

Executive Summary

Asset / Liability Study Results

Michigan State Employees' Retirement System (MSERS)
Pension & OPEB
December 2015

Aon Hewitt
Retirement and Investment

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Asset-Liability Management Background

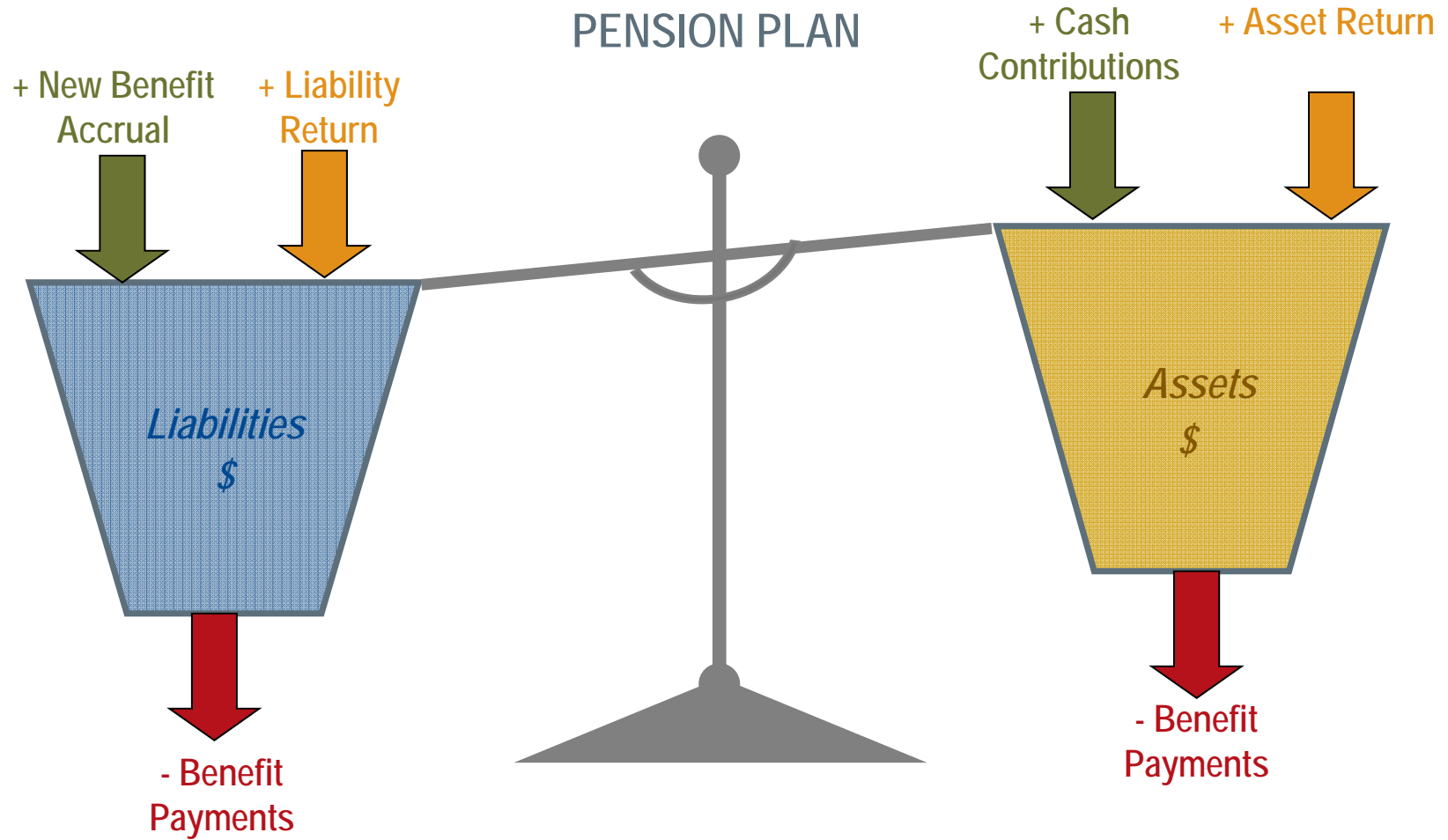
What is an Asset/Liability Study?

- Provides fiduciaries with an understanding of the dynamic relationship between plan assets and liabilities over time
- Illustrates the impact of various asset allocation targets on required contributions and funded status under a range of different macro-economic scenarios
- Identifies future trends in the financial health of the plan based on economic uncertainties that may not be evident from an actuarial valuation, which provides only a snapshot at a point in time
- Helps determine the level of risk that is appropriate in the context of the Plan's liabilities

An asset/liability study provides the tools to align a plan's risk taking with its liabilities

Asset-Liability Management Background

Balance of Liabilities and Assets



Summary of Key Findings for MSERS

▪ Pension

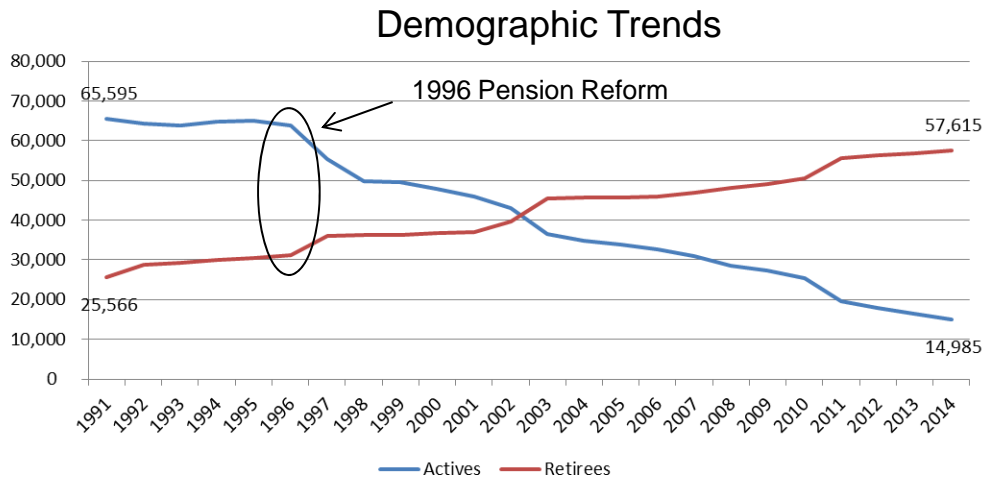
- Existing asset portfolio is well diversified; limited potential for increasing return per unit of risk
- Contribution volatility will increase as the closed amortization period declines to immediate recognition
- Contribution policy will close the funding shortfall and then asset returns will outpace the liability growth rate (further driving up the funded ratio) in our expected case
- Contribution amount is expected to decline over time
 - Adverse market conditions can lead to substantial risk in the plan contribution amount, however
- Net outflow will increase once the current amortization period expires
 - Allocations to illiquid assets will need to be monitored as the net outflow reaches higher levels
- Above findings assume that the contribution policy today extends throughout the next 30 years along with no changes to the current plan design or actuarial assumptions

▪ OPEB

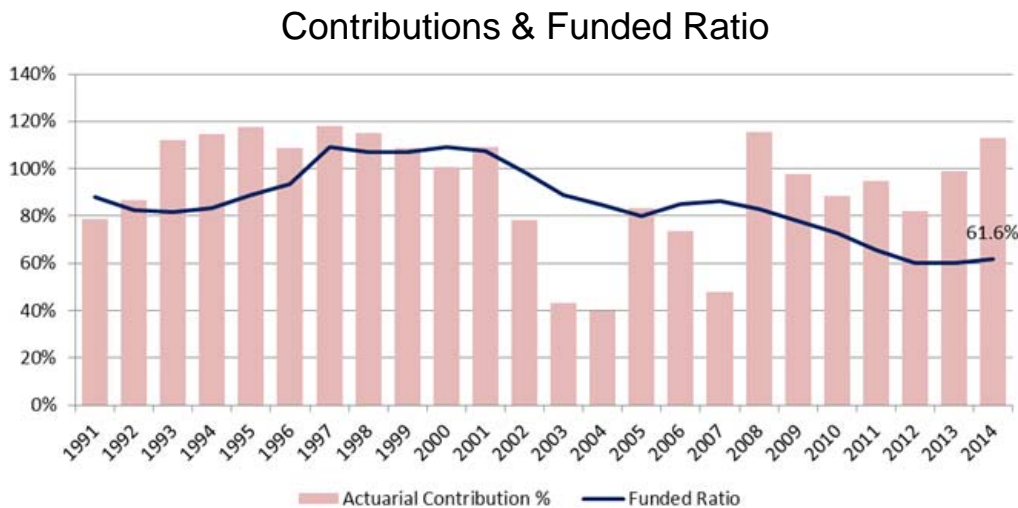
- Similar to Pension, except for the following:
 - Contributions will rise over the next 20 years due to the contribution policy and then decline once the plan moves to immediate recognition of (gains)/losses

Asset-Liability Profile

MSERS Pension Plan Overview



- Pension Reform in 1996 froze the defined benefit plan and created a defined contribution plan for future hires
- MSERS has become more mature over time which may implicate the investment strategy

