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***Wilshire Consulting***

***2017 Report on  
State Retirement Systems:  
Funding Levels and Asset Allocation  
June 20, 2017***

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## Summary of Findings

- The following study includes 131 state retirement systems. Of these 131 retirement systems, 103 systems reported actuarial values on or after June 30, 2016 and 28 systems last reported prior to that date.
- Wilshire Consulting estimates that the ratio of pension assets-to-liabilities, or *funding ratio*, for all 131 state pension plans was 69% in 2016, down from 73% in 2015. U.S. stock performance was low in the fiscal year ending June 30, 2016 while a strengthening U.S. dollar dampened already negative performance of non-U.S. dollar investments. The net affect was that the difference between pension liabilities and pension assets grew during the fiscal year. (Exhibit 1)
- For the 103 state retirement systems that reported actuarial data for 2016, pension assets and liabilities were \$2,349.3 billion and \$3,534.9 billion, respectively. The funding ratio for these 103 state pension plans was 66% in 2016, down from 71% for the same plans in 2015. (Exhibit 2)
- For the 103 state retirement systems that reported actuarial data for 2016, pension assets shrank by -1.8%, or \$42.8 billion, from \$2,392.1 billion in 2015 to \$2,349.3 billion in 2016 while liabilities grew 5.4%, or \$179.6 billion, from \$3,355.3 billion in 2015 to \$3,534.9 billion in 2016. These 103 plans saw their aggregate shortfall, or net pension liability, increase \$222.4 billion over fiscal 2016 from -\$963.2 billion to -\$1185.6 billion. (Exhibit 2)
- Of the 103 state retirement systems that reported actuarial data for 2016, 97% have market value of assets less than pension liabilities, or are *underfunded*. The average underfunded plan has a ratio of assets-to-liabilities equal to 66%. In comparison, of the 131 state retirement systems that reported actuarial data for 2015, 94% were *underfunded*. The average underfunded plan in FY2015 had a ratio of assets-to-liabilities equal to 72%.
- State pension portfolios have, on average, a 64.8% allocation to equities, including real estate and private equity, and a 24.7% allocation to fixed income and a 10.5% allocation to other non-equity assets. The 64.8% equity allocation is somewhat lower than the 68.6% equity allocation in 2006; a more notable trend over the 10-year period has been the rotation out of U.S. equities into other growth assets such as non-U.S. equities, real estate and private equity. (Exhibit 12)
- Asset allocation varies by retirement system. Sixteen of 131 retirement systems have allocations to equity that equal or exceed 75%, and 11 systems have an equity allocation below 50%. The 25<sup>th</sup> and 75<sup>th</sup> percentile range for equity allocation is 60.0% to 71.4%.
- Wilshire forecasts a median 10-year plan return equal to 6.4% per annum, which is 1.1 percentage points below the median actuarial interest rate assumption of 7.5%. One should note that Wilshire's assumptions range over a conservative 10+-year time horizon, while pension plan interest rate assumptions typically project over 20 to 30 years. Using Wilshire's 30-year long-term asset class assumptions, the median estimated return would be 7.4 percent.

## **Financial Overview**

This is Wilshire Consulting’s twenty-first report on the financial condition of state-sponsored defined benefit retirement systems and is based upon data gathered from the most recent financial and actuarial reports provided by 131 retirement systems sponsored by the 50 states and the District of Columbia. Appendix A lists the 131 retirement systems included in this year’s study.

### *The Data*

Financial data on public retirement systems historically have lacked the timeliness and uniform disclosure governing pension plans sponsored by publicly traded companies, making it difficult to conduct a study with data that are both current and consistent across systems. For this reason, our study methodology involves collecting data during the first quarter of each calendar year with the objective of acquiring as many reports as possible with a June 30 valuation date from the previous year. Even for systems with the desire to report in a timely manner, it often takes six months to a year for actuaries to determine liability values. One-hundred-three systems reported actuarial values on or after June 30, 2016 and the remaining 28 systems last reported prior to June 30, 2016.

The Governmental Accounting Standards Board (GASB) is the agency tasked with developing accounting and financial reporting standards for state and local governments<sup>1</sup>. GASB and the financial industry have taken major steps to increase transparency and comparability of pension plan accounting. GASB’s Statement 67, “Financial Reporting for Pension Plans”, impacts the annual pension reporting for plans as of June 2014; Statement 68, “Accounting and Financial Reporting for Pensions”, impacts the annual pension reporting for the employers contributing into government agency-sponsored pensions, and applies to employers’ financial reporting starting in June 2015.

### *Assets versus Liabilities*

Exhibit 1 shows the market value of assets, actuarial value of assets, and total pension liability values for all state retirement systems for which Wilshire has data. With the exception of the two rows identifying Wilshire’s estimated funded ratios, the data presented in each column of Exhibit 1 are limited to only those systems that reported on or after June of that year. For example, all 131 retirement systems in our survey reported actuarial values for fiscal 2015, while only 103 systems reported actuarial values for fiscal 2016. Note that Exhibit 1 includes both market value and actuarial value of assets. Unless otherwise noted, “assets” will refer to market value of assets for the remainder of this report.

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<sup>1</sup> GASB maintains a repository of its statements as well as analysis and guidance for their implementation on its website, <http://www.gasb.org>. For further details, see Appendix B.

**Exhibit 1**  
**Financial Overview of State Retirement Systems<sup>2</sup> (\$ billions)**

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Total Pension Assets:</b>											
Market Value	\$2,378.8	\$2,695.1	\$2,402.4	\$2,015.5	\$2,210.9	\$2,493.0	\$2,507.4	\$2,731.3	\$3,040.5	\$3,074.7	\$2,349.3
Actuarial Value	\$2,280.1	\$2,465.9	\$2,516.7	\$2,471.1	\$2,499.3	\$2,544.3	\$2,581.1	\$2,742.6	\$3,012.3	\$3,073.4	\$2,358.7
<b>Total Pension Liabilities:</b>	\$2,646.9	\$2,833.2	\$2,976.1	\$3,132.7	\$3,233.3	\$3,349.0	\$3,496.4	\$3,774.6	\$3,951.2	\$4,188.2	\$3,534.9
<b>Difference:</b>											
Market Value	-\$268.0	-\$138.1	-\$573.7	-\$1,117.2	-\$1,022.4	-\$856.0	-\$989.0	-\$1,043.3	-\$910.7	-\$1,113.4	-\$1,185.6
Actuarial Value	-\$366.7	-\$367.3	-\$459.4	-\$661.6	-\$734.1	-\$804.7	-\$915.2	-\$1,031.9	-\$938.9	-\$1,114.7	-\$1,176.2
<b>Market Value of Assets as a % of Liabilities:</b>											
All Plans (estimate)*	90%	95%	81%	64%	68%	74%	72%	72%	77%	73%	<b>69%</b>
Reported Plans (actual)	90%	95%	81%	64%	68%	74%	72%	72%	77%	73%	66%
<b>Actuarial Value of Assets as a % of Liabilities:</b>											
All Plans (estimate)*	86%	87%	85%	79%	77%	76%	74%	73%	76%	73%	<b>69%</b>
Reported Plans (actual)	86%	87%	85%	79%	77%	76%	74%	73%	76%	73%	67%
<b>Total No. of Retirement Systems:</b>	131	131	131	131	131	131	131	131	131	131	103

\*The estimation process is explained later in the report (exhibit 3 and its preceding text).

The aggregate pension asset and liability values in Exhibit 1 are not directly comparable across columns because of the different number of retirement systems included for each year. As such, in the case of the most recent year that does not yet include data for the complete set of plans, we include an estimate of the funding ratios across all 131 plans. By combining these estimates with the historical funding ratios for the complete set of plans we can better evaluate the financial health for these 131 retirement systems over the last ten years.

