Milliman

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Introduction

The Milliman Public Pension Funding Study independently measures the aggregate funded status of the 100 largest U.S. public pension plans using basic actuarial principles and reported plan liabilities and assets. The aggregate accrued liability information provided has been determined on a uniform basis with respect to the interest rate assumption across all of the plans in the study. This uniform approach allows for an accurate picture of the overall funded status of these 100 pension plans based on an independent application of Actuarial Standards Board (ASB) standards of practice, actual investment portfolios, and current capital market assumptions. We are not aware of any other study that has taken this approach and we feel this is an important story that needs to be told.

During the past year, the 100 largest U.S. public pension plans (as measured by accrued liability) reported assets of $2.705 trillion and accrued liabilities of $3.600 trillion, for an aggregate underfunding of $0.895 trillion and an aggregate funded ratio of 75.1%. The asset values the plans use for reporting purposes reflect asset smoothing techniques, which are designed to minimize fluctuations in contribution amounts but may deviate significantly from market value. The liabilities the plans report may not reflect current views on future investment return levels. Using current market values of assets and current views on investment returns, these plans have assets of $2.513 trillion and accrued liabilities of $3.706 trillion, resulting in aggregate underfunding of $1.193 trillion and an aggregate funded ratio of 67.8%.

FIGURE 1: MILLIMAN 100, AGGREGATE FUNDED STATUS

$ TRILLIONS	REPORTED FIGURES	RECALIBRATED FIGURES
Market Value of Assets	$2.513	
Actuarial Value of Assets	$2.705	
Accrued Liability	$3.600	$3.706
Unfunded Accrued Liability*	$0.895	$1.193
Funded Ratio*	75.1%	67.8%

*Based on actuarial value of assets for reported figures and market value of assets for recalibrated figures.

Results reported by the plans

As shown in Figure 1, the plans reported an aggregate actuarial value of assets of $2.705 trillion; by comparison, the aggregate market value of assets was $2.513 trillion. Actuarial asset values are designed to reduce contribution volatility by smoothing market gains and losses, typically over three to five years. The advantage of asset smoothing techniques is that contribution levels are more consistent from year to year. After periods of large market losses such as 2000-2002 and 2007-2009, actuarial asset values may be larger than market values. After periods of large market gains such as the late 1990s, the opposite is generally the case. Figure 2 shows the relationship of these two asset measures for the plans in this study.

FIGURE 2: ACTUARIAL VALUE VS. MARKET VALUE
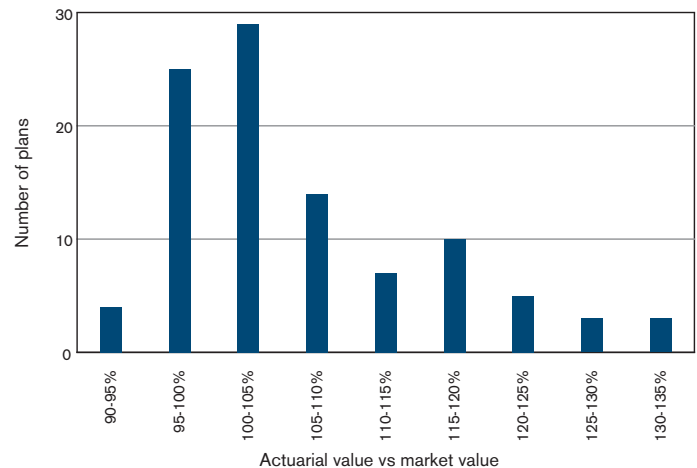
Most pension plans suffered significant asset losses in the 2007-2009 time frame. While these losses were generally followed by sizeable gains during 2009-2011, those gains were typically not as large as the losses that preceded them, leading to plans generally having reported actuarial asset values larger than market values.

In aggregate, the plans included in this study are invested 50.8% in equities; 25.7% in fixed income; 6.6% in real estate; 12.7% in a combination of private equity, hedge funds, and commodities; and 4.2% in cash. However, there is considerable variation in the investment allocation from plan to plan. Figure 3 illustrates this variation, showing the percentage of plan assets invested in non-fixed income asset classes (equities, real estate, private equity, hedge funds, and commodities) as opposed to fixed income and cash.