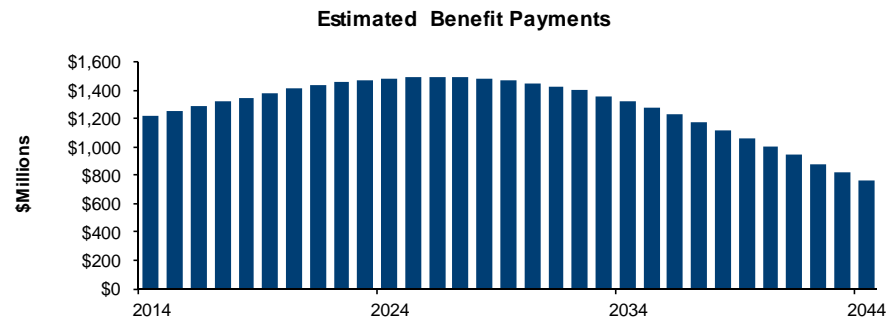


Pension Asset-Liability Profile

As of September 30, 2014

Asset-Liability Snapshot as of 9/30/2014			
Metric (\$, Millions)	Value	Fund %: (MVA)	(AVA)
Market Value of Assets	\$10,975		
Actuarial Value of Assets	\$9,962		
Liability Metrics			
Actuarial Liability (AL) - Accounting	\$16,122 ¹	68.1%	61.8%
Actuarial Liability (AL) - Funding	\$16,173 ²	67.9%	61.6%

Target Asset Allocation as of 9/30/2014		
Metric (\$, Millions)	Value	Alloc %
Return-Seeking		
- U.S. Equity	\$3,073	28.0%
- International Equity	\$1,756	16.0%
- Private Equity	\$1,975	18.0%
- Absolute Return	\$658	6.0%
- Real Estate / Infrastructure	\$1,097	10.0%
- Real Return / Opportunistic	\$1,043	9.5%
- Total	\$9,603	87.5%
Risk-Reducing		
- Cash & Short Duration Fixed Income	\$219	2.0%
- Core Fixed Income	\$1,152	10.5%
- Total	\$1,372	12.5%
Total	\$10,975	100.0%



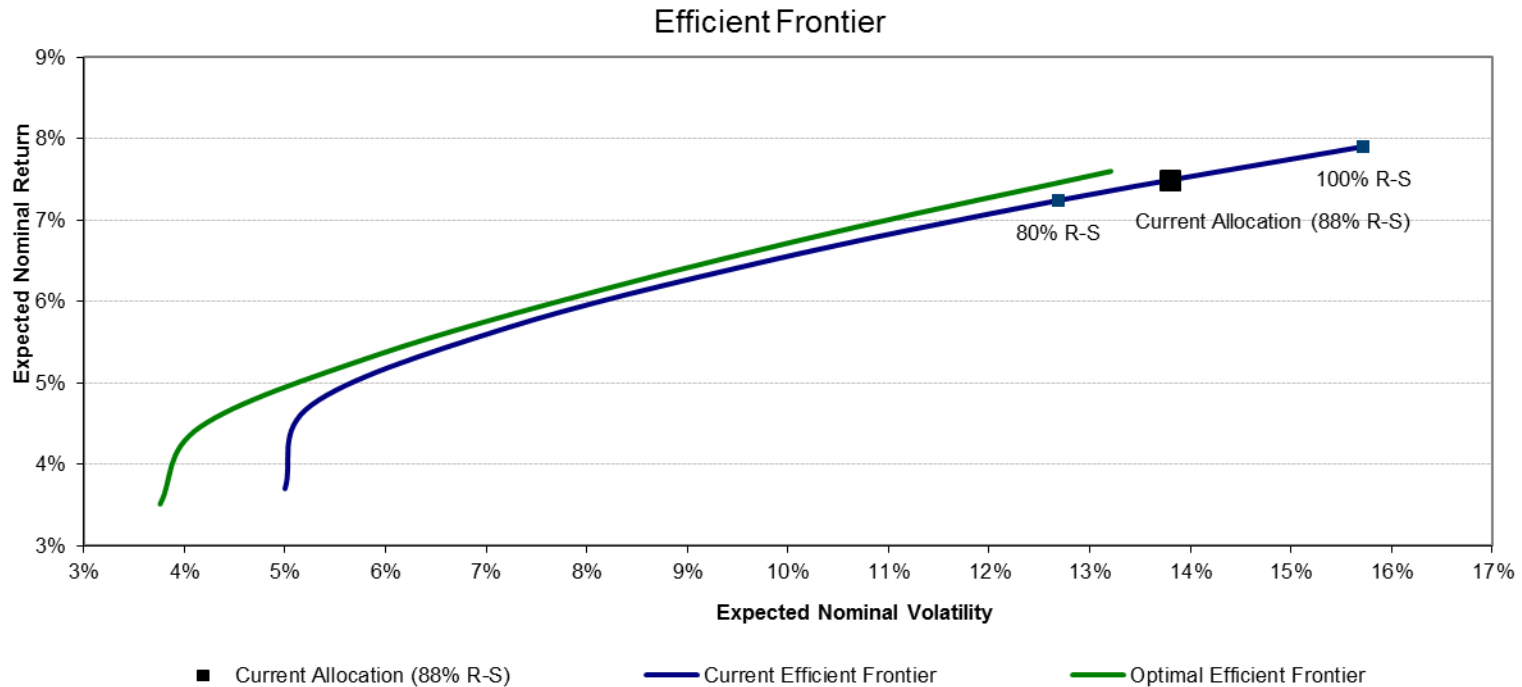
¹ Based on plan's valuation interest rate of 8.00% from the FYE 2014 actuarial valuation report (Accounting)

² Based on plan's valuation interest rate of 8.00% from the FYE 2014 actuarial valuation report (Funding)

Asset-Liability Growth Metrics (based on Funding Liability)			
Metric (\$, Millions)	Value	% Liability	% Assets
AL Interest Cost	\$1,293.8	8.0%	11.8%
AL Normal Cost	\$80.4	0.5%	0.7%
Total Liability Hurdle Rate	\$1,374.2	8.5%	12.5%
Expected Return on Assets	\$878.0	5.4%	8.0%
ER + EE Contributions	\$694.6	4.3%	6.3%
Total Exp. Asset Growth	\$1,572.6	9.7%	14.3%
Hurdle Rate Shortfall	-\$198.4	-1.2%	-1.8%
Est. Benefit Payments	\$1,219.9	7.5%	11.1%

Pension Investment Analysis

Risk/Reward Analysis



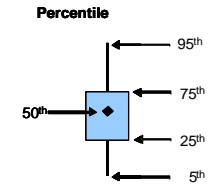
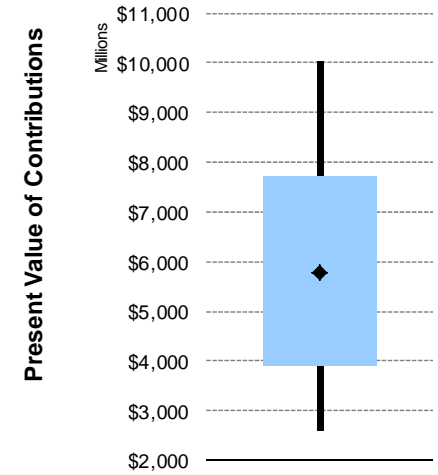
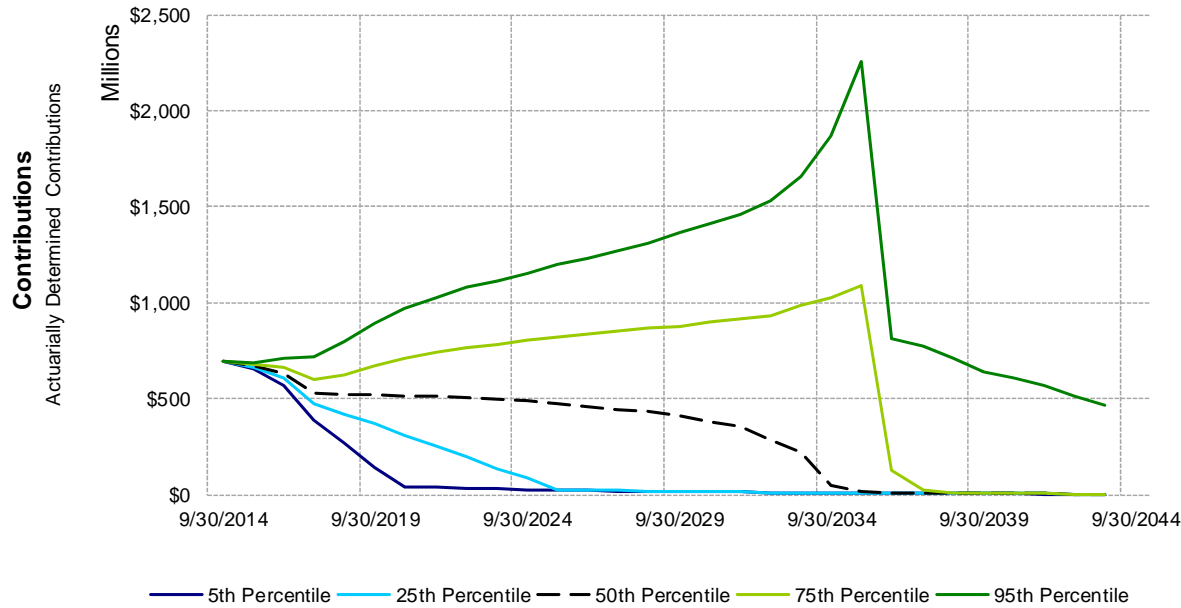
- The blue line represents various combinations of MSERS’ return-seeking and risk-reducing allocations
- The green line is an “unconstrained” efficient frontier

Key Takeaway:

- Current portfolio is well-diversified

Pension Projection Analysis

Gross Contributions (Employer + Employee Portions)



Strategy	Current Allocation - 88% R-S					
Year	9/30/2018	9/30/2023	9/30/2028	9/30/2033	9/30/2038	9/30/2043
5th Percentile	\$266	\$30	\$17	\$10	\$5	\$3
25th Percentile	\$415	\$137	\$18	\$10	\$6	\$3
50th Percentile	\$518	\$494	\$433	\$219	\$6	\$3
75th Percentile	\$625	\$781	\$869	\$983	\$10	\$4
95th Percentile	\$798	\$1,112	\$1,310	\$1,654	\$711	\$464