Wilshire estimates that the aggregate market value funding ratio was 69% at the end of the 2016 fiscal year. This represents the second consecutive year of 4% declines in funded ratio and the first year since 2010 with an aggregate funded ratio below 70%. A significant cause for the decline was negative global equity returns, exacerbated by the British referendum vote to leave the European Union, for the 12-month period ending June 30, 2016. In addition, the projected total pension liability for all plans was estimated to increase.

Over the past 10 years, market value funded ratios have been as high as 95% in 2007 and as low as 64% just two years later in 2009. Since 2009, the market value funded ratio has remained in the high 60 to low 70 percent range with the exception of 2014 when we estimate the funded ratio reached 77%. Over this 10-year period, there has been significant global economic and political turmoil which resulted in asset growth headwinds. In addition, pension liability values have steadily increased due to the natural maturation of pension liabilities and several plans lowering their discount rate. All of these factors have limited the increase in funded ratio.

Actuarial value funding ratios have also declined fairly steadily, with periodic upward blips, over the 10-year period between fiscal year-end 2006 and fiscal year-end 2016, ranging from a high of

<sup>2</sup> As disclosed in annual reports (most annual reports use a June 30 or December 31 fiscal year). Liabilities are the reported actuarial accrued liabilities and assets are the current market and actuarial values as of the same valuation date as liabilities.

87% in 2007 to a nadir of 69% currently. Actuarial accounting practices incorporate smoothing procedures to mitigate asset valuation volatility in plan projections; one product of these accounting conventions is notably lower variability of actuarial value-based funding ratios. However, with the adoption of GASB 67 and 68, most plans have begun reporting their Fiduciary Net Position, which by definition is priced at market; statistics using this metric have increased the overall volatility in subsequent reporting periods.

Exhibit 2 shows asset and liability values for the 103 retirement systems which reported actuarial values for 2016 and compares them with the same totals from the previous ten fiscal years.

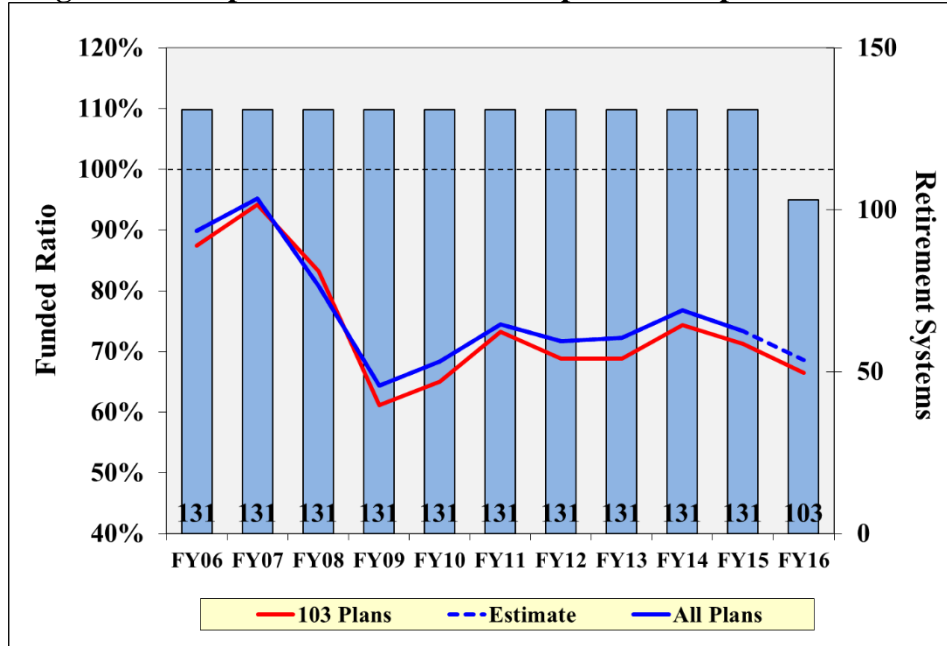
**Exhibit 2**  
**Financial Overview of 103 State Retirement Systems (\$ billions)**

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Annualized Change %		
												2006-2016	2015-2016	
<b>Total Pension Assets:</b>														
- Market Value	\$1,939.9	\$2,239.3	\$2,087.6	\$1,624.1	\$1,776.3	\$2,069.7	\$2,037.4	\$2,206.7	\$2,501.0	\$2,392.1	\$2,349.3	1.9%	-1.8%	
- Actuarial Value	\$1,877.3	\$2,028.9	\$2,096.3	\$2,048.5	\$2,068.0	\$2,108.1	\$2,141.6	\$2,230.8	\$2,474.5	\$2,386.8	\$2,358.7	2.3%	-1.2%	
<b>Total Pension Liabilities:</b>	\$2,218.0	\$2,377.9	\$2,507.7	\$2,655.4	\$2,728.7	\$2,825.2	\$2,960.9	\$3,206.3	\$3,361.2	\$3,355.3	\$3,534.9	4.8%	5.4%	
<b>Difference:</b>														
- Market Value	-\$278.1	-\$138.6	-\$420.1	-\$1,031.3	-\$952.4	-\$755.5	-\$923.5	-\$999.6	-\$860.2	-\$963.2	-\$1,185.6			
- Actuarial Value	-\$340.7	-\$349.0	-\$411.4	-\$606.9	-\$660.6	-\$717.1	-\$819.3	-\$975.5	-\$886.6	-\$968.5	-\$1,176.2			
<b>Assets as a % of Liabilities:</b>														
- Market Value	87%	94%	83%	61%	65%	73%	69%	69%	74%	71%	66%			
- Actuarial Value	85%	85%	84%	77%	76%	75%	72%	70%	74%	71%	67%			
<b>Underfunded Plans as %</b>														
- Market Value	83%	70%	88%	100%	98%	91%	96%	96%	88%	93%	97%			
- Actuarial Value	85%	85%	87%	94%	94%	95%	97%	96%	89%	92%	96%			
<b>Total No. of Systems:</b>	103	103	103	103	103	103	103	103	103	103	103			

At the end of fiscal year 2016, the funded ratio for these plans was 66%. This represents a 5% decline in funded ratio year-over-year and the fifth time in 10 years that this group of plans' funded ratio is below 70%. The year-over-year decline in funded ratio was due to the 5.4% increase in total pension liability value and 1.8% decrease in the market value of assets. Over the past 10 years, the annual increase in total pension liability value is 4.8% compared to an annual increase of 1.9% for the market value of assets which has resulted in the 20% decline in funded ratio.

It is important to note, as with any sample, there exists some level of statistical error. Although the 103 funds with 2016 fiscal year data constitute a sizable majority of the state plans in our survey, one will find some transient variance in sample data from the entire plan cohort. Exhibit 3 provides a graphical comparison between the historical data of all plans versus the subset of 103 plans with more recently reported data. The dotted line represents Wilshire's estimated funding ratio for the complete set of 131 plans, which is derived from the historical relationship between the 103-plan sample and the complete set of 131 plans. Using this approach one can reasonably expect a fiscal 2016 funding ratio of approximately 69% once all plans have reported 2016 actuarial data. This estimation approach and graphical representation of estimated data will be used throughout the remainder of this report.

**Exhibit 3**  
**Funding Ratio Comparison of 103 Plan Sample vs. Complete Set of 131 Plans**



*Funding Ratios*

Expanding on Exhibit 3, Exhibit 4 shows the aggregate, average, median (50<sup>th</sup>), 25<sup>th</sup>, and 75<sup>th</sup> percentile market value funding ratios for the 131 state pension systems over the last ten fiscal years. As Exhibits 3 and 4 show, the aggregate funded ratio was below 70% as of the end of fiscal year 2016. Since reaching the high point at the end of the 2007 fiscal year, funded ratios have trended down reaching a 64% nadir in funded ratio at the end of 2009. Since then, the aggregate market value funded ratio has peaked twice in 2011 and 2014 at 74% and 77%, respectively, only to end the current fiscal year below 70%.