FIGURE 3: PERCENTAGE ALLOCATION TO NON-FIXED INCOME ASSET CLASSES
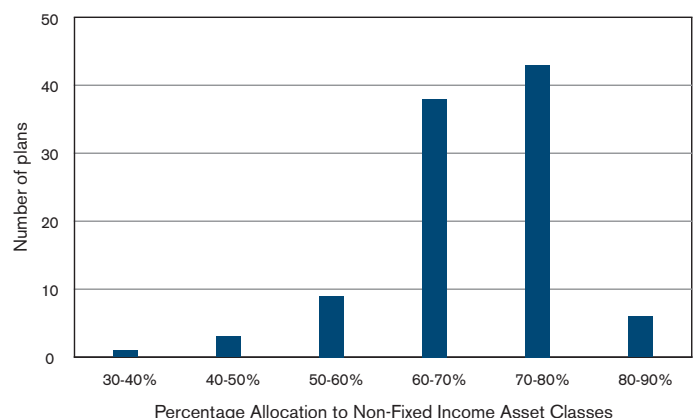
The plans reported accrued liabilities totaling $3.600 trillion, consisting of $1.620 trillion for the 12.8 million plan members who are still working and another $1.980 trillion for the 10.9 million plan members who are retired and receiving benefits or who have stopped working but have not yet started collecting their pensions. In aggregate, the plans have assets sufficient to cover 100% of the accrued liability for retirees and inactive members but just 33% of the assets needed to cover the accrued liability for active plan members. But a quarter of the plans lack sufficient assets to even cover all of the accrued liability for retirees and inactive members.

Figures 4 and 5 demonstrate that there is considerable variation across the universe of plans in both the magnitude of the actuarial accrued liability (AAL) per person and in the relative magnitude of the active member liability compared to the liability for retirees.
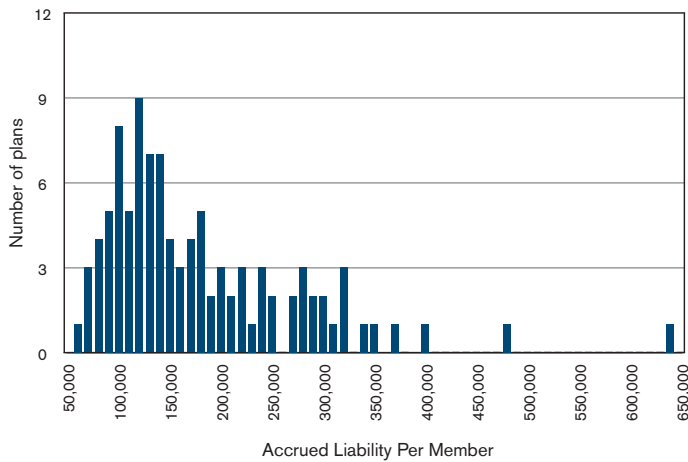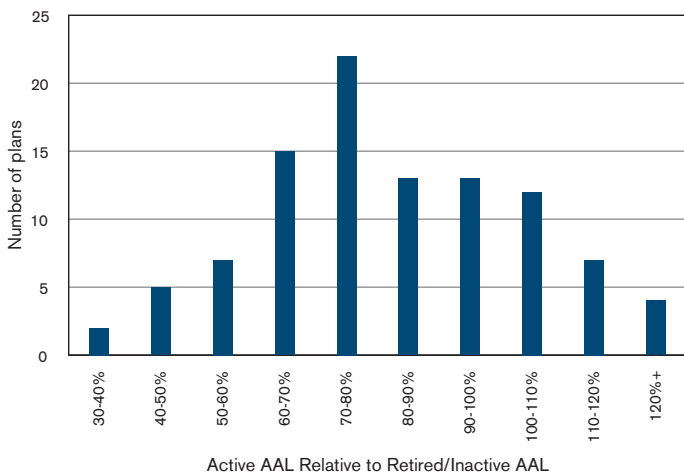
FIGURE 4: ACCRUED LIABILITY PER MEMBER

FIGURE 5: ACTIVE AAL RELATIVE TO RETIRED/INACTIVE AAL


Interest rate assumption

There are three sources of money to pay for public pension benefits: payroll deductions from active members, contributions from plan sponsors, and investment income generated by the plan's assets. When actuaries determine the amounts of future contributions that are needed from plan sponsors, they first need to estimate what level of future investment income a plan's assets are likely to earn. Different types of investments carry different long-term expectations for investment earnings, so the actuary starts with return assumptions for each of the different asset classes. Collectively, these return assumptions, along with the associated variances and coefficients of correlation with other asset classes, are known as capital market assumptions. The actuary then takes into account each particular pension plan's allocation of investments across the different asset classes and arrives at the expected long-term rate of return for the pension plan. This expected rate of return is then used to discount future benefit payments back to the present time so that those future payments are expressed in today's dollars. Using this methodology to determine the plan's liabilities, if the plan sponsor always pays the contributions determined using actuarially sound methods and if the investment results on average match the assumed rate of return, then the plan should accumulate sufficient assets to pay benefits.

As shown above in Figure 3, different plans pursue different asset allocation strategies and therefore should have different expected long-term rates of return. In addition to this diversity of investment approach, experts do not always agree on the expected returns for different asset classes. Figure 6 illustrates the divergence of views in capital market assumptions among seven investment consulting firms, based on a sample asset portfolio.