Key Takeaway:

- Contribution volatility will increase as the closed amortization period declines to immediate recognition

* Projections assume constant 8.0% discount rate for pension liabilities for all investment policies studied

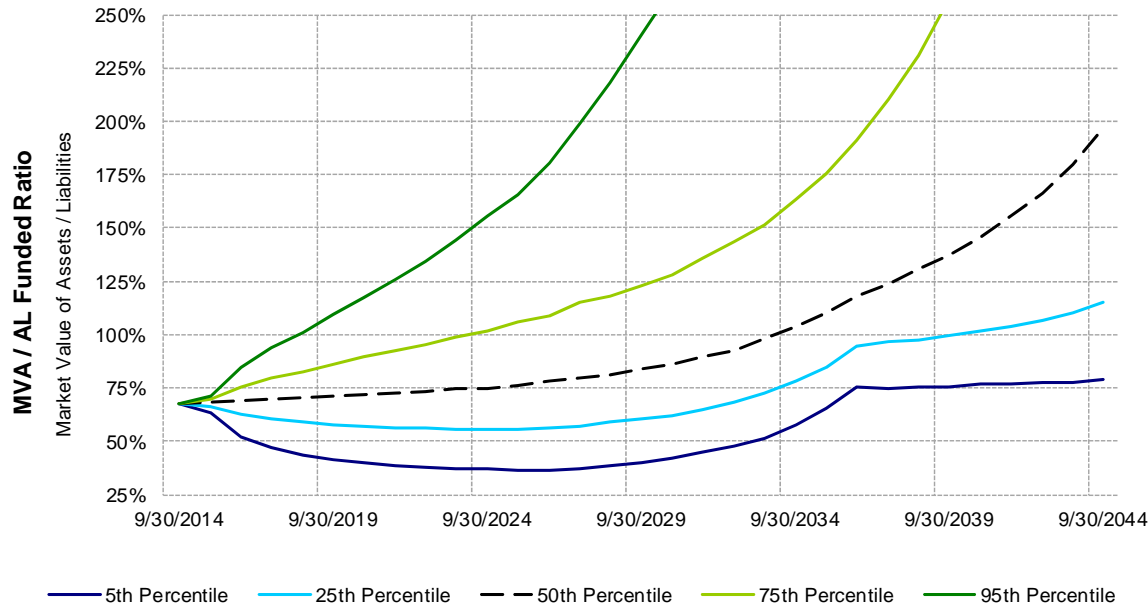
Pension Projection Analysis

Gross Contributions (Employer + Employee Portions)

FYE	80% Return-Seeking			88% Return-Seeking			100% Return-Seeking		
	5th Percentile	50th Percentile	95th Percentile	5th Percentile	50th Percentile	95th Percentile	5th Percentile	50th Percentile	95th Percentile
2015	\$695	\$695	\$695	\$695	\$695	\$695	\$695	\$695	\$695
2016	\$654	\$669	\$687	\$653	\$669	\$688	\$652	\$669	\$689
2017	\$573	\$636	\$709	\$566	\$634	\$713	\$556	\$631	\$723
2018	\$400	\$537	\$700	\$383	\$532	\$714	\$356	\$525	\$743
2019	\$299	\$526	\$781	\$266	\$518	\$798	\$211	\$505	\$834
2020	\$191	\$533	\$869	\$140	\$522	\$890	\$53	\$503	\$920
2021	\$63	\$532	\$951	\$42	\$516	\$971	\$41	\$487	\$1,008
2022	\$37	\$533	\$1,005	\$37	\$514	\$1,027	\$37	\$478	\$1,063
2023	\$33	\$529	\$1,057	\$33	\$506	\$1,080	\$33	\$465	\$1,112
2024	\$30	\$522	\$1,092	\$30	\$494	\$1,112	\$29	\$446	\$1,151
2025	\$26	\$515	\$1,132	\$26	\$487	\$1,155	\$26	\$430	\$1,189
2026	\$24	\$508	\$1,176	\$24	\$472	\$1,196	\$23	\$413	\$1,227
2027	\$21	\$497	\$1,213	\$21	\$459	\$1,231	\$21	\$390	\$1,269
2028	\$19	\$487	\$1,248	\$19	\$440	\$1,270	\$19	\$362	\$1,306
2029	\$17	\$481	\$1,288	\$17	\$433	\$1,310	\$17	\$344	\$1,344
2030	\$15	\$472	\$1,342	\$15	\$410	\$1,363	\$15	\$301	\$1,390
2031	\$13	\$447	\$1,387	\$13	\$382	\$1,412	\$13	\$250	\$1,440
2032	\$12	\$426	\$1,438	\$12	\$353	\$1,463	\$12	\$192	\$1,481
2033	\$11	\$378	\$1,512	\$11	\$284	\$1,527	\$11	\$99	\$1,566
2034	\$10	\$334	\$1,636	\$10	\$219	\$1,654	\$10	\$13	\$1,694
2035	\$9	\$212	\$1,832	\$9	\$47	\$1,869	\$9	\$9	\$1,923
2036	\$6	\$19	\$2,234	\$6	\$12	\$2,257	\$6	\$8	\$2,296
2037	\$7	\$7	\$795	\$7	\$7	\$812	\$7	\$7	\$837
2038	\$6	\$7	\$765	\$6	\$7	\$774	\$6	\$7	\$782
2039	\$5	\$6	\$701	\$5	\$6	\$711	\$5	\$6	\$707
2040	\$5	\$5	\$635	\$5	\$5	\$637	\$5	\$5	\$640
2041	\$4	\$5	\$609	\$4	\$5	\$606	\$4	\$5	\$604
2042	\$4	\$4	\$572	\$4	\$4	\$564	\$4	\$4	\$547
2043	\$3	\$4	\$514	\$3	\$4	\$516	\$3	\$4	\$498
2044	\$3	\$3	\$461	\$3	\$3	\$464	\$3	\$3	\$451

Pension Projection Analysis

Market Value of Assets / Actuarial Liability Funded Ratio



Key Takeaway:

- Contribution policy will close the funding shortfall and then asset returns will outpace the liability growth rate further driving up the funded ratio in our expected case
- Market values of assets do not contain the smoothing parameters of the actuarial value of assets resulting in wider dispersions of results

Strategy	Current Allocation - 88% R-S					
Year	9/30/2019	9/30/2024	9/30/2029	9/30/2034	9/30/2039	9/30/2044
5th Percentile	41%	37%	40%	57%	75%	79%
25th Percentile	58%	56%	60%	79%	100%	115%
50th Percentile	71%	75%	84%	104%	137%	197%
75th Percentile	86%	102%	123%	163%	257%	483%
95th Percentile	109%	156%	241%	427%	908%	2137%
Probability > 100%	13%	27%	40%	54%	75%	83%

* Projections assume constant 8.0% discount rate for pension liabilities for all investment policies studied

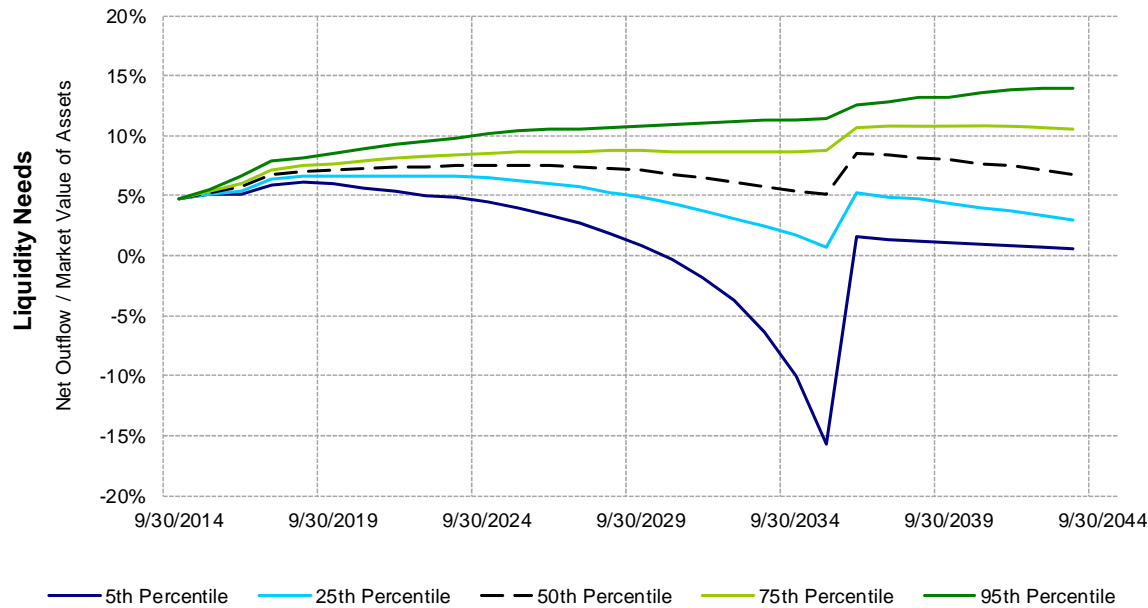
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Pension Projection Analysis

Net Outflow Analysis: (Benefit Payments less Contributions) / Market Value of Assets



Key Takeaways:

- Net outflow will increase once the current amortization period expires
- Allocations to illiquid assets will need to be monitored as the net outflow reaches higher levels

