBLIC SECTOR PENSIONS AND GOVERNMENTAL ACCOUNTING STANDARDS

Accounting Standards For Public Sector Pensions

The Governmental Accounting Standards Board (GASB) has issued three standards that establish accounting for public sector defined benefit pension plans at the state and local level. They are:

GASB No. 25 Financial Reporting for Defined Benefit Pension Plans and Note Disclosures for Defined Contribution Plans (1994)

GASB No. 27 Accounting for Pensions by State and Local Governmental Employers (1997)

GASB No. 50 Pension Disclosures: An Amendment of GASB Statements No. 25 and 27 (2007)

These statements have been codified, along with other related standards and technical bulletins, into Section Pe5 and Section P20. **Section Pe5** *Pension Plans—Defined Benefit* determines financial reporting standards for defined benefit plans. It sets out the financial reporting framework to be followed by the administrators of such plans, to include two financial statements, two schedules, and additional disclosures, as follows:

- Statement of Plan Net Assets, listing plan assets, liabilities, and net assets as of the end of the plan's fiscal year. These items are measured on the accrual basis []e5.112-119).
- Statement of Changes in Plan Net Assets, showing additions and deductions from plan net assets over the fiscal year. Additions to the plan include contributions from the plan employer and members and net investment income. Deductions include benefits and refunds paid to beneficiaries and total administrative expense during the year [Pe5.120-123].
- Notes to the Financial Statements, to include a description of the plan, summary of significant accounting policies, and information on contributions, funded status, and actuarial methods and assumptions [Pe5.124].
- Required Supplementary Information, presented immediately after the notes to the financial statements:
    - Schedule of Funding Progress covering six consecutive years.
    - Schedule of Employer Contributions covering six consecutive years [Pe5.125-126].
- The Parameters, setting out guidance on the actuarial valuation of total projected benefits and designating Actuarial Standard of Practice No. 4, *Measuring Pension Obligations*, as the guide to selection of actuarial assumptions including discount rates.

Section P20 ***Pension Activities—Employer Reporting*** addresses accounting and financial reporting standards for pension expenditures/expense, pension assets and liabilities, note disclosures and required supplementary information to be disclosed by employers, as opposed to the plans themselves. There is considerable overlap between the requirements of Section Pe5 and P20. However, P20 provides specific guidance to employers in the disclosure of the annual required contribution (ARC), annual pension cost, and net pension obligation (NPO). This guidance is summarized below.

Annual Required Contribution (ARC). The ARC is the actuarially determined amount to be contributed to the plan annually. Actuaries may use one of six methods to calculate the amount that must be contributed so that future benefits can be paid out under the terms of the defined benefit pension. In the simplest of cases, the ARC comprises the *normal cost*, the amount of coverage added during the current year by future beneficiaries of the plan [Pe5.128, P20.106-107].

Normal Cost. The normal cost of the plan equals the actuarial present value of future benefits allocated to the current year. It is usually calculated as a level dollar or level percentage of covered payroll.

Amortization of Unfunded Actuarial Accrued Liability (UAAL). If the plan is underfunded, the ARC also includes an amount equal to one year's amortization of the unfunded actuarial accrued liability (UAAL). The maximum amortization period is currently 30 years (P20.107f). The UAAL is the difference between the value of plan assets and the actuarial present value of total projected benefits under the plan; it can be either positive (liability > plan assets) or negative (liability < plan assets). Typically, the unfunded liability comes from transition amounts, plan amendments that increase future benefits, and contribution deficiencies.

Annual Pension Cost. In the simplest case, the annual pension cost is equal to the ARC. Often, however, past contributions to the plan are less than the ARC, thereby creating the **Net Pension Obligation** (NPO). (P20.108) When there is a beginning balance in the NPO, the annual pension cost includes one year's interest on the NPO and an adjustment to avoid double counting. [P20.105] The adjustment is equal to the discounted present value of the beginning NPO balance for the year, using the same amortization method as applied to the ARC for that year [P20.108-110].

The Discount Rate

The calculations underlying the ARC, plan assets, present value of projected benefits liability, and annual pension cost all require actuarial parameters, including actuarial assumptions and economic assumptions. A brief quote from the Pew Charitable Trust study of public sector retirement plans illustrates the issue at hand: "Tiny variations in these assumptions cascade like numerical snowballs into dramatic differences between states." [Pew Center on the States, 2006, 22] Such variations can greatly affect the value of plan assets and the unfunded liability.

Principal among these assumptions are the investment rate of return and the discount rate. At present GASB standards do not distinguish between these two rates and in fact merely specify that the "**investment return (discount rate)"** is to be disclosed along with other significant assumptions. [Pe5.124d.2] The standards specify further that all actuarial assumptions should be selected in accordance with the current version of Actuarial Standard of Practice (ASOP) No. 4, *Measuring Pension Obligations* and that actuarial assumptions "should be based on the actual experience of the covered group . . .but should emphasize expected long-term future trends rather than give undue weight to recent past experience" [P20.107b]. The requirement that actuaries use the investment rate of return to value pension liabilities has caused considerable discussion and criticism.

CRITIQUE OF THE DISCOUNT RATE USED IN PUBLIC SECTOR PENSION ACCOUNTING

Under current governmental accounting standards the investment rate of return—the long-term estimated investment yield—is used not only for calculating the expected (budgeted) return on plan assets, but also for calculating the present value of future benefits under the pension plan. This rate is prescribed in ASOP No. 27 and throughout pension-related governmental accounting standards. The underlying belief is that future pension benefits will be paid out of pension assets and accumulated earnings, and there is thus a long-term link between plan assets and pension liabilities.