Methodology

This study is based on the most recently available Comprehensive Annual Financial Reports and actuarial valuation reports, which reflect valuation dates ranging from June 30, 2009, to January 1, 2012; about two-thirds are from June 30, 2011 or later. For the purposes of this study, the reported asset allocation of each of the included plans has been analyzed to determine an independent measure of the expected long-term rate of return on plan assets. The reported accrued liability for each plan has then been recalibrated to reflect this actuarially determined interest rate. This study therefore adjusts for differences between each plan's assumed rate of investment return and a current market assessment of the expected return based on actual asset allocations. This study is not intended to price the plans' liabilities for accounting purposes or to analyze the funding of individual plans.

FIGURE 6: EXPECTED RETURN FOR SAMPLE PORTFOLIO
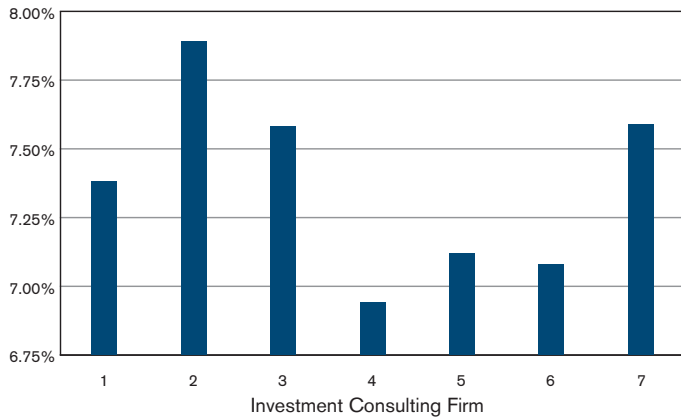
Expectations regarding future returns change over time, compounding the lack of consensus surrounding returns. This has been especially true in the last decade, given the significant slide in expected returns. Figure 7 illustrates the impact of this trend of declining capital market assumptions by showing the expected return for a hypothetical asset allocation as determined by Milliman's capital market assumptions for each year since 1998.

FIGURE 7: EXPECTED RETURN BASED ON CAPITAL MARKET ASSUMPTIONS
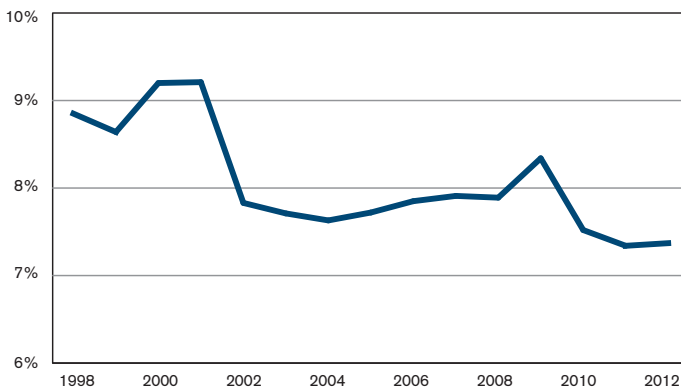
Between the diversity of investment allocations and the lack of agreement among experts regarding future returns, it is not surprising that there is a wide spread of interest rate assumptions reported by the plans in this study, as shown in Figure 8.

FIGURE 8: INTEREST RATE ASSUMPTIONS
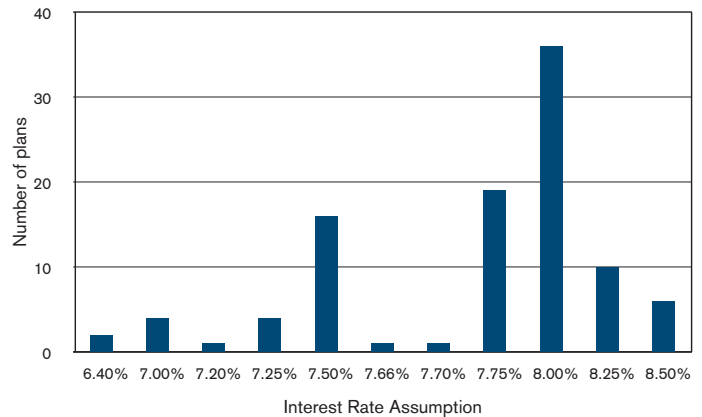
Recalibrating the accrued liability

The median of the interest rate assumptions reported by plans in this study is 8.00% and the liability-weighted average rate is 7.80%. We independently applied the "building block approach" outlined in the ASB standards of practice to each plan's asset allocation, and determined the 50th percentile 30-year geometric real rate of return based on Milliman's December 31, 2011 capital market assumptions. We then applied the plan's reported inflation assumption to arrive at our independent, actuarially determined interest rate. The median of the resulting interest rates is 7.65%, which is 35 basis points lower than the median interest rate assumption reported by the plans; the liability-weighted average of the resulting rates is 7.55%, which is 25 basis points lower than the corresponding figure reported by the plans. Note that for 33 of the 100 plans, the actuarially determined interest rate is higher than the interest rate assumption reported by the plan; this suggests that those plans have included a margin for conservatism in their interest rate assumptions. Figure 9 on page 4 details how the actuarially determined interest rates compare to the interest rate assumptions reported by the plans.