Strategy	Current Allocation - 88% R-S					
Year	9/30/2018	9/30/2023	9/30/2028	9/30/2033	9/30/2038	9/30/2043
5th Percentile	6%	5%	2%	-6%	1%	1%
25th Percentile	7%	7%	5%	2%	5%	3%
50th Percentile	7%	8%	7%	6%	8%	7%
75th Percentile	7%	8%	9%	9%	11%	11%
95th Percentile	8%	10%	11%	11%	13%	14%

* Projections assume constant 8.0% discount rate for pension liabilities for all investment policies studied

Pension Projection Analysis

Summary and Conclusions

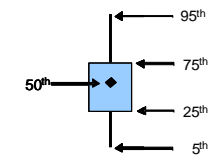
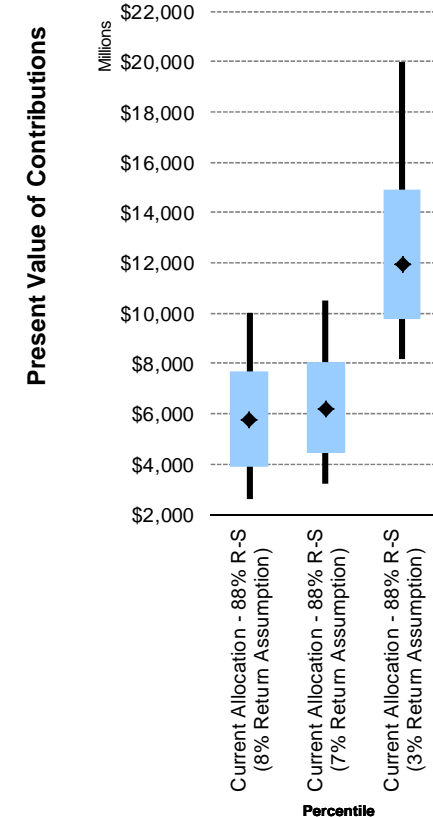
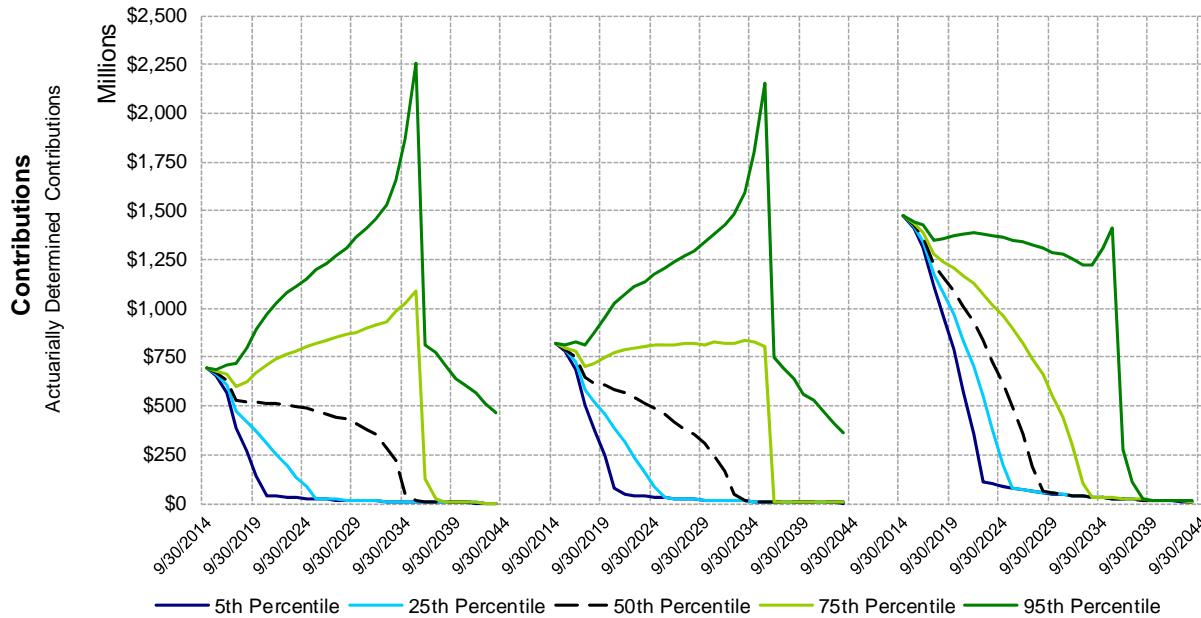
All Scenarios \$ millions	30-year Economic Cost		30-year Present Value of Contributions		30-year Ending Funded Ratio (MVA / AL)	
	Expected	Downside	Expected	Downside	Expected	Downside
Current Allocation - 80% R-S	\$5,575.6	\$9,820.9	\$5,972.2	\$9,926.4	172%	78%
Current Allocation - 88% R-S	\$5,294.6	\$9,884.3	\$5,784.4	\$10,027.2	197%	79%
Current Allocation - 100% R-S	\$4,819.5	\$10,013.9	\$5,498.7	\$10,179.6	248%	79%

Key Findings:

- MSERS is projected to attain fully funded status in the 50th percentile outcome due in part to the contribution policy and then become overfunded while maintaining the existing asset allocation
- Contribution rate is expected to decline over time
- Adverse market conditions can lead to substantial risk in the plan contribution amount

Additional Pension Analysis

Impact of Changing the Actuarial Rate of Return Assumption



Strategy	Current Allocation - 88% R-S (8% Return Assumption)			Current Allocation - 88% R-S (7% Return Assumption)			Current Allocation - 88% R-S (3% Return Assumption)		
	Year	9/30/2023	9/30/2033	9/30/2043	9/30/2023	9/30/2033	9/30/2043	9/30/2023	9/30/2033
5th Percentile	\$30	\$10	\$3	\$37	\$12	\$4	\$37	\$12	\$4
25th Percentile	\$137	\$10	\$3	\$155	\$12	\$4	\$155	\$12	\$4
50th Percentile	\$494	\$219	\$3	\$513	\$13	\$4	\$513	\$13	\$4
75th Percentile	\$781	\$983	\$4	\$801	\$832	\$4	\$801	\$832	\$4
95th Percentile	\$1,112	\$1,654	\$464	\$1,138	\$1,592	\$361	\$1,138	\$1,592	\$361

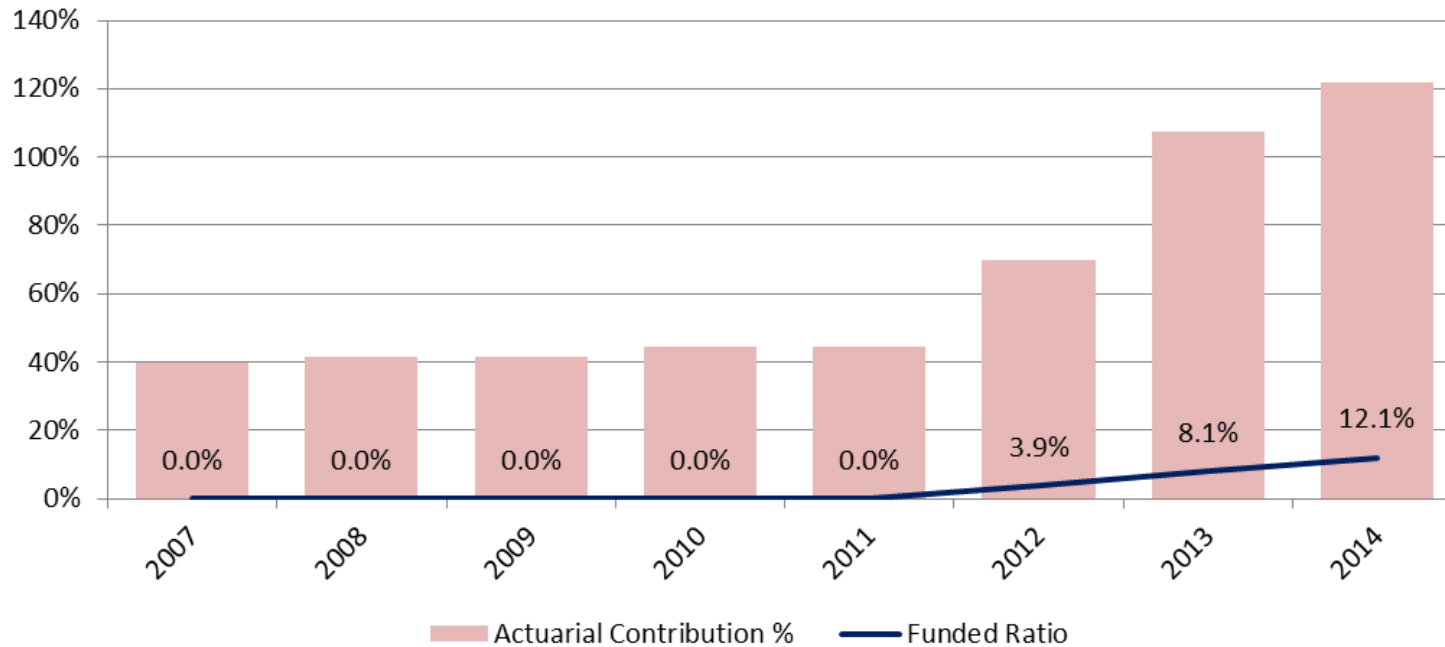
Key Takeaway:

- Using a lower actuarial return assumption will increase the near-term contributions and mitigate asset losses that would otherwise be recognized in future contributions

Asset-Liability Profile

OPEB Plan Overview

Contributions & Funded Ratio



Key Takeaways:

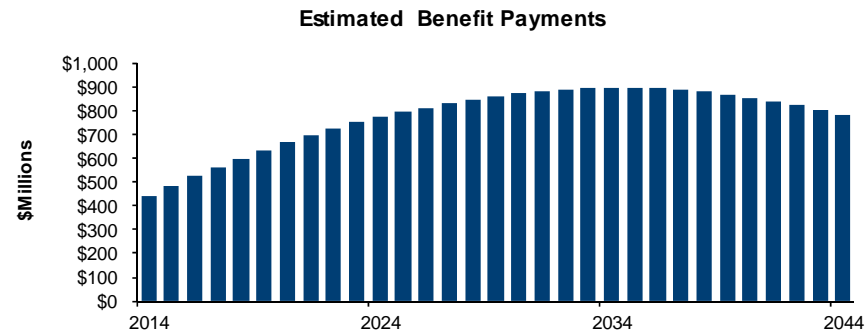
- MSERS began funding more than pay-as-you-go costs in FYE 2012
- Based on the advanced funding, MSERS began utilizing an 8.00% actuarial discount rate

OPEB Asset-Liability Profile

As of September 30, 2014

Asset-Liability Snapshot as of 9/30/2014			
Metric (\$, Millions)	Value	Fund %: (MVA)	(AVA)
Market Value of Assets	\$1,058		
Actuarial Value of Assets	\$1,058		
Liability Metrics			
Actuarial Liability (AL) - Entry Age Normal	\$8,749 ¹	12%	12%

Target Asset Allocation as of 9/30/2014		
Metric (\$, Millions)	Value	Alloc %
Return-Seeking		
- U.S. Equity	\$296	28.0%
- International Equity	\$169	16.0%
- Private Equity	\$190	18.0%
- Absolute Return	\$63	6.0%
- Real Estate / Infrastructure	\$106	10.0%
- Real Return / Opportunistic	\$101	9.5%
- Total	\$926	87.5%
Risk-Reducing		
- Cash & Short Duration Fixed Income	\$21	2.0%
- Core Fixed Income	\$111	10.5%
- Total	\$132	12.5%
Total	\$1,058	100.0%

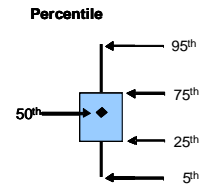
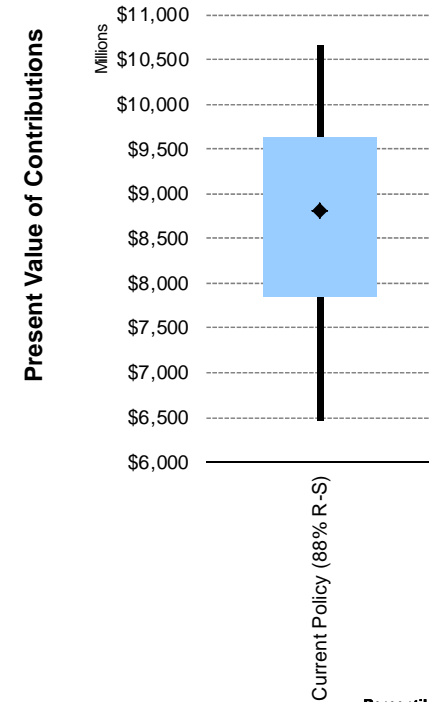
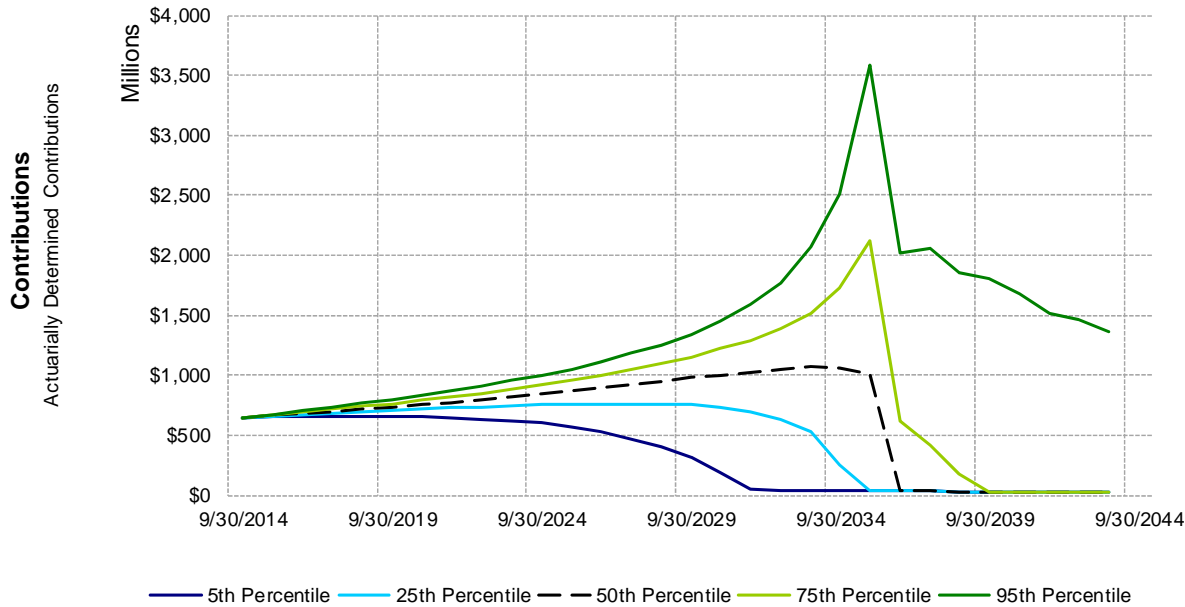


Asset-Liability Growth Metrics			
Metric (\$, Millions)	Value	% Liability	% Assets
AL Interest Cost	\$699.9	8.0%	66.2%
AL Normal Cost	\$97.5	1.1%	9.2%
Total Liability Hurdle Rate	\$797.4	9.1%	75.4%
Expected Return on Assets	\$84.6	1.0%	8.0%
ER + EE Contributions	\$647.5	7.4%	61.2%
Total Exp. Asset Growth	\$732.1	8.4%	69.2%
Hurdle Rate Shortfall	\$65.2	0.7%	6.2%
Est. Benefit Payments	\$444.8	5.1%	42.0%

¹ Based on plan's valuation interest rate of 8.00% from the FYE 2014 actuarial valuation report (Accounting)

OPEB Projection Analysis

Gross Contributions (Employer + Employee Portions)



Strategy	Current Policy (88% R-S)					
Year	9/30/2018	9/30/2023	9/30/2028	9/30/2033	9/30/2038	9/30/2043
5th Percentile	\$659	\$621	\$400	\$39	\$30	\$24
25th Percentile	\$693	\$746	\$759	\$524	\$31	\$24
50th Percentile	\$716	\$819	\$952	\$1,069	\$31	\$24
75th Percentile	\$738	\$881	\$1,092	\$1,519	\$174	\$24
95th Percentile	\$768	\$954	\$1,254	\$2,065	\$1,858	\$1,357

Key Takeaway:

- Contribution volatility will increase as the closed amortization period declines to immediate recognition

* Projections assume constant 8.0% discount rate for OPEB liabilities for all investment policies studied

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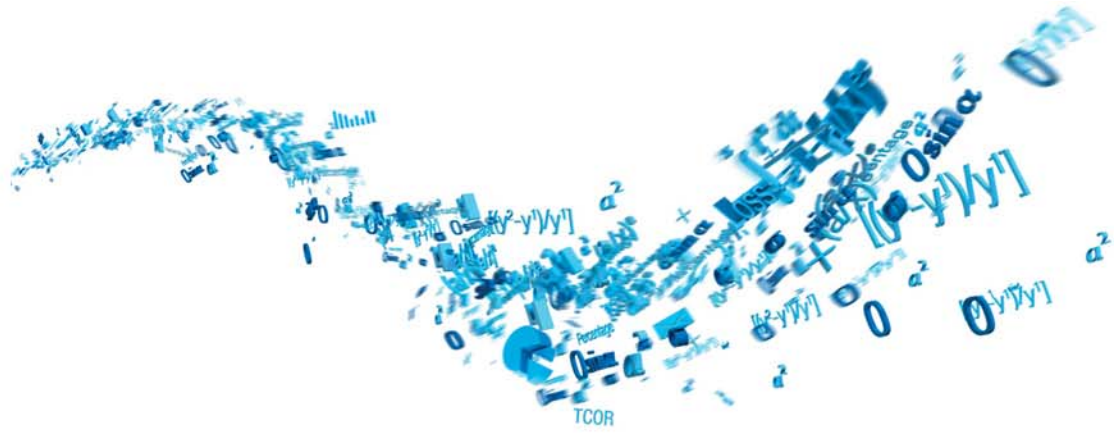
OPEB Projection Analysis

Summary and Conclusions

All Scenarios \$ millions	30-year Economic Cost		30-year Present Value of Contributions		30-year Ending Funded Ratio (MVA / AL)	
	Expected	Downside	Expected	Downside	Expected	Downside
60% Return-Seeking	\$9,019.3	\$10,551.7	\$9,195.5	\$10,566.1	112%	89%
80% Return-Seeking	\$8,626.7	\$10,557.4	\$8,904.2	\$10,621.9	125%	88%
Current Policy (88% R-S)	\$8,491.6	\$10,567.5	\$8,807.0	\$10,661.1	131%	88%
100% Return-Seeking	\$8,245.7	\$10,588.1	\$8,621.1	\$10,718.5	142%	88%

Key Findings:

- MSERS is projected to attain fully funded status in the 50th percentile outcome due in part to the contribution policy and then become overfunded while maintaining the existing asset allocation
- Contributions will rise over the next 20 years due to the contribution policy and then decline once the plan moves to immediate recognition of (gains)/losses
- Adverse market conditions can lead to substantial risk in the plan contribution amount



Appendix

- Assumptions

Review of Actuarial Assumptions and Methods (Pension)