The use of the investment rate of return as a liability discount rate strikes commentators in the financial sector and academic researchers as problematic. Investment rates of return reported by state and local pension plans are typically in the 7.5-8.25% range, as reported in the Public Plans Database - Center for Retirement Research at Boston College (2011) and in the Public Fund Survey (2007). This rate strikes many observers as an unrealistic, if not unsustainable, rate that overstates the probable returns on plan assets. After the market declines of recent years, "many of the America's largest pension funds are sticking to expectations of fat returns on their investments even after a decade of paltry gains, which could leave U.S. retirement plans facing an even deeper funding hole and taxpayers on the hook for huge additional contributions," notes David Reilly, a Wall Street Journal financial analyst. Reilly argues that "return assumptions can affect the size of so-called funding gaps—the amounts by which future liabilities to retirees exceed current pension assets. That's because government plans use the return rates to calculate how much money they need to meet their future obligations to retirees. When there are funding gaps, plans have to get more contributions from either employers or employees." [Reilly, D., 2010].

When the investment rate of return is used to calculate the present value of the projected liability, critics argue that the resulting valuation clearly understates state and local commitments under public pension plans. John Bogle, the founder of Vanguard Group, appeared before the House of Representatives committee exploring retirement security in February 2009. In his remarks he noted the inadequacy of national savings being directed into retirement plans:

> The whole retirement system, in fact, in the country is in, I think, very poor shape, and it's going to be the next big financial crisis in the country, I honestly believe. . . . The private pension plans are underfunded by an estimated $400 billion, and the state and local government plans are under funded by am estimated $800 billion. That's a $1.2 trillion shortfall between the assets the plans

have and the liabilities they will have to the pensioners as they pay out their retirement checks over the rest of their lifetimes." [Bogle 2009]

The use of discount rates in the 7.5-8.25% range not only paints an overly optimistic picture of plan assets and the ability of governments to pay future retirement benefits, but, more importantly, it understates the public sector pension liability. Novy-Marx and Rauh (2010) maintain that pension plans should value the liability by using market-based discount rates that reflect the risk profile of governments' pension liabilities. They argue that the use of a lower, risk-free rate is appropriate because these liabilities are highly unlikely to result in default. Brown and Wilcox examine the extent to which states have backed their pension obligations. They find that a majority of states explicitly protect public-sector pensions through provisions in their state constitutions. On examining cases of severe financial distress, as, for example, in New York City during the 1970s and Orange County, California in the early 1990s, Brown and Wilcox find that defined benefit pension liabilities were paid as promised even as public employees were laid off and other financial commitments were called into question [Brown and Wilcox, 2009, 2-3]. Munnell (April 2010) examined actions taken by the states between 2007 and 2009 in response to the financial crisis. States employed numerous tactics to increase plan funding, control required contributions and/or reduce the unfunded liability. Among these actions were the following:

- Approve pension obligation bonds to pay down the liability[1]
- Extend amortization periods to smooth pension asset values
- Extend amortization periods to reduce the ARC
- Increase/decrease contribution rates of employers, employees, or both.
- Prohibit benefit increases in underfunded plans
- Lower salary growth assumptions and/or delay adoption of new mortality tables [Munnell, April 2010]

The fact that states have the ability to adopt one or more of theses tactics to maintain their pension funds supports the assertion of some that pension benefits are in effect guaranteed and that a low-risk or risk-free rate is therefore appropriate.

Novy-Marx and Rauh (2010) and Munnell et al. (June 2010) study various low-risk rates and reach interesting conclusions. Munnell states that the rate on 30-year Treasury bonds, then about 4%, is probably less than the riskless rate because Treasury bonds offer liquidity to the markets; she suggests that 5% would be a realistic discount rate and projects that lowering the discount rate from 8% to 5% would have increased 2009 state and local pension liabilities from $3.4 trillion to $4.9 trillion [Munnell, June 2010].[2] Novy-Marx and Rauh (2010) state that current discount rates are almost certainly understated. They find that under current accounting standards, the estimated present value of all state pension liabilities based on current salary levels (the accumulated benefit obligation (ABO) is $3.14 trillion and an unfunded liability of $1.20 trillion as of June 2009. They examine several possible discount rates, including the municipal bond rate and the zero-coupon Treasury rate. These rates result in total liabilities of $3.20 trillion and $4.43 trillion respectively. These figures would increase if larger measures of the liability—the projected benefit obligation (PBO) or entry age normal (EAN)--are employed [Novy-Marx and Rauh, 2010].

EXPOSURE DRAFTS ISSUED BY ASB AND GASB IN 2011

The Actuarial Standards Board and Governmental Accounting Standards Board have each issued exposure drafts (ED) of interest here. The ASB issued the proposed revision of ASOP No. 27 entitled "Selection of Economic Assumptions for Measuring Pension Obligations" in January 2011. In June

[1] But see Calabrese (2010) on the dangers of using of pension obligation bonds to finance contributions to defined benefit plans.

[2] Munnell (June 2010) also points out that while valuation of the liability depends on the discount rate, the payment of actual benefits does not.

2011 GASB issued an exposure draft entitled "Accounting and Financial Reporting for Pensions; An Amendment of GASB Statement No. 27."

The ASB weighs in on the discount rate controversy by reworking section 3.6 of ASOP No. 27. In the current document, section 3.6 is very clear. It states:

> 3.6 Selecting an Investment Return Assumption and a Discount Rate—The investment return assumption reflects anticipated returns on the plan's current and future assets. The discount rate is used to determine the present value of expected future plan payments. Generally, the appropriate discount rate is the same as the investment return assumption.

The exposure draft breaks the link between the investment rate of return and the discount rate, a fact celebrated by several respondents during the comment period. In the proposed standard, the new section 3.6 addresses the investment return, while section 3.7 sets out guidance for the separate selection of the discount rate:

> 3.7 Selecting a Discount Rate—The discount rate is used to measure the present value of expected future plan payments. The discount rate may be a single rate or a series of rates, such as a yield curve. The actuary should consider the purpose of the measurement as a primary factor in choosing a discount rate.

The ED lists several measurement purposes—contribution budgeting, settlement, market measurements, and pricing. The discount rate could be chosen to answer the needs of different parties such as creditors and the governmental entity responsible for funding future benefits, with the result that actuaries may need to measure the pension obligation from more than one perspective [Proposed Revision of ASOP No. 27, 3.6-7].

