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Asset-Liability Management Background

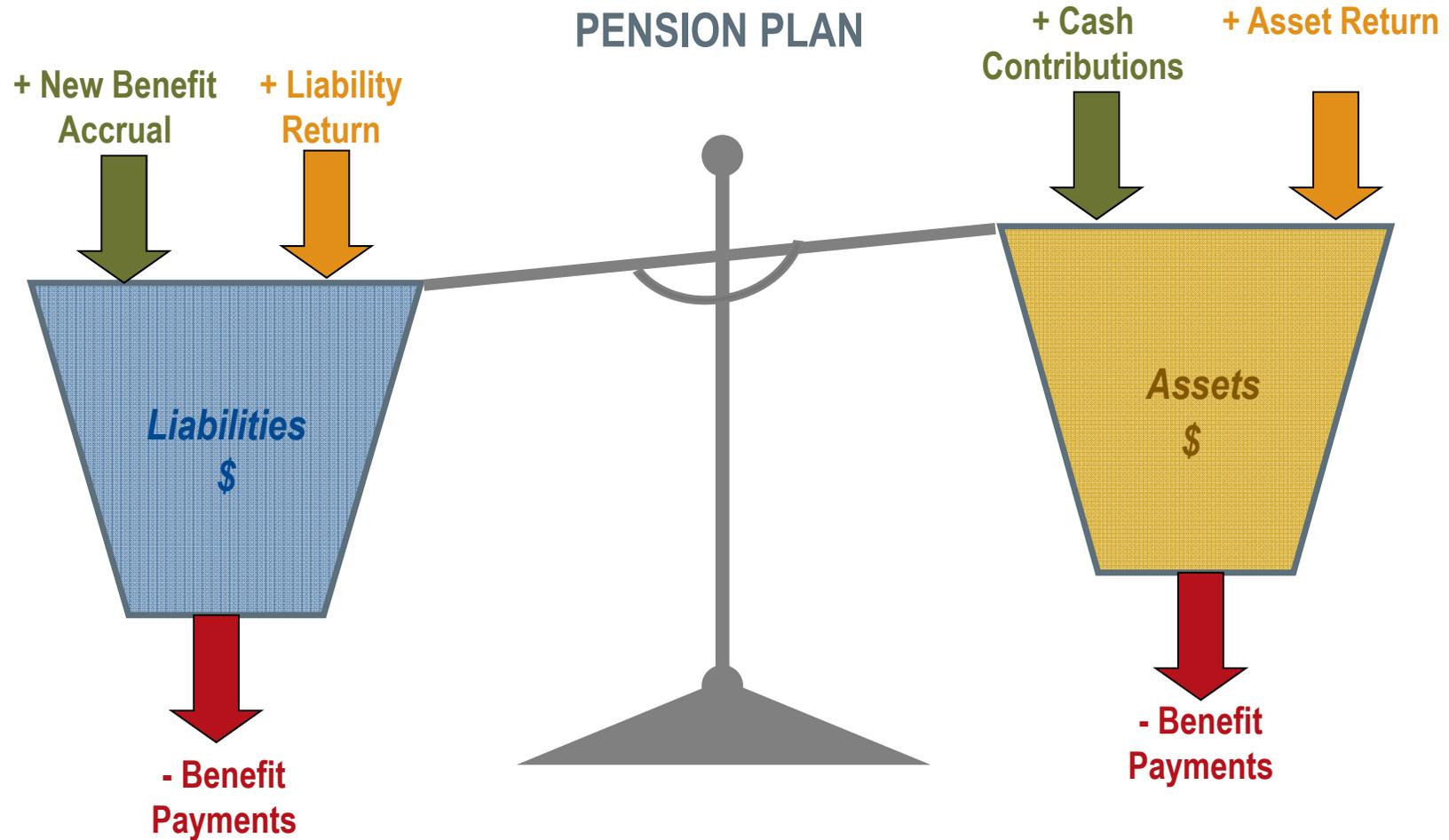
What is an Asset/Liability Study?