- Actuarial Rate of Investment Return
 - 8.00%
- Asset Value
 - Fair market value of assets as of September 30, 2014
 - 4.96% net asset return from September 30, 2014 through June 30, 2015 was included in our analysis
- Asset Allocation
 - Real Estate / Infrastructure target allocation of 10% was modeled as 85% Core Real Estate and 15% Infrastructure
 - Real Return / Opportunistic target allocation of 9.5% was modeled as 33.3% Commodities, 33.3% Private Equity, and 33.3% Direct Hedge Funds
- Participant Data
 - Based on the September 30, 2014 actuarial valuation
- Contributions
 - Participants contribute 4% of salary
 - MSERS contributes an actuarially determined amount comprised of the following:
 - Normal Cost
 - Amortization of Unfunded Actuarial Liability using a closed, 22-year amortization period that will decrease to immediate recognition at expiry
 - Early Retirement Incentive amortization payments (if applicable to projection year)
 - Reduced for participant contributions

Review of Actuarial Assumptions and Methods (OPEB)

- Actuarial Rate of Investment Return
 - 8.00%
- Asset Value
 - Fair market value of assets as of September 30, 2014
 - 4.96% net asset return from September 30, 2014 through June 30, 2015 was included in our analysis
- Asset Allocation
 - Real Estate / Infrastructure target allocation of 10% was modeled as 85% Core Real Estate and 15% Infrastructure
 - Real Return / Opportunistic target allocation of 9.5% was modeled as 33.3% Commodities, 33.3% Private Equity, and 33.3% Direct Hedge Funds
- Participant Data
 - Based on the September 30, 2014 actuarial valuation
- Contributions
 - MSERS contributes an actuarially determined amount comprised of the following:
 - Normal Cost
 - Amortization of Unfunded Actuarial Liability using a closed, level percent, 22-year amortization period that will decrease to immediate recognition at expiry
- Salary Scale
 - 3.5%
- Price Inflation
 - 2.5%

Review of Actuarial Assumptions and Methods (OPEB)

- Projected benefit payments were supplied by the Plan actuary, inclusive of the following assumptions:
 - Prescription Drug Plans
 - As of September 30, 2014 75% of retirees were assumed to be in an Employer Group Waiver Plan with the remaining 25% in a Medicare Part D Plan eligible for the Retiree Drug Subsidy (RDS) reimbursement
 - ♦ Because the impact of future RDS payments is not netted from the liability and projected benefit payments, additional contributions were assumed to represent future RDS payments
 - Per Towers Watson, MSERS received \$2.085M in RDS reimbursements during FYE 9/30/2014 when the Plan actuary's valuation assumption was 50% EGWP / 50% RDS
 - For FYE 2015, with plan assumptions now 75% EGWP / 25% RDS, \$1.1M in expected RDS reimbursements was assumed, growing at 3.5% annually (the ultimate trend assumption)
 - Mortality Assumption
 - RP-2000 Combined Healthy Mortality Table, adjusted for mortality improvements to 2015 using projection scale BB
 - Health Care Cost Trend
 - 9.0% in Year 1 grading down to 3.5% in Year 10 and beyond
 - Opt-Out Assumption
 - 10% of future pension recipients were assumed to opt out of the retiree health care plan

AHIC Capital Market Assumptions—Q3 2015 (30 Years)

	Expected Real Return ¹	Expected Nominal Return ¹	Expected Nominal Volatility
Equity			
1 Large Cap U.S. Equity	4.3%	6.5%	17.5%
2 Small Cap U.S. Equity	4.8%	7.0%	23.5%
3 Global Equity	4.8%	7.0%	19.0%
4 International Equity (Developed)	4.6%	6.8%	20.5%
5 Emerging Markets Equity	5.9%	8.1%	30.5%
Fixed Income			
6 Cash (Govt)	0.7%	2.8%	1.5%
7 Cash (LIBOR)	1.1%	3.2%	2.0%
8 TIPS	1.1%	3.2%	4.5%
9 Core Fixed Income	1.6%	3.7%	5.0%
10 Short Govt Bonds (2-Year Duration)	0.7%	2.8%	2.0%
11 Short Corporate Bonds (2-Year Duration)	1.4%	3.5%	2.5%
12 Intermediate Govt Bonds (4-Year Duration)	0.9%	3.0%	3.5%
13 Intermediate Corporate Bonds (4-Year Duration)	1.9%	4.0%	4.5%
14 Long Duration Bonds – Govt / Credit	2.1%	4.2%	11.5%
15 Long Duration Bonds – Credit	2.5%	4.7%	13.5%
16 Long Duration Bonds – Govt	1.4%	3.5%	11.0%
17 25-year Government Bond	1.4%	3.5%	18.0%
18 High Yield Bonds	3.3%	5.5%	12.0%
19 Bank Loans	2.6%	4.8%	7.5%
20 Non-US Developed Bond (0% Hedged)	0.9%	3.0%	11.0%
21 Non-US Developed Bond (50% Hedged)	1.1%	3.2%	6.5%
22 Non-US Developed Bond (100% Hedged)	1.2%	3.3%	4.0%
23 Emerging Market Bonds	3.5%	5.7%	13.5%
24 Emerging Market Bonds (Corporate USD)	3.1%	5.3%	11.5%
25 Emerging Market Bonds (Sov. Local)	4.3%	6.5%	14.5%
Alternatives			
26 Hedge Funds Universe ²	3.3%	5.5%	10.0%
27 Hedge Funds Buy List ²	3.9%	6.1%	9.5%
28 Direct Hedge Funds ³	4.9%	7.1%	10.0%
29 Real Estate (Broad Market)	4.5%	6.7%	12.5%
30 Core Real Estate	3.6%	5.8%	11.5%
31 Global REITs	4.4%	6.6%	19.0%
32 Commodities	3.1%	5.3%	17.0%
33 Private Equity	6.6%	8.8%	24.5%
34 Infrastructure	5.2%	7.4%	14.5%
Inflation			
35 Inflation	0.0%	2.1%	1.5%

¹ All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees.

² Represents diversified portfolio of Fund of funds investments (includes additional layer of fees at the FoF level).

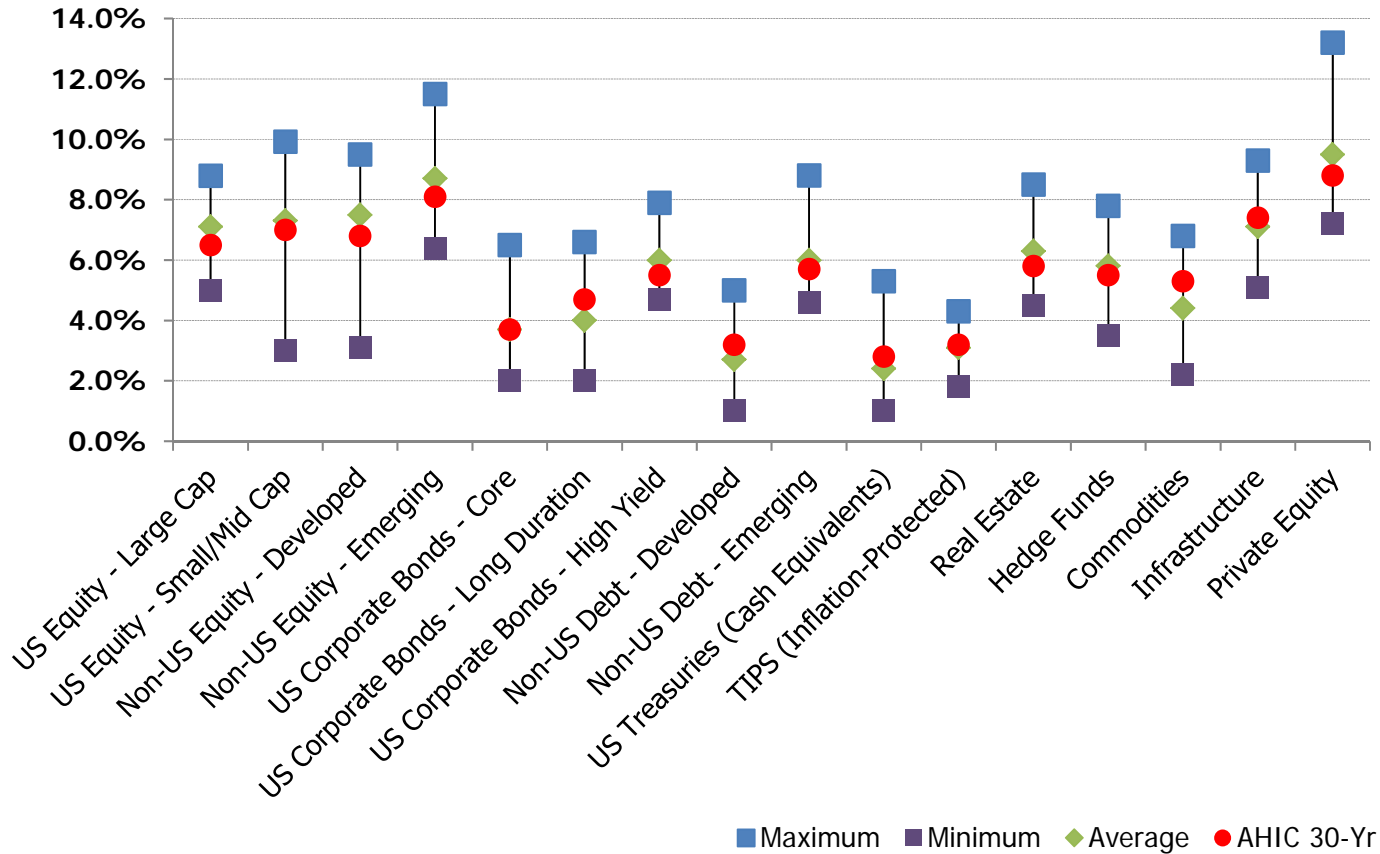
³ Represents diversified portfolio of Direct hedge fund investments.