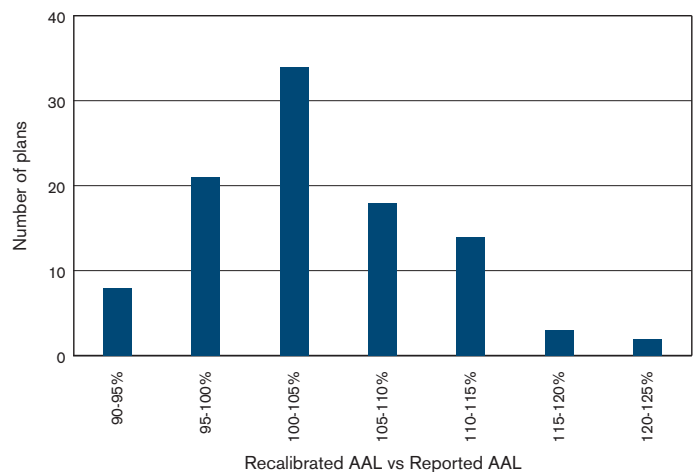FIGURE 9: RECALIBRATED INTEREST RATE VS. REPORTED INTEREST RATE
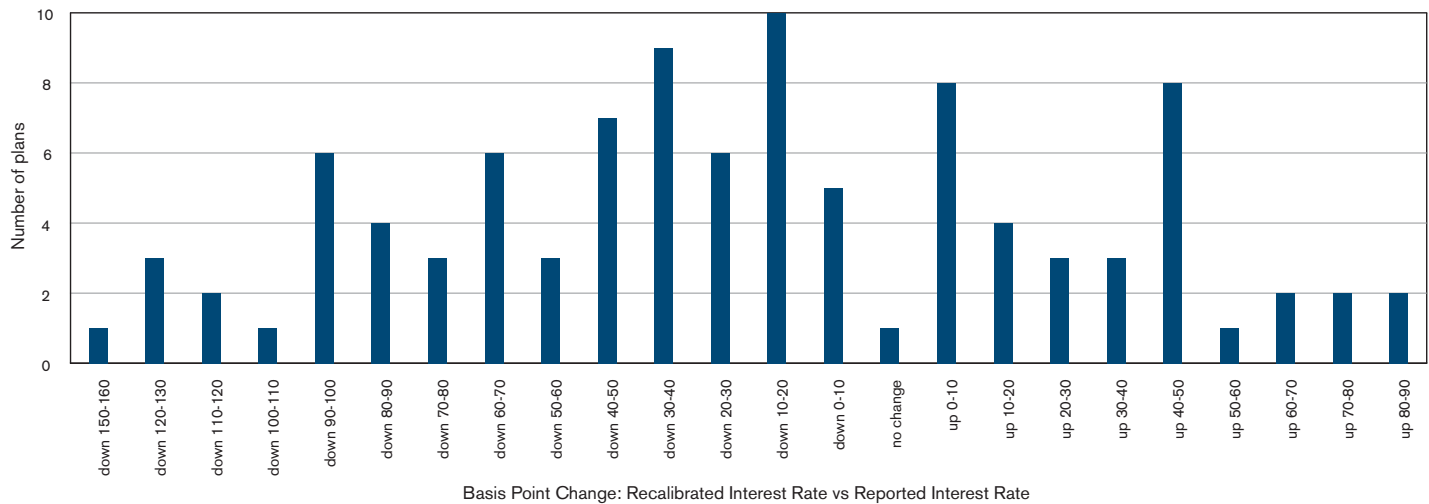
Recalibrating the accrued liabilities for each plan using that plan's actuarially determined interest rate results in an aggregate accrued liability of $3.706 trillion and a 67.8% aggregate market value funded ratio.

FIGURE 10: RECALIBRATED RESULTS

$ TRILLIONS	REPORTED RESULTS	RECALIBRATED RESULTS USING ACTUARIALLY DETERMINED INTEREST RATE
Median interest rate assumption	8.00%	7.65%
Accrued liability	$3.600	$3.706
Asset value		
Actuarial value	$2.705	$2.705
Market value	$2.513	$2.513
(Over)/under funding		
Actuarial value	$0.895	$1.001
Market value	$1.087	$1.193
Funded ratio		
Actuarial value	75.1%	73.0%
Market value	69.8%	67.8%

For most plans in the study, the recalibrated accrued liability is not substantially different from the reported accrued liability, as shown in Figure 11.