In June 2011, GASB issued the proposed amendment of GASB No. 27. The ED offers guidance on accounting for pension plans by state and local government employers where defined benefits are provided through qualified trusts. There are numerous profound changes contained in the ED, discount rates, discussed in sections 22-25 (single and agent employers) and sections 53-56 (cost-sharing employers), among them. The guidance is the same for both types of employers. The ED proposes the following:

- The discount rate should be a single, composite rate that combines both (1) the **rate of return on the investment** to the extent that future benefits are to be paid out of plan assets and (2) **an index rate for a 30-year, tax-exempt municipal bond rated AA/Aa or higher** to the extent that plan assets are insufficient to cover promised benefits.
- Calculation of the composite rate requires an assessment of the plan net position; that is, projections of cash flows into the plan, presumably due to contributions and earnings, and cash flows out of the plan in the form of benefit payments to current and former employees.
- The actuary will have to project these cash inflows and outflows year-by-year to determine the future annual plan net position and the total present value of projected benefit payments.
- The discount rate will be the single rate of return that when applied to all projected benefit payments equals the sum of present values already computed [GASB, ED 22-25, 53-56].

GASB has clearly tried to steer a course between the two extreme positions on the discount rate issue. On the one hand, some observers support the linkage between the investment rate of return on plan assets and the liability discount rate. On the other, some argue that the only appropriate discount rate is a lower, risk-free rate applied to the entire pension liability. The research briefly described above has already examined the use of a single low-risk rate to discount future pension benefits to the present. This study will examine the use of a composite rate, such as the one described in the ED.

SAMPLE AND METHODOLOGY

The study uses data from the Public Plans Database.[3] This database provides complete plan-level information on participants, governance, finance, and investments for 126 state and local defined benefit pension plans.[4] Specifically, this study selects one major defined benefit pension fund from each state for FY 2009 to be included the sample. Five states were not represented in the sample. The Public Plans Database had no listing of a defined benefit for Nebraska in FY 2009. Missing data elements in the records of the defined benefit plans for Connecticut, New York State & Local ERS, and Utah Noncontributory resulted in their elimination from the sample. South Dakota was eliminated because it uses an amortization period of one hundred years. The final sample is forty-five observations.

The key data elements in this study include the actuarial value of assets, actuarial value of liabilities, and unfunded actuarial accrued liability.[5] The actuarial value of assets is the asset value used for valuation purpose. Generally, it is based on the current market value of plan assets plus a portion of prior years' unrealized gains and losses. The actuarial value of accrued liabilities is defined as the present value of future benefits for accrued service. Plans may report the accrued liability using two liability concepts: the projected benefit obligation and the accumulated benefit obligation.[6] Historically; the public sector plans use the projected benefit obligation, while the private sector uses the accumulated benefit obligation [See the Public Plans Database]. The unfunded actuarial accrued liability is the arithmetic difference between the actuarial value of accrued liabilities and the actuarial value of assets. It represents the unfunded pension liability.

The purpose of this study is to examine the effect of a change in discount rates and discount period on the unfunded actuarial accrued liability. The first step in our methodology is to reverse the discounting to present value of the individual state's actuarial accrued liability by calculating the future value of the actuarial accrued liability using the individual states discount rate and period. Table 1 lists the states' discount rates and periods and projected actuarial value of assets, projected value of actuarial accrued liabilities, and projected unfunded actuarial accrued liabilities.

The second step in our methodology is to discount to present value the projected actuarial valued of assets, projected value of actuarial accrued liabilities, and projected unfunded actuarial accrued liabilities using the rates specified in the Proposed Statement of the Governmental Accounting Standards Board Accounting and Financial Reporting for Pensions an amendment of GASB Statement No. 27. As mentioned earlier in this paper, the GASB requires that the unfunded portion of the liability be discounted to present value using an index rate for a 30-year, tax-exempt municipal bond rated AA/Aa or higher (or equivalent quality on another rating scale). Tables 2, 3, and 4 show the calculated values of the unfunded actuarial accrued liability discounted at the AAA, AA, and A rated bonds over a 30-year period.[7]

RESULTS

[3] See: http://pubplans.bc.edu/pls/htmldb/f?p=198:20:2640064138182647::NO:RP::,

[4] Data currently spans fiscal years 2001 through 2009.

[5] Sample statistics for these data elements are contained in Table 1.

[6] The accumulated benefit obligation is the actuarial present value of benefits (vested or unvested) attributed by the pension benefit formula to employee services rendered before a specific date, and based on employee service and compensation prior to that date. The projected benefit obligation is the actuarial present value as of a date of all benefits attributed by the pension benefit formula to employee service rendered prior to that date. The PBO is measured using assumptions as to future compensation levels if the pension benefit formula is based on those future compensation levels. The PBO liability concept typically includes the present value of: the remaining pension benefits to be paid to current retired employees, retirement benefits earned to date by active employees based on their current salaries and years of service, and the effect of future salary increases on the value of benefits already earned by active workers.

[7] This study used the FMS Bonds, Inc., Municipal Bonds market index rate for 30-year bonds. AAA, AA, and A rated bonds had yields listed at 3.95, 4.60, and 5.65, respectively. See http://www.fmsbonds.com/Market_Yields/index.asp

The impact of the adoption of the GASB exposure draft on unfunded actuarial accrued liabilities is more severe as discount rates decline. Therefore, the 30-year AAA tax-free municipal bond index rate (3.95%) results in an average unfunded actuarial accrued liability increase of $10.5 billion while the 30-year A bond index rate (5.65%) results in a more modest average unfunded actuarial accrued liability increase of $4.1 billion. It should be noted that the distribution of unfunded actuarial accrued liabilities are skewed by five large observations. California (15.82%), Ohio (8.57%), New Jersey (7.81%), Illinois (7.89%), and Florida (7.19%) comprise 47.28% of the total unfunded actuarial accrued liability. The median unfunded actuarial liability increase for the 30-year AAA bond is $4.7 billion.

The potential implementation of the exposure draft would not result in an increase in unfunded actuarial accounting liability for all states. For example, if Washington State, North Carolina, and Minnesota used the 30-year AAA tax-free municipal index rate used in this study, their unfunded actuarial accrued liabilities would decline by $1.37 billion, $974 million, and $345 million, respectively. This results from their current use of short discount periods rather than the proposed 30-year period. Washington, North Carolina, and Minnesota use discount period of 10, 9, and 11 years, respectively.