**Exhibit 4**  
**Market Value Funding Ratios by Fiscal Year for 131 Plans**

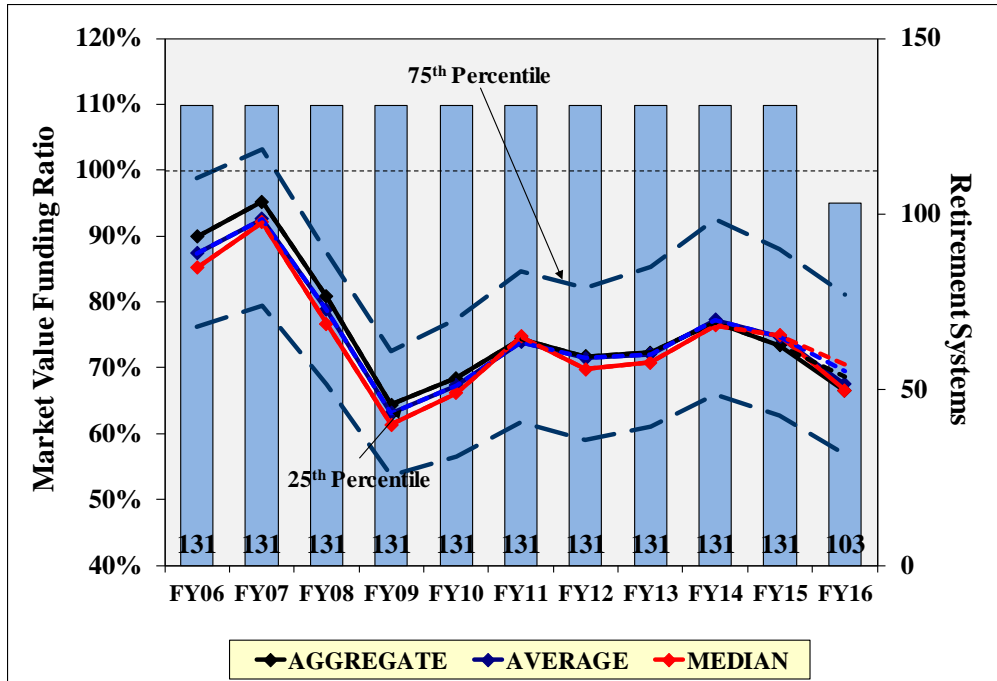


Exhibit 5 shows the same information as Exhibit 4, except it uses the actuarial value of assets and/or Plan Fiduciary Net Position to determine funding ratios. In contrast with Exhibit 4’s more volatile market value-based funding ratio time series, Exhibit 5 shows an essentially steady, gradual decline in funding ratios through fiscal 2013, then an improvement in funding in fiscal 2014, followed by further declines through fiscal 2016. As noted above, accounting conventions prior to fiscal 2014 reporting allow plan sponsors to smooth actuarial values of assets over forecast periods in order to reduce the volatility of projected sponsor contributions to the pension plan.



**Exhibit 5**  
**Actuarial Value Funding Ratios by Fiscal Year for 131 Plans**

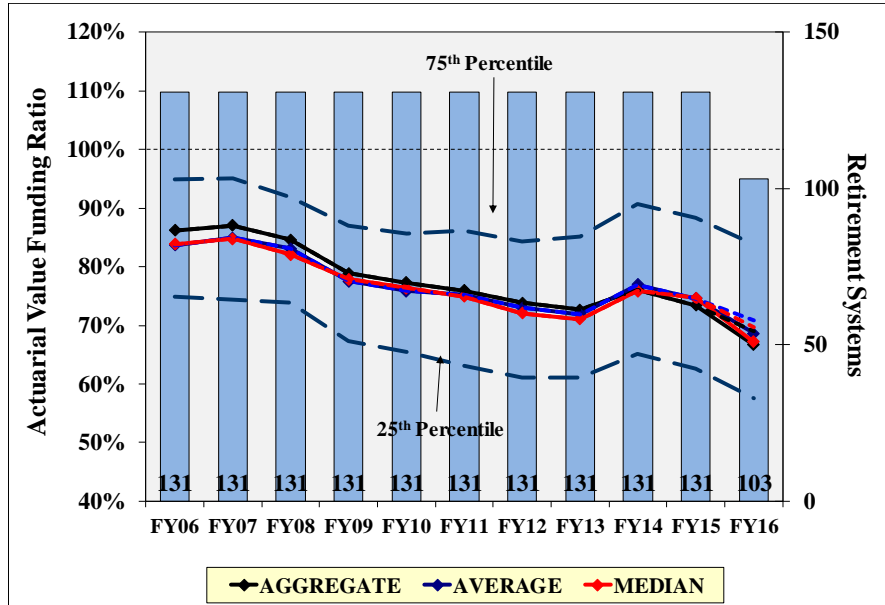
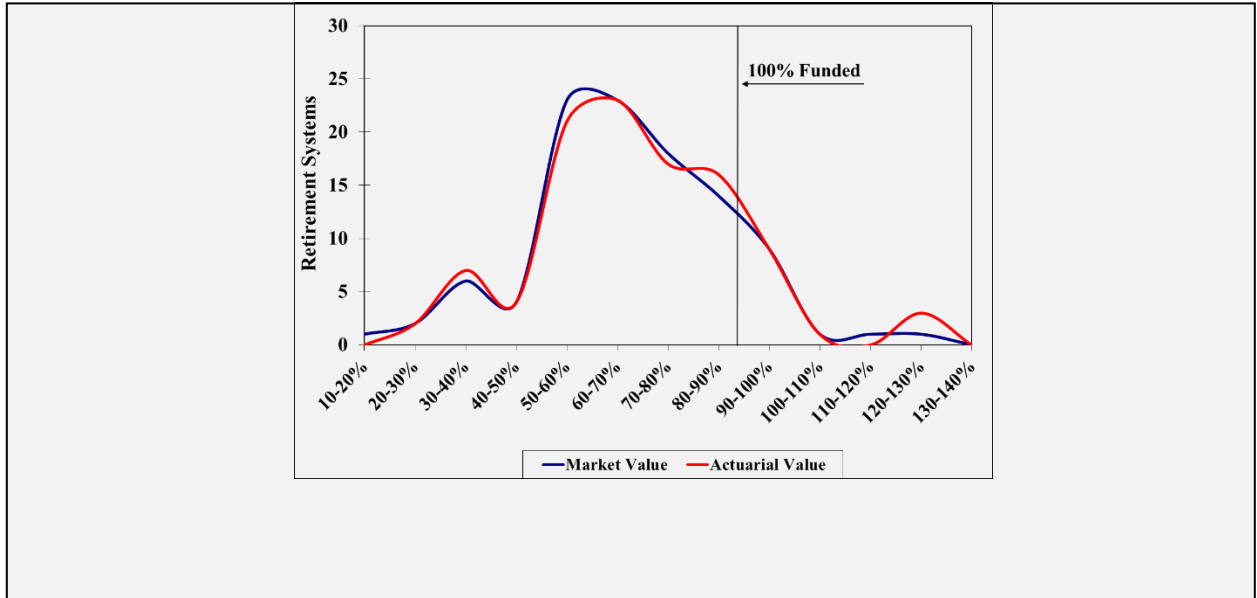


Exhibit 6 shows a more detailed picture of the fiscal condition for the 103 state retirement systems that reported actuarial values for 2016.