- 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



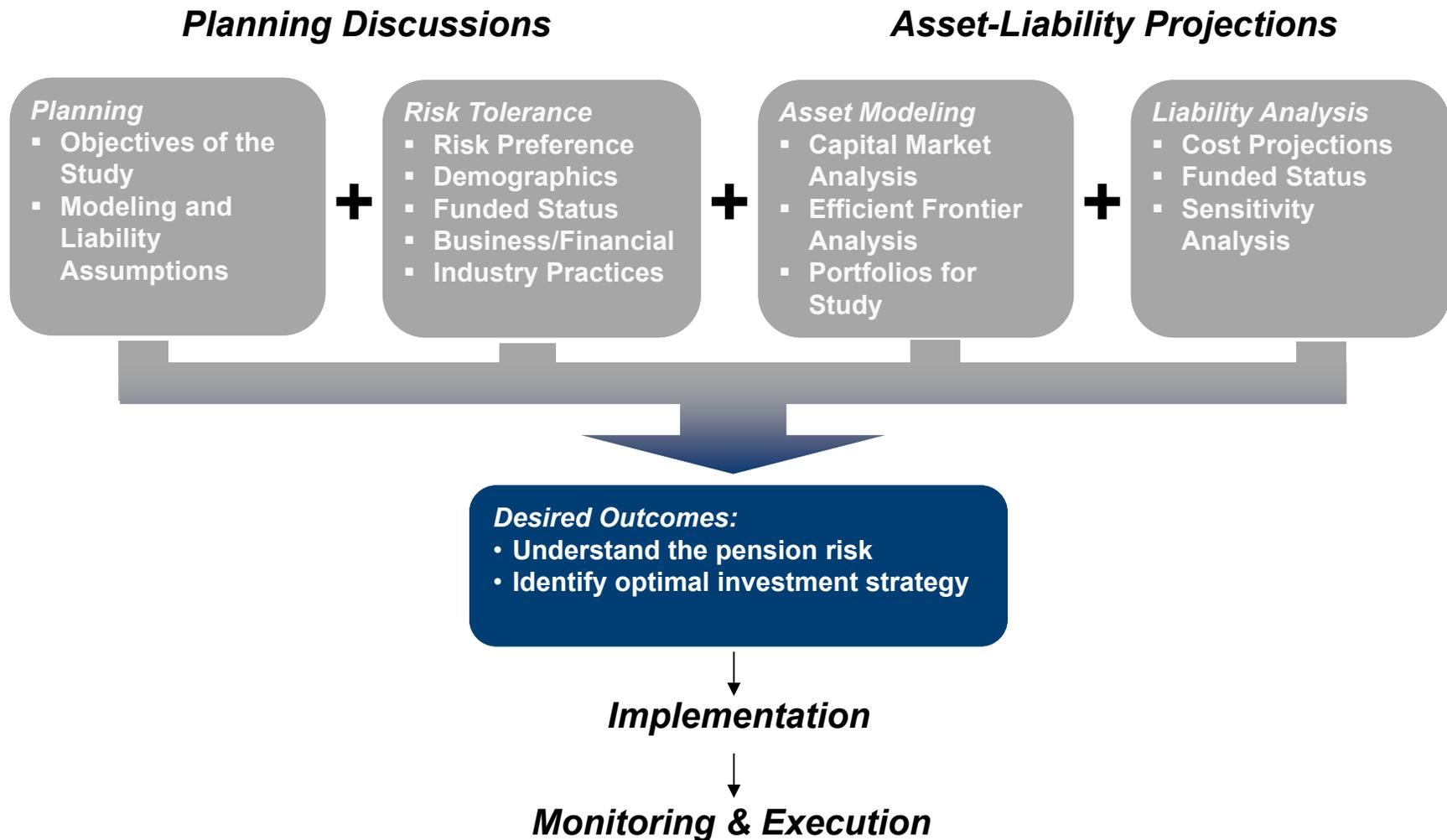
Asset-Liability Management Background

Key Risks for Public Pension Plans

Types of Risk	Time Horizon	Risk Management Tools and Controls
<p>Return Shortfall</p> <ul style="list-style-type: none"> Assets do not grow with liabilities Investment return & contribution less than liability growth 	<p>Long-Term (10+ years)</p>	<ul style="list-style-type: none"> Funding policy Plan design Investment policy Assumptions & methods
<p>Liquidity</p> <ul style="list-style-type: none"> Cannot liquidate assets efficiently to meet needs Lose control of asset allocation 	<p>Short- to Medium-Term (<5 years)</p>	<ul style="list-style-type: none"> Funding policy Benefit accruals Use of Illiquid investments Scenario analysis Monitoring
<p>Investment</p> <ul style="list-style-type: none"> Asset allocation (policy) Investment structure Manager selection Rebalancing Scenario (or path risk) Factor 	<p>Short-to Medium-Term (<5 years)</p>	<ul style="list-style-type: none"> Investment policy statement <ul style="list-style-type: none"> Static/dynamic Asset allocation Rebalancing Manager guidelines Monitoring/roles & responsibilities Risk budgeting Monitoring / dashboards Medium term views Regression and scenario analysis