CONCLUSION

Current GASB standards governing financial reporting for public retirement plans call for the use of the investment rate of return as the liability discount rate. Critics of these standards point out that unfunded liabilities of state and local governments are unlikely to end in default and are therefore riskfree. They find that appropriate discount rate should reflect the low-risk market rate. The recent exposure drafts of ASB and GASB break the link between the investment rate of return and the discount rate. GASB offers a new concept: a single composite rate combining the investment rate of return to the extent that plan assets are sufficient to fund future benefits and a low-risk rate to the exten that future benefits are currently unfunded.

We examine the application of the A, AA, AAA 30-year municipal bond rate to unfunded liabilities of 45 state retirement plans. Using an approximation of the composite rate, we find that the accrued liability increases in most—but not all—cases. Rather than the sharp increase in the liability reported by critics, we find a more moderated increase and, in the case of several state plans, a decrease in the accrued liability. This may be exactly the result desired by GASB: a move to a more theoretically sound discount rate, but one that does not cause major dislocations in the accounting for state and local retirement plans.

Table 1 State Defined Pension Benefit Data (2009) and Future Value Projects

State System	Actual State Defined Benefit Pension Data FY 2009					Future Value Based on Actual Amortization Rate & Period		
Defined Benefit Plan	Actuarial Value of Assets (2009) in Thousands $	Actuarial Value of Accrued Liabilities 2009 in Thousands $	UAAL in Thousands $	Amortization Period	Amortization Rate	Actuarial Value of Assets in Thousands $	Actuarial Value of Accrued Liabilities in Thousands $	UAAL in Thousands $
Alabama ERS	$ 9,828,104	$ 13,756,176	$ 3,928,072	30	8.00%	$98,896,838	$138,423,679	$39,526,841
Alaska PERS	$ 6,108,528	$ 9,702,086	$ 3,593,558	25	8.25%	$44,323,515	$70,398,393	$26,074,878
Arizona SRS	$ 27,094,000	$ 34,290,000	$ 7,196,000	30	8.00%	$272,637,626	$345,048,505	$72,410,879
Arkansas PERS	$ 5,413,000	$ 6,938,000	$ 1,525,000	30	8.00%	$54,469,162	$69,814,713	$15,345,552
California PERF	$ 244,964,000	$ 294,042,000	$ 49,078,000	28	7.75%	$1,980,551,192	$2,377,350,279	$396,799,086
Colorado State	$ 13,382,736	$ 19,977,217	$ 6,594,481	30	8.00%	$134,665,881	$201,023,880	$66,358,000
Delaware State Employees	$ 6,744,050	$ 6,827,006	$ 82,956	20	8.00%	$31,433,728	$31,820,382	$386,654
Florida RS	$ 118,764,692	$ 136,375,597	$ 17,610,905	30	7.75%	$1,114,822,465	$1,280,132,813	$165,310,348
Georgia ERS	$ 13,613,606	$ 15,878,022	$ 2,264,416	30	7.50%	$119,186,510	$139,011,371	$19,824,861
Hawaii ERS	$ 11,400,100	$ 17,636,400	$ 6,236,300	28	8.00%	$99,875,408	$154,511,157	$54,635,749
Idaho PERS	$ 8,646,000	$ 11,732,000	$ 3,086,000	25	7.75%	$55,878,817	$75,823,535	$19,944,718
Illinois SERS	$ 10,999,954	$ 25,298,346	$ 14,298,392	30	8.50%	$127,140,236	$292,404,649	$165,264,413
Indiana PERF	$ 12,569,335	$ 13,506,280	$ 936,945	30	7.25%	$102,619,839	$110,269,340	$7,649,501
Iowa PERS	$ 21,123,980	$ 26,018,594	$ 4,894,614	30	7.50%	$184,939,498	$227,791,625	$42,852,126
Kansas PERS	$ 13,461,221	$ 21,138,206	$ 7,676,985	23	8.00%	$79,037,070	$124,112,208	$45,075,138
Kentucky ERS	$ 5,297,115	$ 11,332,961	$ 6,035,847	28	7.75%	$42,827,545	$91,627,790	$48,800,245