**Exhibit 6**  
**Distribution of 103 State Pension Systems by Fiscal Year 2016 Funding Ratio**

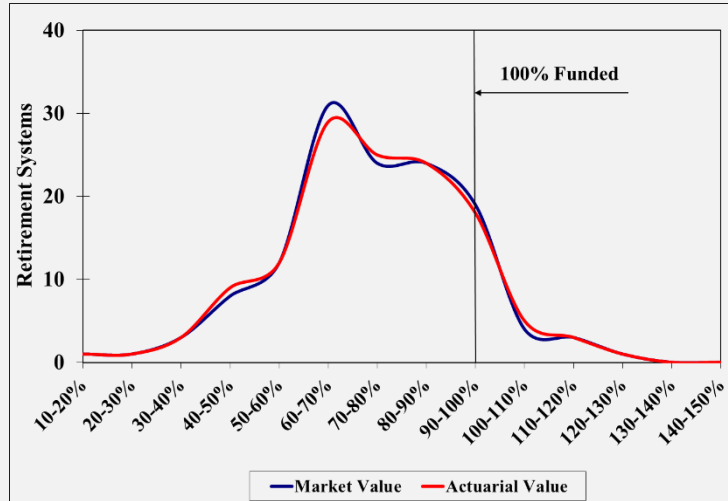


Distribution	Bucket Count				Distribution	Cumulative Count			
	Market Value		Actuarial Value			Market Value		Actuarial Value	
	Count	% of Total	Count	% of Total	Count	% of Total	Count	% of Total	
0-50%	13	13%	13	13%	0-50%	13	13%	13	13%
50-60%	23	22%	21	20%	0-60%	36	35%	34	33%
60-70%	23	22%	23	22%	0-70%	59	57%	57	55%
70-80%	18	17%	17	17%	0-80%	77	75%	74	72%
80-90%	14	14%	16	16%	0-90%	91	88%	90	87%
90-100%	9	9%	9	9%	0-100%	100	97%	99	96%
100-110%	1	1%	1	1%	0-110%	101	98%	100	97%
110-120%	1	1%	0	0%	0-120%	102	99%	100	97%
120-130%	1	1%	3	3%	0-130%	103	100%	103	100%
Total	103	100%	103	100%	Total	103	100%	103	100%

We have noted above that 97%, or 100, of these 103 plans with 2016 actuarial data are underfunded on a market value of asset basis; Exhibit 6 demonstrates the extent of the shortfall. Thirteen plans have assets less than 50% of liabilities; 59 plans have assets less than 70% of liabilities; and 77 plans have assets less than 80% of liabilities. Using the actuarial value of assets to determine funding ratios, 99 plans have assets below liabilities. Thirteen plans have assets less than 50% of liabilities; 57 plans have assets less than 70% of liabilities; and 74 plans have assets less than 80% of liabilities.

Similar to Exhibit 6, Exhibit 7 examines the fiscal condition of the 131 state retirement systems that reported actuarial values for 2015.

**Exhibit 7**  
**Distribution of 131 State Pension Systems by Fiscal Year 2015 Funding Ratio**



Distribution	Bucket Count				Distribution	Cumulative Count			
	Market Value		Actuarial Value			Market Value		Actuarial Value	
	Count	% of Total	Count	% of Total	Count	% of Total	Count	% of Total	
0-50%	13	10%	14	11%	0-50%	13	10%	14	11%
50-60%	12	9%	12	9%	0-60%	25	19%	26	20%
60-70%	31	24%	29	22%	0-70%	56	43%	55	42%
70-80%	24	18%	25	19%	0-80%	80	61%	80	61%
80-90%	24	18%	24	18%	0-90%	104	79%	104	79%
90-100%	19	15%	18	14%	0-100%	123	94%	122	93%
100-110%	4	3%	5	4%	0-110%	127	97%	127	97%
110-120%	3	2%	3	2%	0-120%	130	99%	130	99%
120-130%	1	1%	1	1%	0-130%	131	100%	131	100%
130-140%	0	0%	0	0%	0-140%	131	100%	131	100%
140-150%	0	0%	0	0%	0-150%	131	100%	131	100%
<b>Total</b>	<b>131</b>	<b>100%</b>	<b>131</b>	<b>100%</b>	<b>Total</b>	<b>131</b>	<b>100%</b>	<b>131</b>	<b>100%</b>

Using the market value of assets to determine funding ratios, 123 of the 131 plans, or 94%, had assets less than liabilities. Five plans had assets less than 50% of liabilities; 25 plans had assets less than 70% of liabilities; and 56 plans had assets less than 80% of liabilities. Using the actuarial value of assets to determine funding ratios, 104 of the 131 plans, or 79%, had assets less than liabilities. Five plans had assets less than 50% of liabilities; 26 plans had assets less than 70% of liabilities; and 55 plans had assets less than 80% of liabilities.

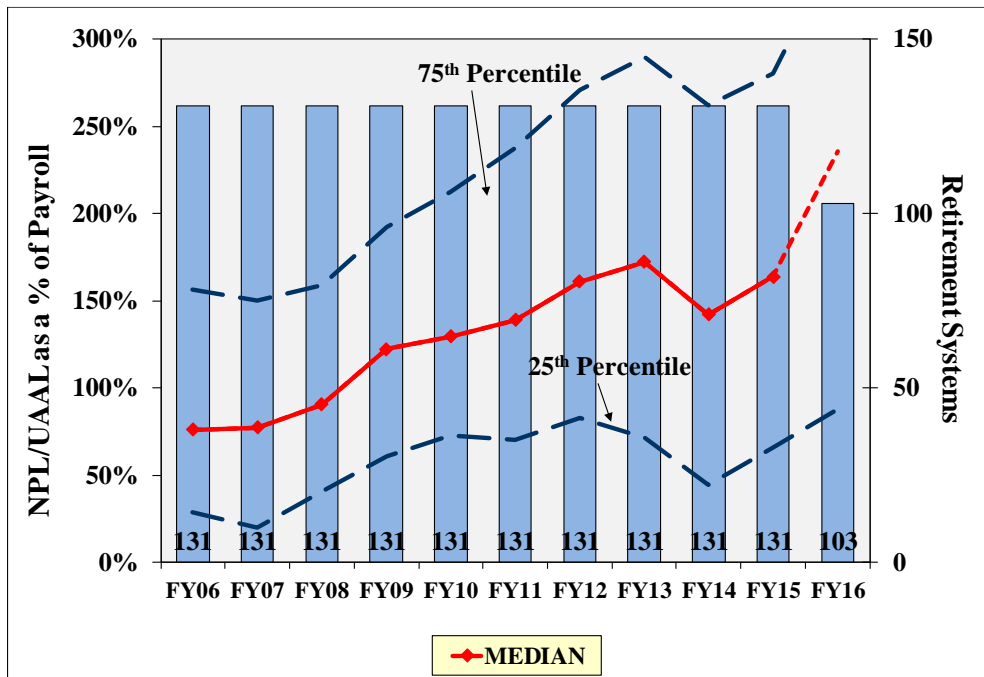
*Plan Net Pension Liability/Unfunded Actuarial Accrued Liability*

The financial health of retirement systems can also be measured by comparing the size of the Plan Net Pension Liability (NPL), or in pre-GASB 67/68 terms the unfunded actuarial accrued liability (UAAL), to relevant metrics. Since assets under Governmental Accounting Standards Board

(GASB) Statement No. 25<sup>3</sup> are based on actuarial values, this section calculates the UAAL using actuarial value of assets for periods prior to fiscal 2014, when GASB 67 took effect.