FIGURE 11: RECALIBRATED AAL VS. REPORTED AAL

On the whole, we conclude that there are only a small number of plans whose interest rate assumptions are causing a sizeable underreporting of liability relative to what would be calculated based on current forecasts of future investment returns; in fact, there are a surprising number of plans whose interest rate assumptions and accrued liability reporting are conservative in light of current forecasts.

Sensitivity analysis

A relatively small change in the interest rate assumption can have a significant impact on the accrued liability. Using an interest rate that is 25 basis points higher or lower than the actuarially determined rate moves the aggregate accrued liability by about 3% and changes the market value funded ratio by about 2%, as can be seen in Figure 12.

FIGURE 12: EFFECTS OF INTEREST RATE ASSUMPTIONS

	- 25 BP	ACTUARIALLY DETERMINED INTEREST RATE	+ 25 BP
Accrued liability ($ trillions)	$3.821	$3.706	$3.598
	(+3.1%)		(-2.9%)
Funded ratio using market value	65.8%	67.8%	69.8%
	(-2.0%)		(+2.0%)

In calculating the actuarially determined interest rates for each plan, we reflected each plan's own inflation assumption. Because the inflation assumption is also incorporated into other actuarial assumptions, such as future salary growth rates and future cost of living increases, this approach ensures internal consistency of the assumptions. However, some plans employ much higher inflation assumptions than the norm, resulting in relatively high actuarially determined interest rates. Using an inflation rate of 2.75% (per Milliman's December 31, 2011 capital market assumptions) in place of each plan's inflation assumption results in an aggregate accrued liability of $3.848 trillion and a market value funded ratio of 65.3%.

The actuarially determined interest rate for the aggregate assets of all of the plans in the study is 7.32% (using Milliman's 2.75% inflation assumption). Using this rate for all of the plans results in an aggregate accrued liability of $3.812 trillion and a market value funded ratio of 65.9%.