Louisiana SERS	$ 8,499,662	$ 13,986,847	$ 5,487,185	30	8.25%	$91,672,443	$150,854,050	$59,181,607
Maine State and Teacher	$ 8,383,147	$ 12,377,262	$ 3,994,115	19	7.75%	$34,620,665	$51,115,534	$16,494,869
Maryland PERS	$ 9,230,381	$ 15,080,783	$ 5,850,402	30	7.75%	$86,643,900	$141,560,555	$54,916,655
Massachusetts SERS	$ 19,019,062	$ 24,862,421	$ 5,843,359	15	8.25%	$62,460,818	$81,651,091	$19,190,273
Michigan SERS	$ 11,106,969	$ 14,233,710	$ 3,126,740	27	8.00%	$88,723,152	$113,699,747	$24,976,595
Minnesota State Employees	$ 9,030,401	$ 10,512,760	$ 1,482,359	11	8.50%	$22,153,082	$25,789,556	$3,636,474
Mississippi PERS	$ 20,597,581	$ 30,594,546	$ 9,996,965	30	8.00%	$207,266,390	$307,862,419	$100,596,029
Missouri State Employees	$ 7,876,079	$ 9,494,807	$ 1,618,727	30	8.50%	$91,033,707	$109,743,365	$18,709,658
Montana PERS	$ 4,002,212	$ 4,792,819	$ 790,607	40	8.00%	$86,946,141	$104,121,706	$17,175,565
Nevada Regular Employees	$ 19,158,282	$ 26,087,621	$ 6,929,338	30	8.00%	$192,783,222	$262,510,775	$69,727,553
New Hampshire Retirement System	$ 4,937,320	$ 8,475,052	$ 3,537,732	28	8.50%	$48,475,679	$83,209,906	$34,734,227
New Jersey PERS	$ 28,858,234	$ 44,470,403	$ 15,612,169	30	8.25%	$311,248,235	$479,632,074	$168,383,838
New Mexico PERF	$ 12,553,986	$ 14,908,279	$ 2,354,293	30	8.00%	$126,326,453	$150,016,898	$23,690,445
North Carolina Teachers & State Employees	$ 55,818,099	$ 58,178,272	$ 2,360,173	9	7.25%	$104,797,458	$109,228,640	$4,431,182
North Dakota PERS	$ 1,617,148	$ 1,901,201	$ 284,053	20	8.00%	$7,537,457	$8,861,415	$1,323,959
Ohio PERS	$ 57,629,000	$ 76,555,000	$ 18,926,000	30	8.00%	$579,900,854	$770,346,698	$190,445,844
Oklahoma PERS	$ 6,208,245	$ 9,291,458	$ 3,083,213	18	7.50%	$22,820,294	$34,153,579	$11,333,285
Oregon PERS	$ 47,828,900	$ 56,748,100	$ 8,919,200	30	8.00%	$481,285,810	$571,036,659	$89,750,849
Pennsylvania State ERS	$ 30,204,693	$ 35,797,017	$ 5,592,324	30	8.00%	$303,939,462	$360,213,100	$56,273,638
Rhode Island ERS	$ 6,655,012	$ 11,383,207	$ 4,728,195	20	8.25%	$32,486,802	$55,567,742	$23,080,940
South Carolina RS	$ 25,183,062	$ 37,150,315	$ 11,967,253	30	8.00%	$253,408,512	$373,830,873	$120,422,361
Tennessee State and Teachers	$ 26,335,199	$ 29,054,967	$ 2,719,767	20	7.50%	$111,868,005	$123,421,172	$11,553,167
Texas ERS	$ 23,509,622	$ 26,191,650	$ 2,682,028	30	8.00%	$236,569,260	$263,557,587	$26,988,328
Vermont State Employees	$ 1,217,638	$ 1,544,144	$ 326,506	29	8.50%	$12,971,213	$16,449,405	$3,478,192
Virginia Retirement System	$ 53,185,000	$ 66,323,000	$ 13,138,000	20	7.50%	$225,921,961	$281,730,229	$55,808,268
Washington PERS 1	$ 9,775,600	$ 13,984,500	$ 4,208,900	10	8.00%	$21,104,787	$30,191,487	$9,086,699
West Virginia PERS	$ 3,248,270	$ 4,930,158	$ 1,681,888	26	7.50%	$21,294,733	$32,320,711	$11,025,979
Wisconsin Retirement System	$ 78,911,300	$ 79,104,600	$ 193,300	20	7.80%	$354,416,894	$355,285,068	$868,175
Wyoming Public Employees	$ 5,742,542	$ 6,565,676	$ 823,134	30	8.00%	$57,785,227	$66,068,142	$8,282,916
Mean	**$ 25,016,290**	**$ 31,311,766**	**$ 6,295,476**	**$ 26**	7.95%	**$ 196,039,288**	**$ 249,857,656**	**$ 53,818,368**
Median	**$ 11,400,100**	**$ 15,080,783**	**$ 3,994,115**	**$ 30**	8.00%	**$ 98,896,838**	**$ 124,112,208**	**$ 26,074,878**
Minimum	**$ 1,217,638**	**$ 1,544,144**	**$ 82,956**	**$ 9**	7.25%	**$ 7,537,457**	**$ 8,861,415**	**$ 386,654**
Maximum	**$ 244,964,000**	**$ 294,042,000**	**$ 49,078,000**	**$ 40**	8.50%	**$ 1,980,551,192**	**$ 2,377,350,279**	**$ 396,799,086**