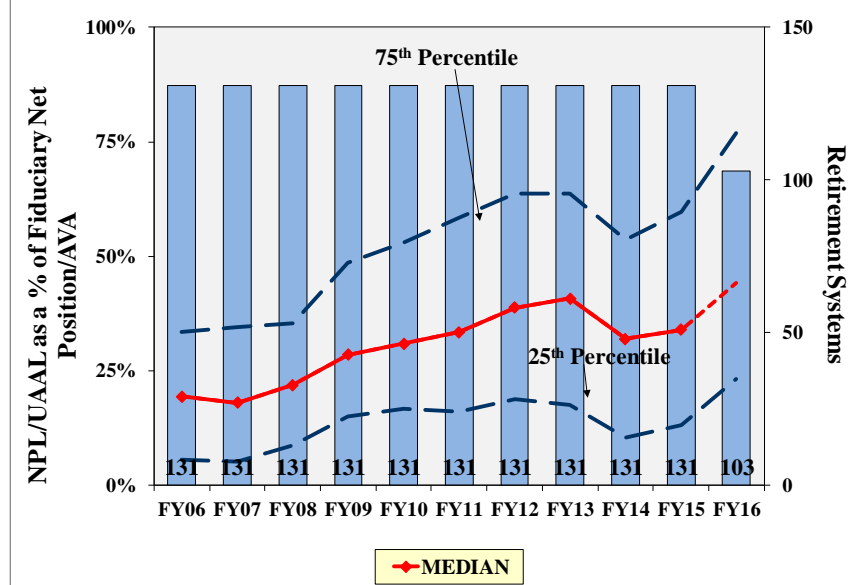
Exhibits 8, 9 and 10 shows the 25<sup>th</sup> percentile, median (50<sup>th</sup>) and 75<sup>th</sup> percentile sizes of the NPL/UAAL relative to the covered payroll, actuarial value of assets and actuarial accrued liability during the last eleven fiscal years for the 131 retirement systems. UAAL increased between fiscal 2006 and fiscal 2013, with an especially steep climb during the most recent recession. With the adoption of GASB 67 and the strong performance of global equities in fiscal 2014, the ratio of Net Pension Liability to each of the three metrics considered fell markedly that year. In more recent fiscal years, however, growth in NPL outpaced growth in all three of the metrics:

**Exhibit 8**  
**NPL/UAAL as a % of Covered Payroll by Fiscal Year for 131 Plans**

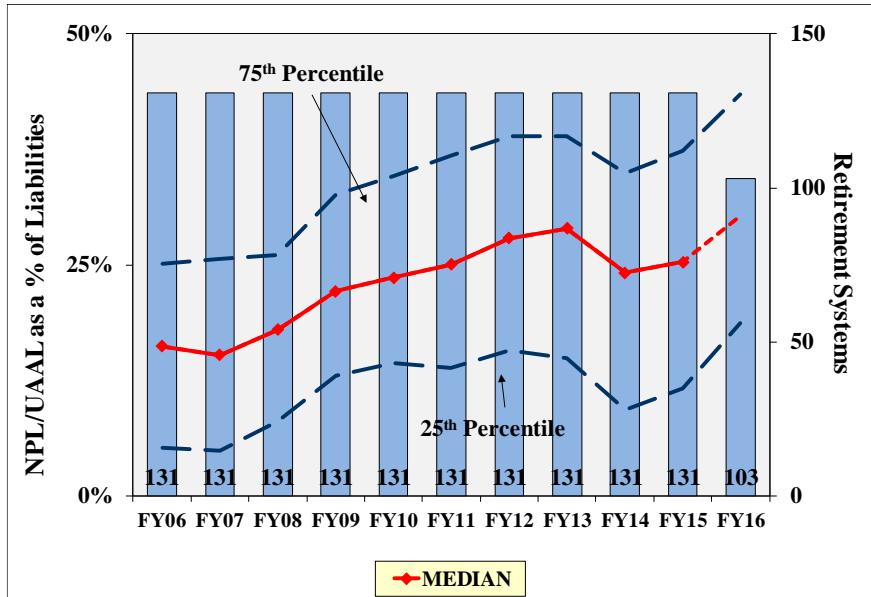


<sup>3</sup> GASB No. 25, “Financial Reporting for Defined Benefit Pension Plans and Note Disclosures for Defined Contribution Plans”.

**Exhibit 9**  
**NPL/UAAL as a % of Actuarial Value of Assets by Fiscal Year for 131 Plans**



**Exhibit 10**  
**NPL/UAAL as a % of Accrued Liabilities by Fiscal Year for 131 Plans**



**Asset Allocation**

In this section, we examine the high level asset allocation strategies employed by the state retirement systems. Exhibit 11 provides a snapshot of the aggregate asset allocation as of the latest reported fiscal year-end across all 131 state retirement systems.

**Exhibit 11**  
**Average Asset Allocation for State Pension Plans**

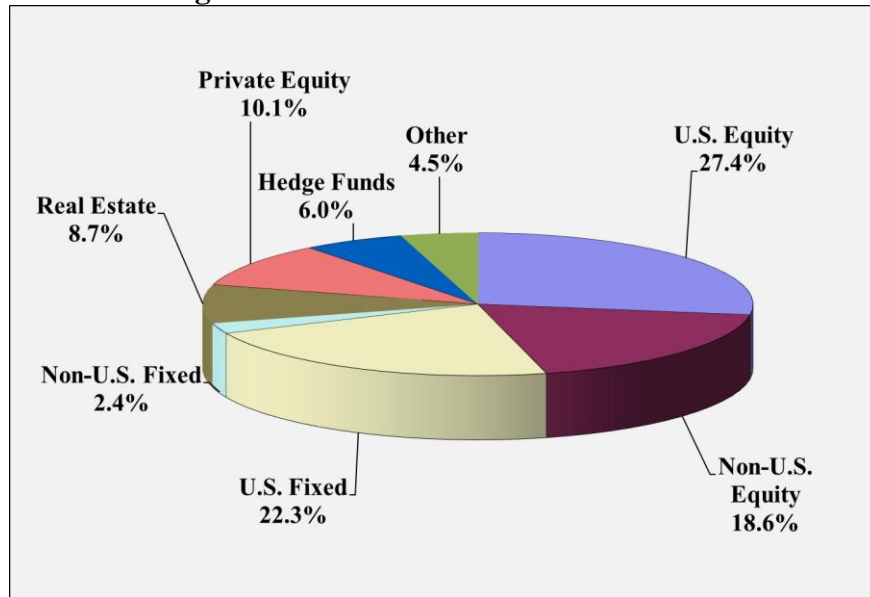


Exhibit 12 examines the change in average asset allocation over the last ten years.

**Exhibit 12**  
**Change in Average Asset Allocation for State Pension Plans**

Equity	2006	2011	2016	Change in Exposure	
				06-11	11-16
U.S. Equity	42.3 %	31.2 %	27.4 %	-14.9 %	-3.8 %
Non-U.S. Equity	17.1	19.9	18.6	1.5	-1.3
Real Estate	4.8	6.4	8.7	3.9	2.3
Private Equity	4.4	8.6	10.1	5.7	1.5
Equity Subtotal	68.6	66.0	64.8	-3.8	-1.2
Debt					
U.S. Fixed	27.2	23.4	22.3	-4.9	-1.1
Non-U.S. Fixed	0.9	1.7	2.4	1.5	0.7
Debt Subtotal	28.1	25.1	24.7	-3.4	-0.4
Other	3.3	8.9	10.5	7.2	1.6
Return *	6.1	6.1	6.4	0.3	0.2
Risk *	11.8	11.6	12.1	0.3	0.5

\* Return and Risk are based on Wilshire Consulting's current asset class assumptions (Exhibit 13).