Reported Data

PLAN NAME	VALUATION DATE	MARKET VALUE OF ASSETS ($ MILLIONS)	ACTUARIAL VALUE OF ASSETS ($ MILLIONS)	ACCRUED LIABILITY ($ MILLIONS)	SURPLUS / (UNFUNDED) ACCRUED LIABILITY ($ MILLIONS)	FUNDED RATIO	COUNT OF ACTIVE MEMBERS	COUNT OF INACTIVE / RETIRED MEMBERS
Employees' Retirement System of Alabama	09/30/10	8,103	9,739	14,284	(4,545)	68%	86,967	51,654
Teachers' Retirement System of Alabama	09/30/10	16,889	20,124	28,300	(8,176)	71%	136,290	97,591
State of Alaska Public Employees' Retirement System	06/30/10	5,392	6,470	10,372	(3,902)	62%	26,442	32,490
Arizona Public Safety Personnel Retirement System	06/30/11	5,217	5,796	9,365	(3,569)	62%	18,638	10,603
Arizona State Retirement System	06/30/11	26,440	27,559	36,632	(9,073)	75%	208,939	321,574
Arkansas Public Employees Retirement System	06/30/11	5,785	5,467	7,734	(2,267)	71%	45,145	41,027
Arkansas Teacher's Retirement System	06/30/10	9,884	10,845	14,697	(3,852)	74%	72,208	30,587
California Public Employees' Retirement System	06/30/10	201,632	257,070	308,343	(51,273)	83%	794,138	824,069
California State Teachers' Retirement System	07/01/11	140,040	143,930	207,770	(63,840)	69%	429,600	426,760
University of California Retirement Plan	07/01/11	41,873	42,757	51,831	(9,074)	82%	115,568	117,199
Chicago Public Schools	06/30/11	10,313	10,109	16,941	(6,832)	60%	30,133	28,287
Municipal Employees' Annuity and Benefit Fund of Chicago	12/31/11	5,053	5,552	12,293	(6,741)	45%	31,976	36,754
Colorado Public Employees' Retirement Association	12/31/10	38,406	39,229	59,338	(20,109)	66%	201,095	268,581
Connecticut State Employees Retirement System	06/30/11	8,985	10,123	21,127	(11,004)	48%	47,778	45,640
Connecticut State Teachers' Retirement System	06/30/10	12,274	14,430	23,496	(9,066)	61%	51,368	31,808
County Employees' Annuity and Benefit Fund of Cook County	12/31/11	7,441	7,897	13,724	(5,827)	58%	22,037	28,450
Delaware State Employees' Pension Plan	06/30/11	7,057	7,092	7,548	(456)	94%	35,572	25,347
Florida State Retirement System	07/01/11	129,123	126,078	145,034	(18,956)	87%	533,486	453,191
Employees' Retirement System of Georgia	06/30/11	12,233	12,668	16,657	(3,989)	76%	66,081	45,229
Teachers' Retirement System of Georgia	06/30/11	54,084	54,529	63,592	(9,063)	86%	222,020	169,141
Employees' Retirement System of the State of Hawaii	06/30/11	11,642	11,943	20,097	(8,154)	59%	65,310	46,338
Public Employee Retirement System of Idaho	07/01/11	11,383	11,360	12,641	(1,281)	90%	65,798	60,823
Illinois Municipal Retirement Fund	12/31/10	25,164	24,251	29,129	(4,878)	83%	176,179	229,016
State Employees' Retirement System of Illinois	06/30/11	11,008	11,160	31,395	(20,235)	36%	66,363	64,275
State Universities Retirement System of Illinois	06/30/11	14,274	13,946	31,514	(17,568)	44%	81,611	79,922
Teachers' Retirement System of the State of Illinois	06/30/11	37,471	37,770	81,300	(43,530)	46%	166,013	196,108
Indiana Public Employees' Retirement Fund	06/30/11	12,461	12,001	14,913	(2,912)	80%	147,933	91,313
Indiana State Teachers' Retirement Fund	06/30/11	9,122	8,892	20,315	(11,423)	44%	71,343	54,611
Iowa Public Employees' Retirement System	06/30/11	22,772	22,575	28,257	(5,682)	80%	164,436	164,277
Kansas Public Employee Retirement System	12/31/10	12,918	13,590	21,854	(8,264)	62%	157,919	120,729
Kentucky Employees Retirement Systems	06/30/11	4,050	4,238	11,903	(7,665)	36%	50,908	47,926
Kentucky Teachers' Retirement System	06/30/11	15,131	14,908	25,969	(11,061)	57%	76,349	50,554
County Employees Retirement System (of Kentucky)	06/30/11	7,338	7,409	11,777	(4,368)	63%	94,692	60,161
Los Angeles City Employees' Retirement System	06/30/11	9,187	9,691	13,392	(3,701)	72%	25,449	22,820
The Water and Power Employees' Retirement Plan of the City of Los Angeles	07/01/11	7,418	7,465	9,297	(1,832)	80%	9,203	10,190
Los Angeles County Employees Retirement Association	06/30/11	39,452	39,194	48,599	(9,405)	81%	92,786	67,329
Los Angeles Fire and Police Pension Plan	06/30/11	14,400	14,338	16,616	(2,278)	86%	13,432	12,451
Louisiana State Employees' Retirement System	06/30/11	9,703	8,763	15,221	(6,458)	58%	54,930	97,795
Teachers' Retirement System of Louisiana	06/30/11	14,577	13,286	24,097	(10,811)	55%	86,742	92,006
Maine Public Employees Retirement System	06/30/11	8,678	8,737	11,282	(2,545)	77%	38,759	28,900
Maryland State -- Employees' Combined System only	06/30/11	12,851	12,388	19,723	(7,335)	63%	85,453	90,547
Maryland Teachers	06/30/11	22,765	21,869	32,985	(11,116)	66%	105,528	83,182
Massachusetts State Board of Retirement System	01/01/11	19,314	21,245	26,243	(4,998)	81%	86,586	57,600
Massachusetts Teachers' Retirement System	01/01/11	21,016	23,118	34,891	(11,773)	66%	87,136	55,690
Michigan Public School Employee's Retirement System	09/30/10	35,855	43,294	60,927	(17,633)	71%	242,568	202,748
Michigan State Employees Retirement System	09/30/11	9,249	10,782	14,860	(4,078)	73%	19,650	61,742
Municipal Employees' Retirement System of Michigan	12/31/10	5,975	6,945	9,317	(2,372)	75%	35,816	33,891
Minnesota State Retirement System	07/01/11	9,198	9,130	10,576	(1,446)	86%	47,955	45,586
Minnesota Teachers Retirement System	07/01/11	17,297	17,132	22,171	(5,039)	77%	76,755	91,970
Public Employees Retirement Association of Minnesota	06/30/11	13,617	13,456	17,899	(4,443)	75%	139,952	117,146
Public Employees' Retirement System of Mississippi	06/30/11	20,377	20,315	32,654	(12,339)	62%	161,676	212,475
Missouri State Employees' Plan	06/30/11	7,769	8,022	10,124	(2,102)	79%	51,660	53,027
Public School Retirement System of Missouri	06/30/11	28,100	29,387	34,383	(4,996)	85%	77,708	47,914