Source Data Public Plans Database: State and Local Defined Benefit Plans, http://pubplans.bc.edu/pls/htmldb/f?p=198:20:4380850194532719::NO:RP::, September 2, 2011

Table 2 State Defined Pension Benefit Plans: Projected UAAL at 30-Year AAA Tax-Free Municipal Bond Rate

State System	Projected Unfunded Actuarial Accrude Liability AAA rated tax-free 30 Year Municipal Bond (3.95%)				
Defined Benefit Plan	Actuarial Value of Assets (2009) in Thousands $	Projected Value of Accrued Actuarial Liabilities	Projected UAAL	2009 UAAL	Projected UAAL - 2009 UAAL
Alabama ERS	$ 9,828,104	$ 22,192,056	$ 12,363,952	$ 3,928,072	$ 8,435,880
Alaska PERS	$ 6,108,528	$ 14,264,721	$ 8,156,193	$ 3,593,558	$ 4,562,635
Arizona SRS	$ 27,094,000	$ 49,744,042	$ 22,650,042	$ 7,196,000	$ 15,454,042
Arkansas PERS	$ 5,413,000	$ 10,213,071	$ 4,800,071	$ 1,525,000	$ 3,275,071
California PERF	$ 244,964,000	$ 369,082,310	$ 124,118,310	$ 49,078,000	$ 75,040,310
Colorado State	$ 13,382,736	$ 34,139,444	$ 20,756,708	$ 6,594,481	$ 14,162,227
Delaware State Employees	$ 6,744,050	$ 6,864,995	$ 120,945	$ 82,956	$ 37,989
Florida RS	$ 118,764,692	$ 170,473,584	$ 51,708,892	$ 17,610,905	$ 34,097,987
Georgia ERS	$ 13,613,606	$ 19,814,800	$ 6,201,194	$ 2,264,416	$ 3,936,778
Hawaii ERS	$ 11,400,100	$ 28,490,101	$ 17,090,001	$ 6,236,300	$ 10,853,701
Idaho PERS	$ 8,646,000	$ 14,884,685	$ 6,238,685	$ 3,086,000	$ 3,152,685
Illinois SERS	$ 10,999,954	$ 62,694,477	$ 51,694,523	$ 14,298,392	$ 37,396,131
Indiana PERF	$ 12,569,335	$ 14,962,090	$ 2,392,755	$ 936,945	$ 1,455,810
Iowa PERS	$ 21,123,980	$ 34,528,077	$ 13,404,097	$ 4,894,614	$ 8,509,483
Kansas PERS	$ 13,461,221	$ 27,560,674	$ 14,099,453	$ 7,676,985	$ 6,422,468
Kentucky ERS	$ 5,297,115	$ 20,561,777	$ 15,264,662	$ 6,035,847	$ 9,228,815
Louisiana SERS	$ 8,499,662	$ 27,011,602	$ 18,511,940	$ 5,487,185	$ 13,024,755
Maine State and Teacher	$ 8,383,147	$ 13,542,724	$ 5,159,576	$ 3,994,115	$ 1,165,461
Maryland PERS	$ 9,230,381	$ 26,408,249	$ 17,177,868	$ 5,850,402	$ 11,327,466
Massachusetts SERS	$ 19,019,062	$ 25,021,758	$ 6,002,696	$ 5,843,359	$ 159,337
Michigan SERS	$ 11,106,969	$ 18,919,620	$ 7,812,651	$ 3,126,740	$ 4,685,911
Minnesota State Employee	$ 9,030,401	$ 10,167,886	$ 1,137,485	$ 1,482,359	$ (344,874)
Mississippi PERS	$ 20,597,581	$ 52,063,906	$ 31,466,325	$ 9,996,965	$ 21,469,360
Missouri State Employees	$ 7,876,079	$ 13,728,440	$ 5,852,360	$ 1,618,727	$ 4,233,633
Montana PERS	$ 4,002,212	$ 9,374,710	$ 5,372,498	$ 790,607	$ 4,581,890
Nevada Regular Employees	$ 19,158,282	$ 40,968,983	$ 21,810,700	$ 6,929,338	$ 14,881,362
New Hampshire Retirement	$ 4,937,320	$ 15,802,147	$ 10,864,827	$ 3,537,732	$ 7,327,095
New Jersey PERS	$ 28,858,234	$ 81,528,510	$ 52,670,276	$ 15,612,169	$ 37,058,107
New Mexico PERF	$ 12,553,986	$ 19,964,331	$ 7,410,345	$ 2,354,293	$ 5,056,052
North Carolina Teachers &	$ 55,818,099	$ 57,204,168	$ 1,386,069	$ 2,360,173	$ (974,104)
North Dakota PERS	$ 1,617,148	$ 2,031,281	$ 414,133	$ 284,053	$ 130,080
Ohio PERS	$ 57,629,000	$ 117,200,247	$ 59,571,247	$ 18,926,000	$ 40,645,247
Oklahoma PERS	$ 6,208,245	$ 9,753,284	$ 3,545,039	$ 3,083,213	$ 461,826
Oregon PERS	$ 47,828,900	$ 75,902,865	$ 28,073,965	$ 8,919,200	$ 19,154,765
Pennsylvania State ERS	$ 30,204,693	$ 47,807,024	$ 17,602,331	$ 5,592,324	$ 12,010,007
Rhode Island ERS	$ 6,655,012	$ 13,874,704	$ 7,219,692	$ 4,728,195	$ 2,491,497
South Carolina RS	$ 25,183,062	$ 62,851,042	$ 37,667,980	$ 11,967,253	$ 25,700,727
Tennessee State and Teach	$ 26,335,199	$ 29,949,017	$ 3,613,818	$ 2,719,767	$ 894,050
Texas ERS	$ 23,509,622	$ 31,951,541	$ 8,441,919	$ 2,682,028	$ 5,759,891
Vermont State Employees	$ 1,217,638	$ 2,305,613	$ 1,087,975	$ 326,506	$ 761,469
Virginia Retirement System	$ 53,185,000	$ 70,641,764	$ 17,456,764	$ 13,138,000	$ 4,318,764
Washington PERS 1	$ 9,775,600	$ 12,617,909	$ 2,842,309	$ 4,208,900	$ (1,366,591)
West Virginia PERS	$ 3,248,270	$ 6,697,184	$ 3,448,914	$ 1,681,888	$ 1,767,026
Wisconsin Retirement Syst	$ 78,911,300	$ 79,182,864	$ 271,564	$ 193,300	$ 78,264
Wyoming Public Employee	$ 5,742,542	$ 8,333,428	$ 2,590,887	$ 823,134	$ 1,767,753
Mean	**$ 25,016,290**	**$ 41,850,616**	**$ 16,834,325**	**$ 6,295,476**	**$ 10,538,850**
Median	**$ 11,400,100**	**$ 25,021,758**	**$ 8,156,193**	**$ 3,994,115**	**$ 4,685,911**
Minimum	**$ 1,217,638**	**$ 2,031,281**	**$ 120,945**	**$ 82,956**	**$ (1,366,591)**
Maximum	**$ 244,964,000**	**$ 369,082,310**	**$ 124,118,310**	**$ 49,078,000**	**$ 75,040,310**

Source Data FMS Bonds, Inc., Municipal Bonds market index rate for 30-year bonds

Table 3 State Defined Pension Benefit Plans: Projected UAAL at 30-Year AA Tax-Free Municipal Bond Rate