During the period, the average allocation to U.S. equity and fixed income declined significantly from 42.3% to 27.4% and 27.2% to 22.3% respectively. Flows from U.S. equity and fixed income have moved primarily to real estate, private equity and other (cash, cash equivalents, commodities, hedge funds and other absolute return strategies). One can propose several possible explanations for these phenomena, alone or in combination:

- Rotation out of the relatively efficient U.S. stock and bond markets into less-efficient asset spaces;
- Plan sponsors reducing the home-market bias in their fund holdings;
- Plan sponsors increasing asset diversification in an attempt to de-risk the Total Fund;
- Plan sponsors increasing their exposures to more leveraged strategies, such as private market equity, in an effort to meet return targets.

Portfolio expected return and risk are calculated by combining Wilshire's 10-year assumptions for the major asset classes and each retirement system's actual asset allocation. Exhibit 12 includes the expected return and risk based on the average asset allocations from 2006, 2011 and 2016 using Wilshire's current long-term return and risk assumptions illustrated in Exhibit 13. The redeployment of assets over the past decade out of U.S. public markets and into offshore and alternative assets has caused the average state pension plan to move towards a somewhat higher

expected risk profile along the efficient frontier, with a slight increase in the expected return. This projected increase in risk-adjusted performance suggests that these plans' allocations to return-enhancing asset strategies are also delivering diversification benefits.

**Exhibit 13**  
**Wilshire's December, 2016 Capital Market Assumptions**

	Expected Return		Risk
	10-Year	30-Year	
U.S. Equity	6.5 %	7.6 %	17.0 %
Non-U.S. Equity	6.7	7.8	18.8
Private Equity	9.4	10.4	27.5
Real Estate	6.0	7.4	14.0
U.S. Bonds	3.6	4.8	5.2
Non-U.S Bonds	1.3	3.9	3.5

Exhibit 14 contains summary statistics on asset allocation for all state retirement systems. The median allocation<sup>4</sup> is 25.6% to U.S. equities and 17.8% to Non-U.S. equities. However, there is considerable variability in allocations among individual systems. Wilshire estimates that the median state pension fund has a 10-year expected return of 6.4%. This result is 1.1% less than the current median liability discount rate of 7.50%. It is important to note that Wilshire's long-term asset assumptions do not include any expectations from active management. By contrast, the actuarial discount rate assumed by plans is typically geared at a longer-term horizon and includes all anticipated sources of return. As such, while we present these data for illustrative purposes, they are not directly comparable (i.e. Wilshire's assumptions are primarily derived to assist in conducting asset allocation studies and are not put forth as a metric to formulate an assumed actuarial rate of return).

Wilshire has also developed a set of asset class return assumptions with longer time horizons; these forecast returns assume a resumption of long-term equilibrium relationships between asset classes and inflation. Using 30-year long-term assumptions, the median state defined benefit pension is estimated to have an annualized return of 7.4% (again, with no assumption of alpha from active management).

<sup>4</sup> The "Median" column in Exhibit 14 represents the median for each asset class and therefore does not sum to 100%. The median expected return is based on the median fund return, not on the median asset mix.



**Exhibit 14**  
**Summary Asset Allocation Statistics for State Pension Plans**

	<u>Lowest (%)</u>	<u>Median (%)</u>	<u>Highest (%)</u>
U.S. Equity	0.0 %	25.3 %	77.4 %
Non-U.S. Equity	0.0	17.8	36.0
Private Equity	0.0	9.2	45.6
Real Estate	0.0	8.4	19.3
U.S. Bonds	8.2	22.3	51.3
Non-U.S Bonds	0.0	0.7	16.9
Hedge Funds	0.0	5.0	25.7
Other	0.0	2.9	29.1
<b>Expected Returns</b>	<b>5.5 %</b>	<b>6.4 %</b>	<b>7.3 %</b>

Exhibit 15 plots the expected return and risk for each of the 131 state retirement systems based upon their actual asset allocation. Systems that plot in the upper right employ more aggressive asset mixes while systems that plot in the lower left represent those with more conservative mixes. The dashed horizontal line, equal to 7.50%, represents the current median actuarial interest rate assumption employed by state pension plans.

Using Wilshire’s December 2016 10-year capital market return forecasts, none of the 131 state retirement systems are expected to earn long-term asset returns that equal or exceed the median liability discount rate assumption. It is again important to note that Wilshire return assumptions represent beta only, with no projection of alpha from active management, and may differ in time horizon (10+ years) from the methodologies underlying actuarial interest rate assumptions (20 to 30+ years). Using Wilshire’s 30-year longer-term assumptions, 58 of the 131 plans’ assets, in their current allocation, would be projected to earn long-term returns above their current discount rates.

**Exhibit 15**  
**Projected Return & Risk Forecasts for State Pension Plans**

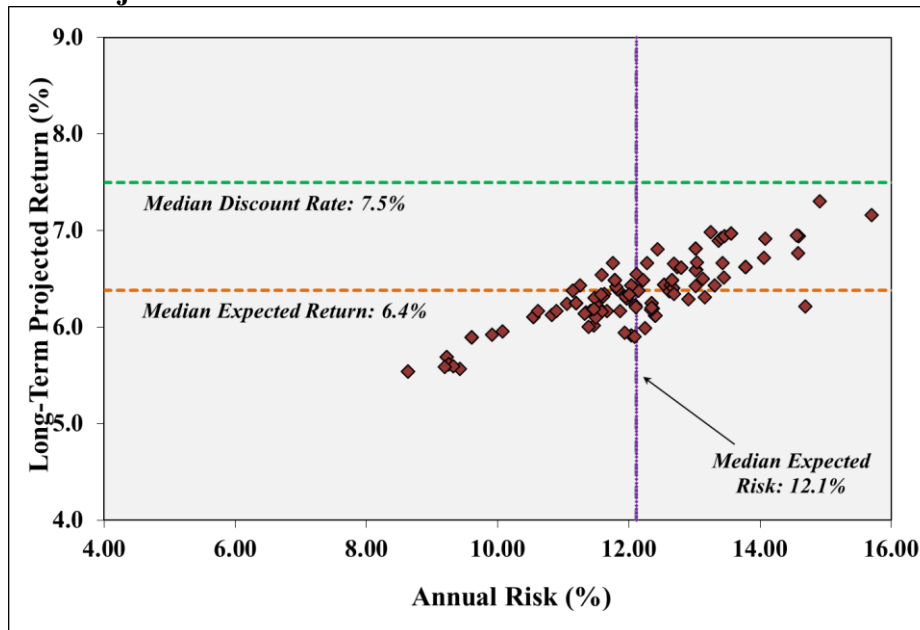
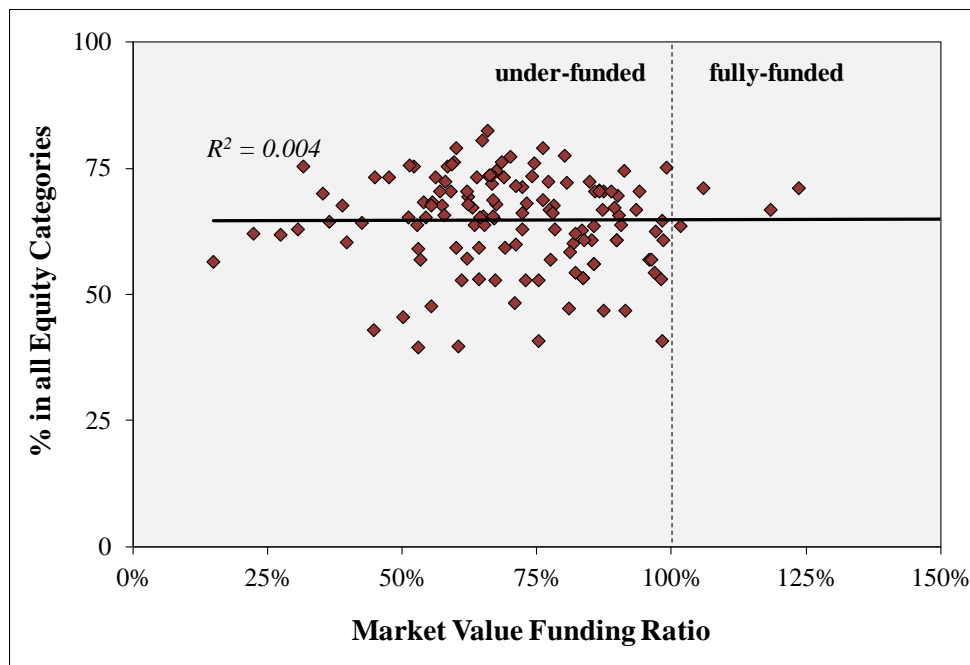


Exhibit 16 addresses the relationship between asset allocation and funding for all state systems. The allocation to equity asset classes, a proxy for investment aggressiveness, is plotted on the vertical scale. The market value funding ratio is on the horizontal scale.