AHIC Capital Market Assumptions—Q3 2015 (30 Years)

Nominal Correlations		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1	Large Cap U.S. Equity	1.00	0.92	0.95	0.79	0.80	0.08	0.08	-0.06	0.06	0.03	0.10	-0.05	0.10	0.00	0.09	-0.12	-0.13	0.58	0.41	-0.04	-0.03	0.00	0.42	0.39	0.44	0.60	0.48	0.60	0.40	0.39	0.66	0.30	0.70	0.38	0.04
2	Small Cap U.S. Equity	0.92	1.00	0.87	0.73	0.73	0.06	0.06	-0.06	0.05	0.02	0.09	-0.06	0.09	-0.01	0.08	-0.12	-0.12	0.54	0.38	-0.03	-0.03	-0.01	0.38	0.35	0.39	0.55	0.44	0.55	0.38	0.36	0.61	0.26	0.66	0.36	0.03
3	Global Equity	0.95	0.87	1.00	0.93	0.90	0.07	0.07	-0.06	0.06	0.02	0.09	-0.06	0.10	0.00	0.10	-0.12	-0.13	0.63	0.42	0.17	0.15	-0.01	0.46	0.44	0.55	0.60	0.48	0.59	0.41	0.39	0.64	0.39	0.67	0.37	0.06
4	International Equity (Developed)	0.79	0.73	0.93	1.00	0.84	0.03	0.03	-0.05	0.05	0.00	0.06	-0.06	0.08	0.00	0.09	-0.10	-0.11	0.56	0.37	0.40	0.34	-0.02	0.42	0.41	0.57	0.52	0.42	0.52	0.37	0.35	0.54	0.43	0.57	0.32	0.07
5	Emerging Markets Equity	0.80	0.73	0.90	0.84	1.00	0.06	0.06	-0.05	0.08	0.02	0.09	-0.06	0.12	0.01	0.13	-0.12	-0.13	0.66	0.44	0.22	0.19	0.00	0.49	0.46	0.55	0.54	0.43	0.54	0.37	0.36	0.54	0.35	0.58	0.32	0.06
6	Cash (Gov't)	0.08	0.06	0.07	0.03	0.06	1.00	0.98	0.43	0.49	0.92	0.80	0.65	0.51	0.22	0.18	0.24	0.15	0.12	0.05	0.12	0.30	0.64	0.16	0.08	0.00	-0.04	-0.03	-0.04	0.14	0.15	0.08	0.20	0.09	0.11	0.46
7	Cash (LIBOR)	0.08	0.06	0.07	0.03	0.06	0.98	1.00	0.42	0.49	0.91	0.80	0.64	0.52	0.22	0.19	0.23	0.15	0.13	0.06	0.12	0.30	0.63	0.17	0.08	0.00	-0.03	-0.02	-0.03	0.13	0.15	0.08	0.19	0.08	0.11	0.45
8	TIPS	-0.06	-0.06	-0.06	-0.05	-0.05	0.43	0.42	1.00	0.48	0.56	0.48	0.57	0.45	0.29	0.25	0.30	0.22	0.10	-0.09	0.07	0.13	0.22	0.13	0.04	-0.02	-0.11	-0.09	-0.11	0.02	0.02	-0.03	0.17	-0.05	0.00	0.40
9	Core Fixed Income	0.06	0.05	0.06	0.05	0.08	0.49	0.49	0.48	1.00	0.69	0.77	0.87	0.95	0.84	0.85	0.74	0.64	0.36	0.13	0.19	0.34	0.61	0.52	0.27	0.16	0.07	0.05	0.07	0.07	0.08	0.06	0.08	0.05	0.06	0.14
10	Short Gov't Bonds (2-Year Duration)	0.03	0.02	0.02	0.00	0.02	0.92	0.91	0.56	0.69	1.00	0.86	0.87	0.68	0.39	0.32	0.42	0.29	0.12	-0.08	0.15	0.33	0.67	0.21	0.09	0.01	-0.12	-0.10	-0.12	0.11	0.12	0.05	0.18	0.04	0.08	0.44
11	Short Corporate Bonds (2-Year Duration)	0.10	0.09	0.09	0.06	0.09	0.80	0.80	0.48	0.77	0.86	1.00	0.75	0.87	0.42	0.43	0.35	0.24	0.30	0.22	0.15	0.32	0.62	0.39	0.22	0.11	0.07	0.06	0.07	0.13	0.14	0.10	0.16	0.10	0.11	0.36
12	Intermediate Gov't Bonds (4-Year Duration)	-0.05	-0.06	-0.06	-0.06	-0.06	0.65	0.64	0.57	0.87	0.87	0.75	1.00	0.76	0.69	0.59	0.75	0.62	0.05	-0.26	0.18	0.35	0.64	0.23	0.06	-0.01	-0.23	-0.18	-0.22	0.04	0.05	-0.02	0.10	-0.04	0.02	0.25
13	Intermediate Corporate Bonds (4-Year Duration)	0.10	0.09	0.10	0.08	0.12	0.51	0.52	0.45	0.95	0.68	0.87	0.76	1.00	0.70	0.75	0.56	0.46	0.42	0.31	0.17	0.32	0.57	0.55	0.31	0.19	0.17	0.13	0.10	0.10	0.09	0.09	0.09	0.09	0.18	
14	Long Duration Bonds – Gov't / Credit	0.00	-0.01	0.00	0.00	0.01	0.22	0.22	0.29	0.84	0.39	0.42	0.69	0.70	1.00	0.96	0.94	0.92	0.19	-0.05	0.17	0.30	0.51	0.40	0.17	0.10	-0.01	-0.01	-0.01	0.02	0.02	0.00	-0.02	0.00	0.01	-0.09
15	Long Duration Bonds – Credit	0.09	0.08	0.10	0.09	0.13	0.18	0.19	0.25	0.85	0.32	0.43	0.59	0.75	0.96	1.00	0.80	0.78	0.42	0.21	0.16	0.28	0.47	0.56	0.31	0.21	0.18	0.14	0.18	0.06	0.06	0.07	-0.01	0.08	0.06	-0.08
16	Long Duration Bonds – Gov't	-0.12	-0.12	-0.12	-0.10	-0.12	0.24	0.23	0.30	0.74	0.42	0.35	0.75	0.56	0.94	0.80	1.00	0.97	-0.11	-0.35	0.17	0.30	0.51	0.16	-0.02	-0.04	-0.24	-0.20	-0.24	-0.04	-0.03	-0.08	-0.04	-0.10	-0.04	-0.10
17	25-year Government Bond	-0.13	-0.12	-0.13	-0.11	-0.13	0.15	0.15	0.22	0.64	0.29	0.24	0.62	0.46	0.92	0.78	0.97	1.00	-0.14	-0.33	0.15	0.26	0.45	0.13	-0.04	-0.05	-0.22	-0.18	-0.22	-0.05	-0.05	-0.08	-0.07	-0.11	-0.05	-0.16
18	High Yield Bonds	0.58	0.54	0.63	0.56	0.66	0.12	0.13	0.10	0.36	0.12	0.30	0.05	0.42	0.19	0.42	-0.11	-0.14	1.00	0.76	0.16	0.17	0.10	0.75	0.63	0.57	0.64	0.51	0.63	0.26	0.25	0.40	0.35	0.44	0.25	0.17
19	Bank Loans	0.41	0.38	0.42	0.37	0.44	0.05	0.06	-0.09	0.13	-0.08	0.22	-0.26	0.31	-0.05	0.21	-0.35	-0.33	0.76	1.00	0.05	0.05	0.00	0.46	0.55	0.44	0.69	0.55	0.68	0.17	0.17	0.28	0.15	0.30	0.17	0.07
20	Non-US Developed Bond (0% Hedged)	-0.04	-0.03	0.17	0.40	0.22	0.12	0.12	0.07	0.19	0.15	0.15	0.17	0.17	0.17	0.15	0.16	0.05	1.00	0.96	0.31	0.22	0.21	0.50	0.03	0.02	0.03	0.00	0.00	-0.02	0.43	-0.01	0.02	0.14		
21	Non-US Developed Bond (50% Hedged)	-0.03	-0.03	0.15	0.34	0.19	0.30	0.30	0.13	0.34	0.33	0.32	0.35	0.32	0.30	0.28	0.30	0.26	0.17	0.05	0.96	1.00	0.57	0.26	0.22	0.45	0.01	0.00	0.01	0.02	0.02	-0.01	0.40	0.00	0.03	0.18
22	Non-US Developed Bond (100% Hedged)	0.00	-0.01	-0.01	-0.02	0.00	0.64	0.63	0.22	0.61	0.67	0.62	0.64	0.57	0.51	0.47	0.51	0.45	0.10	0.00	0.31	0.57	1.00	0.25	0.12	0.08	-0.04	-0.03	-0.04	0.06	0.07	0.02	0.09	0.01	0.05	0.19
23	Emerging Market Bonds	0.42	0.38	0.46	0.42	0.49	0.16	0.17	0.13	0.52	0.21	0.39	0.23	0.55	0.40	0.56	0.16	0.13	0.75	0.46	0.22	0.26	0.25	1.00	0.72	0.64	0.53	0.42	0.52	0.18	0.18	0.28	0.21	0.30	0.17	0.07
24	Emerging Market Bonds (Corporate USD)	0.39	0.35	0.44	0.41	0.46	0.08	0.08	0.04	0.27	0.09	0.22	0.06	0.31	0.17	0.31	-0.02	-0.04	0.63	0.55	0.21	0.22	0.12	0.72	1.00	0.62	0.56	0.44	0.56	0.15	0.15	0.25	0.25	0.26	0.15	0.08
25	Emerging Market Bonds (Sov. Local)	0.44	0.39	0.55	0.57	0.55	0.00	0.00	-0.02	0.16	0.01	0.11	-0.01	0.19	0.10	0.21	-0.04	-0.05	0.57	0.44	0.50	0.45	0.08	0.64	0.62	1.00	0.46	0.37	0.46	0.10	0.10	0.27	0.42	0.18	0.11	0.00
26	Hedge Funds Universe ²	0.60	0.55	0.60	0.52	0.54	-0.04	-0.03	-0.11	0.07	-0.12	0.07	-0.23	0.17	-0.01	0.18	-0.24	-0.22	0.64	0.69	0.03	0.01	-0.04	0.53	0.56	0.46	1.00	0.72	0.99	0.24	0.23	0.40	0.27	0.42	0.23	0.03
27	Hedge Funds Buy List ²	0.48	0.44	0.48	0.42	0.43	-0.03	-0.02	-0.09	0.05	-0.10	0.06	-0.18	0.13	-0.01	0.14	-0.20	-0.18	0.51	0.55	0.02	0.00	-0.03	0.42	0.44	0.37	0.72	1.00	0.71	0.19	0.19	0.33	0.22	0.33	0.18	0.03
28	Direct Hedge Funds ²	0.60	0.55	0.59	0.52	0.54	-0.04	-0.03	-0.11	0.07	-0.12	0.07	-0.22	0.17	-0.01	0.18	-0.24	-0.22	0.63	0.68	0.03	0.01	-0.04	0.52	0.56	0.46	0.99	0.71	1.00	0.24	0.23	0.40	0.27	0.41	0.23	0.03
29	Real Estate (Broad Market)	0.40	0.38	0.41	0.37	0.37	0.14	0.13	0.02	0.07	0.11	0.13	0.04	0.10	0.02	0.06	-0.04	-0.05	0.26	0.17	0.00	0.02	0.06	0.18	0.15	0.10	0.24	0.19	0.24	1.00	0.96	0.50	0.08	0.35	0.20	0.07
30	Core Real Estate	0.39	0.36	0.39	0.35	0.36	0.15	0.15	0.02	0.08	0.12	0.14	0.05	0.10	0.02	0.06	-0.03	-0.05	0.25	0.17	0.00	0.02	0.07	0.18	0.15	0.10	0.23	0.19	0.23	0.96	1.00	0.47	0.08	0.33	0.19	0.08
31	Global REITs	0.66	0.61	0.64	0.54	0.54	0.08	0.08	-0.03	0.06	0.05	0.10	-0.02	0.09	0.00	0.07	-0.08	-0.08	0.40	0.28	-0.02	-0.01	0.02	0.28	0.25	0.27	0.40	0.33	0.40	0.50	0.47	1.00	0.19	0.48	0.27	0.04
32	Commodities	0.30	0.26	0.39	0.43	0.35	0.20	0.19	0.17	0.08	0.18	0.16	0.10	0.09	-0.02	-0.01	-0.04	-0.07	0.35	0.15	0.43	0.40	0.09	0.21	0.25	0.42	0.27	0.22	0.27	0.08	0.08	0.19	1.00	0.10	0.08	0.41
33	Private Equity	0.70	0.66	0.67	0.57	0.58	0.09	0.08	-0.05	0.05	0.04	0.10	-0.04	0.09	0.00	0.08	-0.10	-0.11	0.44	0.30	-0.01	0.00	0.01	0.30	0.26	0.18	0.42	0.33	0.41	0.35	0.33	0.48	0.10	1.00	0.33	0.05
34	Infrastructure	0.38	0.36	0.37	0.32	0.32	0.11	0.11	0.00	0.06	0.08	0.11	0.02	0.09	0.01	0.06	-0.04	-0.05	0.25	0.17	0.02	0.03	0.05	0.17	0.15	0.11	0.23	0.18	0.23	0.20	0.19	0.27	0.08	0.33	1.00	0.06
35	Inflation	0.04	0.03	0.06	0.07	0.06	0.46	0.45	0.40	0.14	0.44	0.36	0.25	0.18	-0.09	-0.08	-0.10	-0.16	0.17	0.07	0.14	0.18	0.19	0.07	0.08	0.00	0.03	0.03	0.03	0.07	0.08	0.04	0.41	0.05	0.06	1.00