State System	Projected Unfunded Actuarial Accrude Liability AA rated tax-free 30 Year Municipal Bond (4.60%)				
Defined Benefit Plan	Actuarial Value of Assets (2009) in Thousands $	Projected Value of Accrued Actuarial Liabilities	Projected UAAL	Actual 2009 UAAL	Projected UAAL - 2009 UAAL
Alabama ERS	$ 9,828,104	$ 20,083,243	$ 10,255,139	3,928,072	6,327,067
Alaska PERS	$ 6,108,528	$ 12,873,589	$ 6,765,061	3,593,558	3,171,503
Arizona SRS	$ 27,094,000	$ 45,880,820	$ 18,786,820	7,196,000	11,590,820
Arkansas PERS	$ 5,413,000	$ 9,394,365	$ 3,981,365	1,525,000	2,456,365
California PERF	$ 244,964,000	$ 347,912,525	$ 102,948,525	49,078,000	53,870,525
Colorado State	$ 13,382,736	$ 30,599,152	$ 17,216,416	6,594,481	10,621,935
Delaware State Employees	$ 6,744,050	$ 6,844,367	$ 100,317	82,956	17,361
Florida RS	$ 118,764,692	$ 161,654,046	$ 42,889,354	17,610,905	25,278,449
Georgia ERS	$ 13,613,606	$ 18,757,116	$ 5,143,510	2,264,416	2,879,094
Hawaii ERS	$ 11,400,100	$ 25,575,208	$ 14,175,108	6,236,300	7,938,808
Idaho PERS	$ 8,646,000	$ 13,820,607	$ 5,174,607	3,086,000	2,088,607
Illinois SERS	$ 10,999,954	$ 53,877,390	$ 42,877,436	14,298,392	28,579,044
Indiana PERF	$ 12,569,335	$ 14,553,979	$ 1,984,644	936,945	1,047,699
Iowa PERS	$ 21,123,980	$ 32,241,856	$ 11,117,876	4,894,614	6,223,262
Kansas PERS	$ 13,461,221	$ 25,155,852	$ 11,694,631	7,676,985	4,017,646
Kentucky ERS	$ 5,297,115	$ 17,958,216	$ 12,661,101	6,035,847	6,625,254
Louisiana SERS	$ 8,499,662	$ 23,854,181	$ 15,354,519	5,487,185	9,867,334
Maine State and Teacher	$ 8,383,147	$ 12,662,700	$ 4,279,552	3,994,115	285,437
Maryland PERS	$ 9,230,381	$ 23,478,369	$ 14,247,988	5,850,402	8,397,586
Massachusetts SERS	$ 19,019,062	$ 23,997,930	$ 4,978,868	5,843,359	(864,491)
Michigan SERS	$ 11,106,969	$ 17,587,084	$ 6,480,115	3,126,740	3,353,374
Minnesota State Employe	$ 9,030,401	$ 9,973,875	$ 943,474	1,482,359	(538,885)
Mississippi PERS	$ 20,597,581	$ 46,696,968	$ 26,099,387	9,996,965	16,102,422
Missouri State Employees	$ 7,876,079	$ 12,730,253	$ 4,854,174	1,618,727	3,235,446
Montana PERS	$ 4,002,212	$ 8,458,369	$ 4,456,157	790,607	3,665,550
Nevada Regular Employee	$ 19,158,282	$ 37,248,921	$ 18,090,638	6,929,338	11,161,300
New Hampshire Retiremer	$ 4,937,320	$ 13,949,027	$ 9,011,708	3,537,732	5,473,975
New Jersey PERS	$ 28,858,234	$ 72,544,997	$ 43,686,763	15,612,169	28,074,594
New Mexico PERF	$ 12,553,986	$ 18,700,412	$ 6,146,426	2,354,293	3,792,133
North Carolina Teachers a	$ 55,818,099	$ 56,967,758	$ 1,149,659	2,360,173	(1,210,514)
North Dakota PERS	$ 1,617,148	$ 1,960,646	$ 343,498	284,053	59,445
Ohio PERS	$ 57,629,000	$ 107,039,695	$ 49,410,695	18,926,000	30,484,695
Oklahoma PERS	$ 6,208,245	$ 9,148,638	$ 2,940,392	3,083,213	(142,820)
Oregon PERS	$ 47,828,900	$ 71,114,532	$ 23,285,632	8,919,200	14,366,432
Pennsylvania State ERS	$ 30,204,693	$ 44,804,747	$ 14,600,054	5,592,324	9,007,730
Rhode Island ERS	$ 6,655,012	$ 12,643,304	$ 5,988,292	4,728,195	1,260,097
South Carolina RS	$ 25,183,062	$ 56,426,341	$ 31,243,279	11,967,253	19,276,026
Tennessee State and Tea	$ 26,335,199	$ 29,332,639	$ 2,997,440	2,719,767	277,673
Texas ERS	$ 23,509,622	$ 30,511,676	$ 7,002,054	2,682,028	4,320,026
Vermont State Employees	$ 1,217,638	$ 2,120,046	$ 902,408	326,506	575,902
Virginia Retirement Syste	$ 53,185,000	$ 67,664,315	$ 14,479,315	13,138,000	1,341,315
Washington PERS 1	$ 9,775,600	$ 12,133,121	$ 2,357,521	4,208,900	(1,851,379)
West Virginia PERS	$ 3,248,270	$ 6,108,932	$ 2,860,662	1,681,888	1,178,774
Wisconsin Retirement Sy	$ 78,911,300	$ 79,136,546	$ 225,246	193,300	31,946
Wyoming Public Employe	$ 5,742,542	$ 7,891,523	$ 2,148,982	823,134	1,325,848
Mean	**$ 25,016,290**	**$ 38,979,331**	**$ 13,963,040**	**$ 6,295,476**	**$ 7,667,565**
Median	**$ 11,400,100**	**$ 23,478,369**	**$ 6,765,061**	**$ 3,994,115**	**$ 3,665,550**
Minimum	**$ 1,217,638**	**$ 1,960,646**	**$ 100,317**	**$ 82,956**	**$ (1,851,379)**
Maximum	**$ 244,964,000**	**$ 347,912,525**	**$ 102,948,525**	**$ 49,078,000**	**$ 53,870,525**

Source Data FMS Bonds, Inc., Municipal Bonds market index rate for 30-year bonds

Table 4 State Defined Pension Benefit Plans: Projected UAAL at 30-Year A Tax-Free Municipal Bond Rate