**Exhibit 16**  
**Asset Allocation & Actuarial Funding Ratios for State Pension Plans**



The vertical line in Exhibit 16 separates overfunded plans from underfunded plans. Casual observation uncovers no pattern connecting funded ratio to equity exposure, and in fact the R-squared between the total equity exposures and funding ratios of these plans is basically zero. In other words, there is no discernable relationship between asset allocation and funding. State retirement systems show a broad spectrum of asset allocations that appear to be unrelated to the size of their unfunded liabilities.

## Appendix A: State Retirement Systems<sup>5</sup>

<u>Retirement System</u>	<u>Retirement System</u>	<u>Report Date</u>
Alabama ERS	Alabama Employees' Retirement System	9/30/2015
Alabama TRS	Alabama Teachers' Retirement System	9/30/2015
Alaska PERS	Alaska Public Employees' Retirement System	6/30/2016
Alaska TRS	Alaska Teachers' Retirement System	6/30/2016
Arizona PSPRS	Arizona Public Safety Personnel Retirement System	6/30/2016
Arizona SRS	Arizona State Retirement System	6/30/2016
Arkansas Highway ERS	Arkansas Highway Employees Retirement System	6/30/2016
Arkansas PERS	Arkansas Public Employees Retirement System	6/30/2016
Arkansas TRS	Arkansas Teachers Retirement System	6/30/2015
California PERS	California Public Employees' Retirement System	6/30/2016
California Regents	The Regents of the University of California	6/30/2016
California STRS	California State Teachers' Retirement System	6/30/2016
Colorado Fire & Police	Colorado Fire & Police Pension Association	12/31/2015
Colorado PERA: Municipal	Colorado PERA: Municipal Division Trust Fund	12/31/2015
Colorado PERA: State & School	Colorado PERA: State & School Division Trust Fund	12/31/2015
Connecticut SERS	Connecticut State Employees' Retirement System	6/30/2016
Connecticut TRS	Connecticut State Teacher's Retirement System	6/30/2016
DC Police & Fire	District of Columbia Police Officers & Fire Fighters' Retirement System	9/30/2015
DC TRS	District of Columbia Teachers Retirement System	9/30/2015
Delaware PERS	Delaware Public Employees' Retirement System	6/30/2016
Florida RS	Florida Retirement Systems	6/30/2016
Georgia ERS	Georgia Employees Retirement System	6/30/2016
Georgia TRS	Georgia Teachers Retirement System	6/30/2016
Hawaii ERS	Hawaii Employees' Retirement System	6/30/2016
Idaho FRF	Idaho Firefighters' Retirement Fund	6/30/2016
Idaho PERSI	Idaho Public Employee Retirement Fund Base Plan	6/30/2016
Illinois Muni Ret Fund	Illinois Municipal Retirement Fund	12/31/2015
Illinois SERS	Illinois State Employees' Retirement System	6/30/2016
Illinois SURS	Illinois State Universities Retirement System	6/30/2016
Illinois TRS	Illinois State Teachers' Retirement System	6/30/2016
Indiana PERF: Employees	Indiana Public Employees' Retirement Fund: Employees	6/30/2016
Indiana PERF: Police & Fire	Indiana PERF: Police Officers' & Firefighters' Pension & Disability Fund	6/30/2016
Indiana TRF	Indiana State Teachers Retirement Fund	6/30/2016
Iowa Fire & Police	Iowa Municipal Fire & Police Retirement System	6/30/2016
Iowa PERS	Iowa Public Employees Retirement System	6/30/2016
Kansas PERS	Kansas Public Employees Retirement System	6/30/2016
Kentucky RS: CERS Hazardous	Kentucky Employees Retirement System: County Hazardous Employees	6/30/2016
Kentucky RS: CERS Non-Hazardous	Kentucky Employees Retirement System: County Non-Hazardous Employees	6/30/2016
Kentucky RS: KERS Hazardous	Kentucky Employees Retirement System: State Hazardous Employees	6/30/2016
Kentucky RS: KERS Non-Hazardous	Kentucky Employees Retirement System: State Non-Hazardous Employees	6/30/2016
Kentucky RS: State Police	Kentucky Employees Retirement System: State Police Retirement System	6/30/2016
Kentucky TRS	Kentucky Teachers' Retirement System	6/30/2016
Louisiana School ERS	Louisiana School Employees' Retirement System	6/30/2015
Louisiana SERS	Louisiana State Employees' Retirement Systems	6/30/2016
Louisiana State Police	Louisiana State Police Pension & Retirement System	6/30/2016

<sup>5</sup> All state plan information is obtained from public information sources.

## Appendix A: (cont.)

<u>Retirement System</u>	<u>Retirement System</u>	<u>Report Date</u>
Louisiana TRS	Louisiana Teachers Retirement System	6/30/2016
Maine SRS	Maine State Retirement System	6/30/2016
Maryland SRPS: Employees	Maryland State Retirement & Pension System: Employees	6/30/2016
Maryland SRPS: State Police	Maryland State Retirement & Pension System: State Police	6/30/2016
Maryland SRPS: Teachers	Maryland State Retirement & Pension System: Teachers	6/30/2016
Massachusetts SRB	Massachusetts Public Employee Retirement Administration Commission: SRB	6/30/2016
Massachusetts Teachers	Massachusetts Public Employee Retirement Administration Commission: Teachers	6/30/2016
Michigan Municipal	Michigan Municipal Employees Retirement System	12/31/2015
Michigan Public School ERS	Michigan Public School Employees Retirement System	9/30/2016
Michigan SERS	Michigan State Employees Retirement System	9/30/2016
Michigan State Police	Michigan State Police Retirement System	9/30/2015
Minnesota PERA: Employees	Minnesota Public Employees Retirement Association: Employees	6/30/2016
Minnesota PERA: Police & Fire	Minnesota Public Employees Retirement Association: Police & Fire	6/30/2016
Minnesota SRS: Employees	Minnesota State Retirement System: Employees	6/30/2016
Minnesota SRS: State Patrol	Minnesota State Retirement System: State Patrol	6/30/2016
Minnesota TRA	Minnesota Teachers Retirement Association	6/30/2016
Mississippi PERS	Mississippi Public Employees' Retirement System	6/30/2016
Missouri ERS	Missouri State Employee Retirement System	6/30/2016
Missouri Highway ERS	Missouri Highway & Transportation Employees and Highway Patrol Retirement System	6/30/2016
Missouri PEERS	Missouri Public Education Employee Retirement System	6/30/2016
Missouri PSRS	Missouri Public School Retirement System	6/30/2016
Montana PERB	Montana Public Employees Retirement Board	6/30/2016
Montana TRS	Montana Teachers' Retirement System	6/30/2016
Nebraska RS	Nebraska Retirement System	6/30/2016
Nevada PERS	Nevada Public Employees' Retirement System	6/30/2016
New Hampshire Retirement System	New Hampshire Retirement System	6/30/2016
New Jersey PERS	New Jersey Public Employees Retirement System	6/30/2016
New Jersey Police & Fire	New Jersey Police & Firemen's Retirement System	6/30/2016
New Jersey State Police	New Jersey State Police Retirement System	6/30/2016
New Jersey TPAF	New Jersey Teachers' Pension & Annuity Fund	6/30/2016
New Mexico ERB	New Mexico Educational Retirement System	6/30/2016
New Mexico PERA	New Mexico Public Employees Retirement Association	6/30/2016
New York STRS	New York State Teachers Retirement System	6/30/2016
New York: ERS	New York State & Local Employees' Retirement System	3/31/2016
New York: Police & Fire	New York Police & Fire Retirement System	3/31/2016
North Carolina Local ERS	North Carolina Local Governmental Employees' Retirement System	6/30/2016
North Carolina TSERS	North Carolina Teachers' & State Employees' Retirement System	6/30/2016
North Dakota PERS	North Dakota Public Employees Retirement System	6/30/2016
North Dakota TFFR	North Dakota Teachers' Fund for Retirement	6/30/2016
Ohio PERS	Ohio Public Employees Retirement System	12/31/2015
Ohio Police & Fire	Ohio Police & Fire Pension Fund	12/31/2015
Ohio School Employees RS	Ohio School Employees Retirement System	6/30/2016
Ohio STRS	Ohio State Teachers Retirement System	6/30/2016
Oklahoma Firefighters	Oklahoma Firefighters Pension & Retirement System	6/30/2016
Oklahoma PERS	Oklahoma Public Employees Retirement System	6/30/2016