PLAN NAME	VALUATION DATE	MARKET VALUE OF ASSETS ($ MILLIONS)	ACTUARIAL VALUE OF ASSETS ($ MILLIONS)	ACCRUED LIABILITY ($ MILLIONS)	SURPLUS / (UNFUNDED) ACCRUED LIABILITY ($ MILLIONS)	FUNDED RATIO	COUNT OF ACTIVE MEMBERS	COUNT OF INACTIVE / RETIRED MEMBERS
Nebraska Public Employees Retirement Systems School Retirement System	06/30/11	7,264	7,267	9,040	(1,773)	80%	39,886	38,140
Public Employees' Retirement System of the State of Nevada	06/30/10	20,906	24,725	35,078	(10,353)	70%	102,594	55,726
New Hampshire Retirement System	06/30/11	5,891	5,741	9,998	(4,257)	57%	49,738	28,626
Public Employees' Retirement System of New Jersey	07/01/10	23,038	28,735	46,285	(17,550)	62%	309,099	140,533
Teachers' Pension and Annuity Fund of New Jersey	06/30/10	25,764	33,136	48,418	(15,282)	68%	157,912	80,714
The Police and Firemen's Retirement System of New Jersey	07/01/10	18,880	22,559	29,274	(6,715)	77%	44,204	35,973
Educational Retirement Board of New Mexico	06/30/11	9,589	9,642	15,293	(5,651)	63%	61,673	68,468
Public Employees Retirement Association of New Mexico	06/30/11	11,994	11,855	16,826	(4,971)	70%	48,057	38,659
New York City Employees' Retirement System	06/30/11	31,903	41,710	54,920	(13,210)	76%	186,284	139,898
New York City Police Pension Fund	06/30/09	17,424	22,676	31,822	(9,146)	71%	35,608	44,285
Teachers' Retirement System of the City of New York	06/30/09	23,078	30,775	47,989	(17,214)	64%	113,132	78,311
New York State and Local ERS	03/31/10	121,419	125,482	133,574	(8,092)	94%	529,466	459,515
New York State Teachers' Retirement System	06/30/10	76,845	88,544	88,319	225	100%	285,774	141,716
NY State & Local Police & Fire	03/31/11	20,194	22,230	22,998	(768)	97%	32,449	33,590
North Carolina Local Governmental Employees' Retirement System	12/31/10	17,759	18,571	18,646	(75)	100%	122,585	90,281
North Carolina Teachers and State Employees Retirement System	12/31/10	54,108	57,102	59,876	(2,774)	95%	317,740	266,087
Ohio Police and Fire Pension Fund	01/01/11	10,076	10,681	15,384	(4,703)	69%	28,073	26,225
Ohio Public Employees Retirement System	12/31/09	57,854	57,629	76,555	(18,926)	75%	348,112	174,645
Schools Employees' Retirement System of Ohio	06/30/11	10,502	10,397	15,943	(5,546)	65%	125,337	79,631
The State Teachers Retirement System of Ohio	07/01/11	63,117	58,110	98,766	(40,656)	59%	177,897	155,078
Oklahoma Public Employees Retirement System	07/01/11	6,841	6,599	8,180	(1,581)	81%	40,551	34,940
Teachers' Retirement System of Oklahoma	06/30/11	10,156	9,961	17,561	(7,600)	57%	88,085	58,554
Orange County Employees Retirement System	12/31/10	8,358	8,673	12,426	(3,753)	70%	21,742	17,070
Oregon Public Employees Retirement System	12/31/10	52,766	51,584	59,330	(7,746)	87%	193,569	176,081
Pennsylvania State Employees' Retirement System	12/31/10	25,879	29,444	39,180	(9,736)	75%	109,255	118,039
The Public School Employees' Retirement System of Pennsylvania	06/30/11	51,200	59,141	85,640	(26,499)	69%	279,152	309,724
Puerto Rico Government Employees Retirement System	06/30/11	1,724	1,724	25,457	(23,733)	7%	135,972	113,191
Puerto Rico Teachers Retirement System	06/30/11	2,386	2,386	11,449	(9,063)	21%	43,402	36,129
Rhode Island Employees Retirement System	06/30/11	5,964	6,220	10,581	(4,361)	59%	24,614	26,957
Sacramento County Employees' Retirement System	06/30/11	6,141	6,421	7,383	(962)	87%	12,434	11,531
San Bernardino County Employees' Retirement Association	06/30/11	6,137	6,485	8,190	(1,705)	79%	19,258	12,988
San Diego County Employees Retirement Association	06/30/11	8,183	8,542	10,483	(1,941)	81%	16,523	19,621
City and County of San Francisco Employees' Retirement System	07/01/11	15,599	16,313	18,599	(2,286)	88%	28,222	29,812
South Carolina Retirement System	07/01/10	19,681	25,400	38,774	(13,374)	66%	195,403	263,101
Tennessee Consolidated Retirement System	07/01/11	33,662	36,681	40,069	(3,388)	92%	215,076	116,585
Texas County & District Retirement System	12/31/11	17,430	19,016	21,410	(2,394)	89%	121,919	106,807
Texas Municipal Retirement System	12/31/11	18,571	18,346	21,563	(3,217)	85%	101,151	84,448
Employees' Retirement System of Texas	08/31/11	21,204	23,997	29,050	(5,053)	83%	137,293	168,330
Teacher Retirement System of Texas	08/31/11	107,421	115,253	139,315	(24,062)	83%	828,919	377,383
Utah Retirement Systems	12/31/11	15,935	16,861	21,517	(4,656)	78%	87,901	71,000
Virginia Employees Retirement System	06/30/10	51,280	52,729	72,801	(20,072)	72%	329,374	179,003
Washington Public Employees' Retirement System	06/30/10	23,991	28,767	29,803	(1,036)	97%	156,526	105,759
Washington State Law Enforcement Officer's and Fire Fighters' Plan 1 and 2	06/30/10	9,667	11,604	9,238	2,366	126%	17,076	10,429
Washington State Teachers' Retirement System	06/30/10	11,949	14,385	14,938	(553)	96%	66,325	49,519
West Virginia Teachers' Retirement System	06/30/11	4,144	4,144	8,904	(4,760)	47%	35,670	33,168
Wisconsin Retirement System	12/31/10	75,872	80,627	80,759	(132)	100%	264,150	333,717
State of Wyoming Retirement System	01/01/12	5,318	5,761	7,037	(1,276)	82%	36,070	26,078