State System	Projected Unfunded Actuarial Accrude Liability A rated tax-free 30 Year Municipal Bond (5.65%)				
Defined Benefit Plan	Actuarial Value of Assets (2009) in Thousands $	Projected Value of Accrued Actuarial Liabilities	Projected UAAL	Actual 2009 UAAL	Projected UAAL - 2009 UAAL
Alabama ERS	$ 9,828,104	$ 17,427,990	$ 7,599,886	$ 3,928,072	3,671,814
Alaska PERS	$ 6,108,528	$ 11,121,984	$ 5,013,456	$ 3,593,558	1,419,898
Arizona SRS	$ 27,094,000	$ 41,016,550	$ 13,922,550	$ 7,196,000	6,726,550
Arkansas PERS	$ 5,413,000	$ 8,363,513	$ 2,950,513	$ 1,525,000	1,425,513
California PERF	$ 244,964,000	$ 321,257,163	$ 76,293,163	$ 49,078,000	27,215,163
Colorado State	$ 13,382,736	$ 26,141,489	$ 12,758,753	$ 6,594,481	6,164,272
Delaware State Employ	$ 6,744,050	$ 6,818,393	$ 74,343	$ 82,956	(8,613)
Florida RS	$ 118,764,692	$ 150,549,164	$ 31,784,472	$ 17,610,905	14,173,567
Georgia ERS	$ 13,613,606	$ 17,425,362	$ 3,811,756	$ 2,264,416	1,547,340
Hawaii ERS	$ 11,400,100	$ 21,904,999	$ 10,504,899	$ 6,236,300	4,268,599
Idaho PERS	$ 8,646,000	$ 12,480,801	$ 3,834,801	$ 3,086,000	748,801
Illinois SERS	$ 10,999,954	$ 42,775,594	$ 31,775,640	$ 14,298,392	17,477,248
Indiana PERF	$ 12,569,335	$ 14,040,116	$ 1,470,781	$ 936,945	533,836
Iowa PERS	$ 21,123,980	$ 29,363,223	$ 8,239,243	$ 4,894,614	3,344,629
Kansas PERS	$ 13,461,221	$ 22,127,886	$ 8,666,665	$ 7,676,985	989,680
Kentucky ERS	$ 5,297,115	$ 14,680,012	$ 9,382,897	$ 6,035,847	3,347,051
Louisiana SERS	$ 8,499,662	$ 19,878,599	$ 11,378,937	$ 5,487,185	5,891,752
Maine State and Teacl	$ 8,383,147	$ 11,554,641	$ 3,171,493	$ 3,994,115	(822,622)
Maryland PERS	$ 9,230,381	$ 19,789,290	$ 10,558,909	$ 5,850,402	4,708,507
Massachusetts SERS	$ 19,019,062	$ 22,708,805	$ 3,689,743	$ 5,843,359	(2,153,616)
Michigan SERS	$ 11,106,969	$ 15,909,257	$ 4,802,288	$ 3,126,740	1,675,547
Minnesota State Empl	$ 9,030,401	$ 9,729,591	$ 699,190	$ 1,482,359	(783,169)
Mississippi PERS	$ 20,597,581	$ 39,939,332	$ 19,341,751	$ 9,996,965	9,344,786
Missouri State Employ	$ 7,876,079	$ 11,473,414	$ 3,597,334	$ 1,618,727	1,978,607
Montana PERS	$ 4,002,212	$ 7,304,584	$ 3,302,372	$ 790,607	2,511,765
Nevada Regular Emplo	$ 19,158,282	$ 32,564,905	$ 13,406,623	$ 6,929,338	6,477,284
New Hampshire Retire	$ 4,937,320	$ 11,615,722	$ 6,678,403	$ 3,537,732	3,140,670
New Jersey PERS	$ 28,858,234	$ 61,233,650	$ 32,375,416	$ 15,612,169	16,763,247
New Mexico PERF	$ 12,553,986	$ 17,108,984	$ 4,554,998	$ 2,354,293	2,200,705
North Carolina Teache	$ 55,818,099	$ 56,670,089	$ 851,990	$ 2,360,173	(1,508,183)
North Dakota PERS	$ 1,617,148	$ 1,871,707	$ 254,560	$ 284,053	(29,493)
Ohio PERS	$ 57,629,000	$ 94,246,312	$ 36,617,312	$ 18,926,000	17,691,312
Oklahoma PERS	$ 6,208,245	$ 8,387,313	$ 2,179,068	$ 3,083,213	(904,145)
Oregon PERS	$ 47,828,900	$ 65,085,432	$ 17,256,532	$ 8,919,200	8,337,332
Pennsylvania State ER	$ 30,204,693	$ 41,024,511	$ 10,819,818	$ 5,592,324	5,227,494
Rhode Island ERS	$ 6,655,012	$ 11,092,820	$ 4,437,807	$ 4,728,195	(290,388)
South Carolina RS	$ 25,183,062	$ 48,336,852	$ 23,153,790	$ 11,967,253	11,186,537
Tennessee State and T	$ 26,335,199	$ 28,556,544	$ 2,221,345	$ 2,719,767	(498,422)
Texas ERS	$ 23,509,622	$ 28,698,709	$ 5,189,087	$ 2,682,028	2,507,059
Vermont State Employ	$ 1,217,638	$ 1,886,395	$ 668,757	$ 326,506	342,251
Virginia Retirement Sy	$ 53,185,000	$ 63,915,340	$ 10,730,340	$ 13,138,000	(2,407,660)
Washington PERS 1	$ 9,775,600	$ 11,522,714	$ 1,747,114	$ 4,208,900	(2,461,786)
West Virginia PERS	$ 3,248,270	$ 5,368,252	$ 2,119,982	$ 1,681,888	438,094
Wisconsin Retirement	$ 78,911,300	$ 79,078,225	$ 166,925	$ 193,300	(26,375)
Wyoming Public Empl	$ 5,742,542	$ 7,335,110	$ 1,592,569	$ 823,134	769,435
Mean	**$ 25,016,290**	**$ 35,364,030**	**$ 10,347,739**	**$ 6,295,476**	**$ 4,052,264**
Median	**$ 11,400,100**	**$ 19,789,290**	**$ 5,013,456**	**$ 3,994,115**	**$ 1,978,607**
Minimum	**$ 1,217,638**	**$ 1,871,707**	**$ 74,343**	**$ 82,956**	**$ (2,461,786)**
Maximum	**$ 244,964,000**	**$ 321,257,163**	**$ 76,293,163**	**$ 49,078,000**	**$ 27,215,163**

Source Data FMS Bonds, Inc., Municipal Bonds market index rate for 30-year bonds.

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