## Appendix A: (cont.)

<u>Retirement System</u>	<u>Retirement System</u>	<u>Report Date</u>
Oklahoma Police	Oklahoma Police Pension & Retirement System	6/30/2016
Oklahoma TRS	Oklahoma Teachers Retirement System	6/30/2015
Oregon PERS	Oregon Public Employees Retirement System	6/30/2016
Pennsylvania PSERS	Pennsylvania Public School Employees' Retirement System	6/30/2016
Pennsylvania SERS	Pennsylvania State Employees' Retirement System	12/31/2015
Rhode Island ERS	Rhode Island Employees Retirement System	6/30/2016
Rhode Island JRBT	Rhode Island Judicial Retirement Benefits Trust	6/30/2016
Rhode Island MERS	Rhode Island Municipal Employees Retirement System	6/30/2016
Rhode Island SPRBT	Rhode Island State Police Retirement Benefits Trust	6/30/2016
South Carolina Police	South Carolina Police Officers Retirement System	6/30/2016
South Carolina RS	South Carolina Retirement System	6/30/2016
South Dakota RS	South Dakota Retirement System	6/30/2016
Tennessee Consolidated RS	Tennessee Consolidated Retirement System	6/30/2016
Texas CDRS	Texas County & District Retirement System	12/31/2015
Texas CDRS	Texas County & District Retirement System	12/31/2015
Texas ERS	Texas Employees Retirement System	8/31/2016
Texas LECOSRF	Texas Law Enforcement & Custodial Officers Supplemental Retirement Fund	8/31/2016
Texas Municipal	Texas Municipal Retirement System	12/31/2015
Texas Municipal	Texas Municipal Retirement System	12/31/2015
Texas TRS	Texas Teachers Retirement System	8/31/2016
Utah Contributory RS	Utah Contributory Retirement System	12/31/2014
Utah Contributory RS	Utah Contributory Retirement System	12/31/2014
Utah Firefighters RS	Utah Firefighters Retirement System	12/31/2015
Utah Noncontributory RS	Utah Noncontributory Retirement System	12/31/2015
Utah Public Safety RS	Utah Public Safety Retirement System	12/31/2015
Vermont MERS	Vermont Municipal Employees' Retirement System	6/30/2016
Vermont SERS	Vermont State Employees' Retirement System	6/30/2016
Vermont TRS	Vermont State Teacher's Retirement System	6/30/2016
Virginia JRS	Virginia Judicial Retirement System	6/30/2016
Virginia LORS	Virginia Law Officers' Retirement System	6/30/2016
Virginia RS	Virginia Retirement System	6/30/2016
Virginia SPORS	Virginia State Police Officers' Retirement System	6/30/2016
Washington LEOFF 1	Washington Law Enforcement Officers & Fire Fighters' Retirement System 1	6/30/2016
Washington LEOFF 2	Washington Law Enforcement Officers & Fire Fighters' Retirement System 2	6/30/2016
Washington PERS 1	Washington Public Employees' Retirement System Plan 1	6/30/2016
Washington PERS 2/3	Washington Public Employees' Retirement System Plan 2	6/30/2016
Washington SERS 2 & 3	Washington School Employees' Retirement System Plan 2 & 3	6/30/2016
Washington TRS 1	Washington Teachers' Retirement System Plan 1	6/30/2016
Washington TRS 2 & 3	Washington Teachers' Retirement System Plan 2 & 3	6/30/2016
Washington WSPRS 1 & 2	Washington State Patrol Retirement System	6/30/2016
West Virginia PERS	West Virginia Public Employees Retirement System	6/30/2015

## Appendix B: Key Policy Requirements within GASB 67 and 68<sup>6</sup>

- Governmental employers and plan sponsors will have to show the Net Pension Liability (NPL) of their retirement systems on their balance sheets; the NPL of a given pension is defined as the excess of its accrued Total Pension Liability over the Plan Fiduciary Net Position, or the fair market value of assets available for payment of pension benefits. Additionally, the employers and plan sponsors must present a detailed reconciliation of the change in NPL (i.e., pension expense) over the preceding twelve months in the balance sheets. The reliance on the Plan Fiduciary Net Position (i.e., total assets available for pension benefits, priced at market) to calculate NPL is a key difference from previous reporting standards, which allowed plans to use a smoothed actuarial value of assets to calculate their total actuarial liability and unfunded actuarial liability. This will make NPL potentially a more volatile measure of these pensions' financial health than the unfunded actuarial liability permitted by prior GASB rules.
- The only accepted actuarial cost method for calculating net pension liability will be individual level-percent-of-pay entry-age normal method.
- If current and expected future plan assets are projected to fully cover plan benefits, NPL can be computed using a discount rate equal to the expected long-term return on plan assets (see below for additional reporting requirements). If current and expected future assets are not projected to fully cover plan benefits, the unfunded-benefit portion of NPL must be computed using a discount rate derived from the yield or index rate for 20-year tax-exempt general obligation municipal bonds with an average rating of AA/Aa or higher. In our research for this year's funding report, we have found very few plans that utilized discount rates different from their assumed return on assets.
- The NPL must be reported using discount rates 1% higher and 1% lower than the discount rate (defined above) used in the primary disclosures.
- Disclosure of target asset allocation levels will now be required in the Notes to the Financial Statements included in pension plans' Comprehensive Annual Financial Reports (CAFRs).
- Pension plans are required to detail the asset classes used to calculate their long-term expected rate of return as well as the expected real rate of return for each.
- In the Required Supplementary Information section, pension plans will be required to provide a schedule of the last ten fiscal years' annual money-weighted rates of return on plan assets, net of investment expenses. Most plans have not been able to supply this information, nor ten years of Net Pension Liability schedules, in their fiscal 2014 or 2015 CAFRs.

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<sup>6</sup> GASB maintains a repository of its statements as well as analysis and guidance for their implementation on its website, <http://www.gasb.org>.

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