Study Technical Appendix
Methodology: Expected rate of return on assets

For the purposes of this study, we recalibrated liabilities for included plans to reflect discounting at the expected rate of return on current plan assets. To develop the expected rate of return used in these calculations, we relied on the most recently available asset statements for each plan, particularly on statements of plan net assets as disclosed in published Comprehensive Annual Financial Reports (CAFRs). We did not make adjustments for potential differences between actual asset allocations and target policy asset allocations.

Our method for calculation of the expected rate of return was the "building-block" method as outlined in Actuarial Standard of Practice No. 27, using geometric averaging methodology. We used Milliman's December 31, 2011 capital market assumptions to calculate the 50th percentile 30-year real rate of return, and then added the plan's inflation assumption to arrive at the total expected investment return on plan assets. Where the plan's inflation assumption was not available, we used Milliman's December 31, 2011 capital market inflation assumption of 2.75%. We did not make any adjustment to the expected rate of return for plan expenses, nor did we include any assumption for investment alpha (i.e., we did not assume any excess return over market averages resulting from active versus passive management).

In addition to the 50th percentile rate of return described above, we also developed the following adjusted interest rates for sensitivity analysis:

- The rate as described above, plus and minus 0.25%

- The rate as described above, but using Milliman's December 31, 2011 capital market inflation assumption, for each plan, rather than each plan's inflation assumption

- The rate as described above, based on the overall asset allocation for all plans in the study, and using Milliman's December 31, 2011 capital market inflation assumption

Methodology: Liability recalibration

We performed the recalibration of liabilities for pension plans included in the study using adjustment benchmarks developed based on detailed calculations for certain pension plans meeting broad categorization definitions. For these benchmark plans, we developed precise liability durations separately for active, terminated vested, and retired member populations. These calculated liability durations were modified durations, further adjusted for plan- and population-specific convexity. We applied a variety of cost of living adjustments (COLAs) to the various

benchmark plans, resulting in a library of adjustment factors taking into account plan type, plan provisions, demographic characteristics, and COLAs.

We then selected liability adjustment factors for each plan in the study based on plan type, COLA provisions, and average demographic characteristics where available. For example, a teachers' plan was typically matched with a set of teachers' plan adjustment factors, with similar COLA provisions. If average ages, service levels, or expected working lifetimes were available, we also used these criteria to aid in choosing the adjustment factors. For each liability recalibration calculation, we then recalculated the selected benchmark durations to reflect the actual starting plan interest rate assumption. We performed separate liability adjustments for active, terminated vested, and retired liabilities, thereby adjusting for varying plan maturity levels.

The liability durations used for adjustment provide an estimate of the sensitivity of the present value of benefits (PVB) to changes in the interest rate assumption. We assumed that for active populations, the actuarial accrued liabilities (AAL) varied 85% as much as the PVB when liabilities were reported under the projected unit credit cost method, and 70% as much as the PVB when liabilities were reported under the entry age normal cost method. These assumptions for the relative change in AAL compared with PVB were based on the average results of a survey of actual changes in AAL versus PVB for selected Milliman clients. Although most plans in the study reported liability results under one of these two cost methods for Governmental Accounting Standards Board (GASB) reporting purposes, a handful of plans disclosed liabilities only under the frozen initial liability cost method. For those plans, we used the entry age normal assumption for the relative change of AAL to PVB.

Where any discrepancy occurred between liabilities disclosed for GASB reporting, and liabilities disclosed elsewhere, the GASB reporting numbers were relied upon.

For the purposes of this study, we recalibrated liabilities only for changes in the overall interest rate assumption. In the scenarios where the interest rate was developed using Milliman's capital market inflation assumption, we did not attempt to adjust for any potential impact of this change on liabilities other than on the overall interest rate (i.e., we did not attempt to adjust salary scales, COLA assumptions, or any other valuation parameter that may be tied to the assumed rate of inflation).