Ask 29 Consultants and...

Expected Geometric Returns by Asset Class



SOURCE: Horizon Actuarial survey of 2015 capital market assumptions from 29 independent investment advisors
 Expected returns of the survey are annualized over 10-20 years (geometric). Returns are 'blended,' using 10-year assumptions when 20-year assumptions are not available.
 AHIC expected returns are annualized over 30-years.

Aon Hewitt Annual 10-Year Assumptions: Expected Returns and Volatility

Asset Class	Expected Nominal Return					Expected Nominal Risk (Volatility)				
	Q3 2015	2014	2013	2012	2011	Q3 2015	2014	2013	2012	2011
Large Cap U.S. Equity	6.5%	6.7%	7.1%	7.5%	8.0%	17.0%	19.0%	19.0%	21.0%	21.0%
Small Cap U.S. Equity	6.7	6.9	7.3	7.7	8.2	23.0	25.0	25.0	27.0	27.0
Global Equity	7.0	7.1	7.5	8.3	8.9	18.5	19.5	19.5	21.5	21.0
International Equity (Developed)	6.9	7.2	7.3	8.4	9.1	20.0	20.5	20.5	22.5	22.5
Emerging Markets Equity	8.0	8.4	8.9	9.4	9.8	30.0	28.5	28.5	31.5	31.5
Cash (Gov't)	2.1	2.2	2.5	1.3	1.5	1.0	1.0	1.5	1.0	1.0
Core Fixed Income (Market Duration)	2.9	2.9	3.3	1.9	2.6	4.0	3.5	4.0	3.0	4.0
High Yield Bonds	4.7	4.2	4.6	3.9	5.9	12.0	14.0	14.0	14.0	14.0
Hedge Funds Universe ¹	5.0	5.0	5.2	5.2	5.7	9.0	8.0	8.0	8.0	7.5
Real Estate (Broad Market)	6.7	7.0	7.2	7.4	7.3	12.5	14.5	14.5	16.0	16.0
Private Equity	8.8	9.0	9.3	9.7	9.8	24.0	26.0	26.0	28.5	28.5
Inflation	2.1	2.2	2.1	2.3	2.1	--	--	--	--	--

¹ Hedge Fund Universe assumptions are capital market assumptions for fund of hedge funds

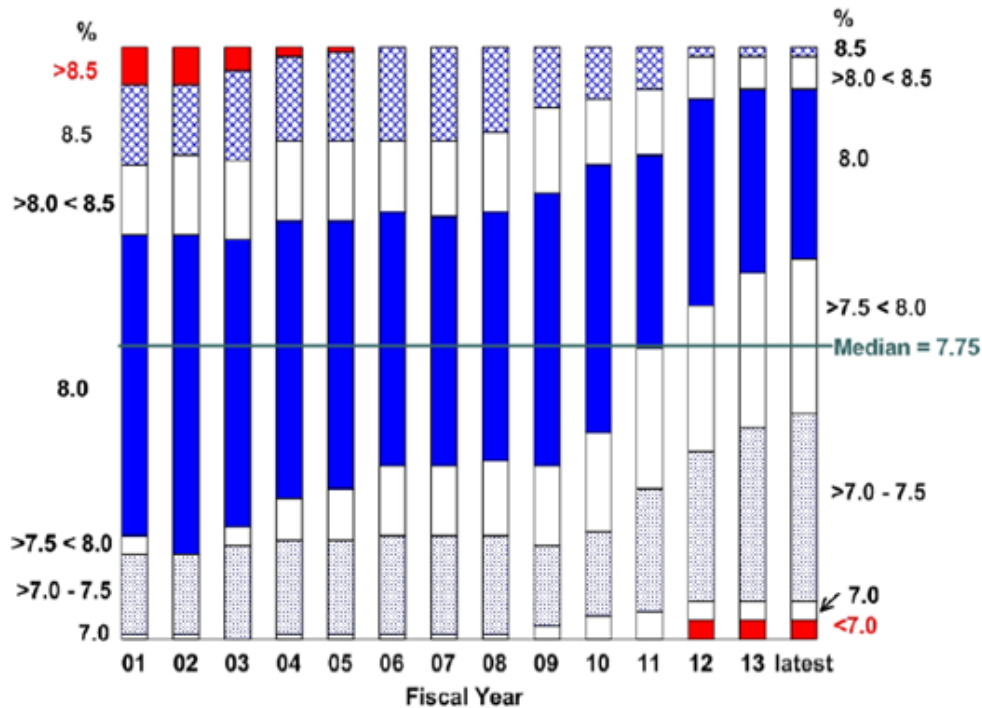
- With a few exceptions, our return expectations have generally decreased over the past 4 years

Color Key
Increased from 2011
No Change from 2011
Decreased from 2011

Public Pension Peer Review

MSERS's Investment Return Assumption versus Public Peers

Figure 4: Change in distribution of public pension investment return assumptions, FY 01 through October 2014



Source: Compiled by NASRA based on Public Fund Survey, Oct. 2014

- The chart illustrates the trend in investment return assumptions over the past 14 years according to the Public Fund Survey compiled by NASRA
- The median Investment return assumption has declined from 8.00% in 2001-2010 to 7.75%

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