Asset-Liability Management Background

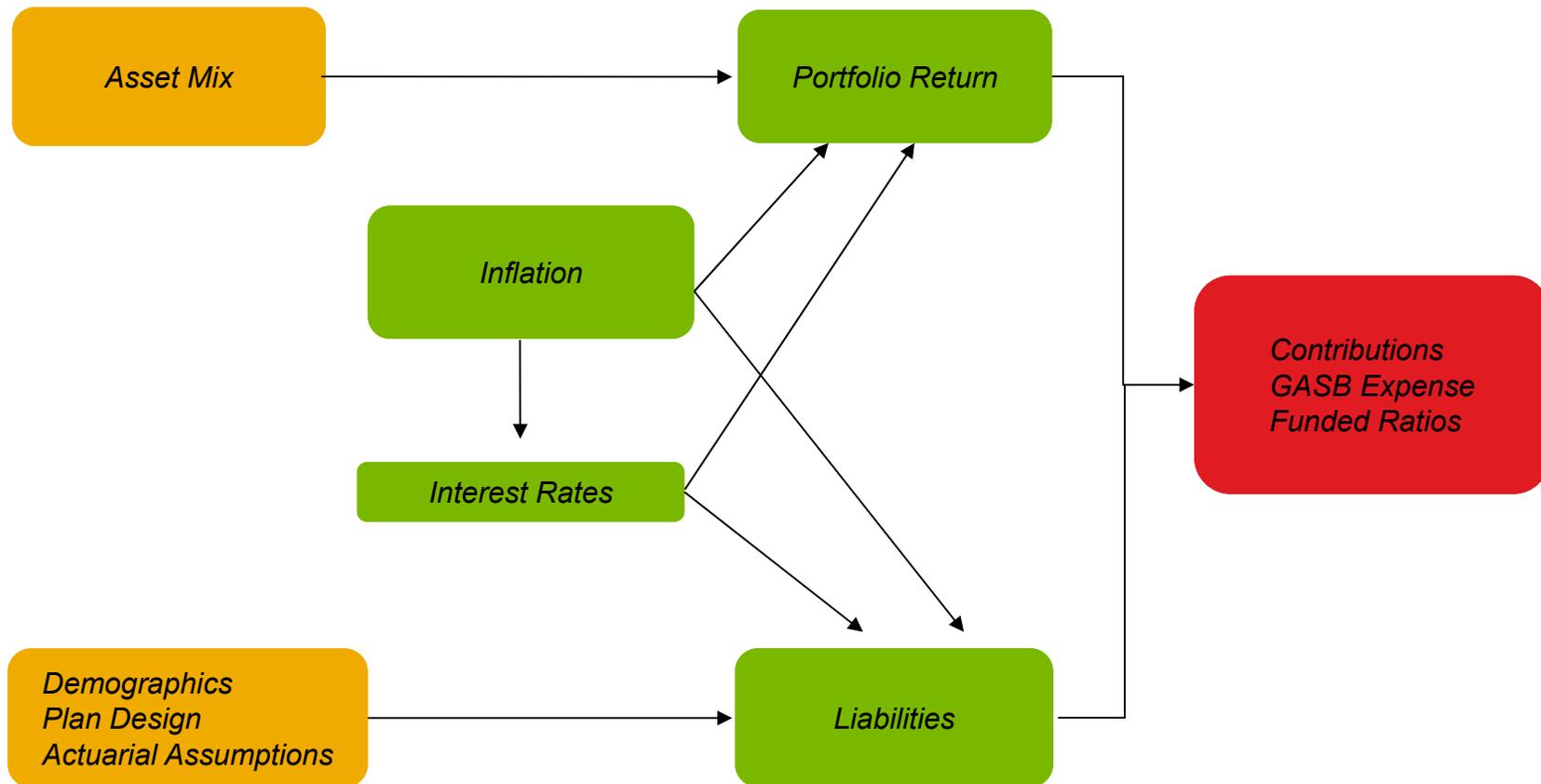
Overview of the Asset-Liability Study Process



Asset-Liability Management Background

Mechanics of Asset-Liability Modeling Process

- The graphic below shows how pension plan assets and liabilities are impacted by common factors such as inflation, interest rates and expected returns. It also depicts the flow chart for asset-liability modeling used for the projections that follow.



Asset-Liability Management Background

Modeling Process

- Goals of an asset-liability study:
 - Understand the pension plan's asset-liability risk, and
 - Identify the optimal investment strategies

- Stochastic, Monte Carlo simulation analysis used
 - 5,000 independent economic trials
 - Building block approach
 - Starts with inflation and interest rates
 - Using a multi-factor regression analysis, other asset classes are then modeled
 - Assets and liabilities are modeled over the projection period
 - Projections include contribution requirements, and funded ratios

- Asset-liability studies are best-suited to determine the optimal mix of Return-Seeking (e.g., equity) and Fixed Income assets for the pension fund
 - Asset mix is the single most important investment decision for the plan sponsor
 - Is it worthwhile to have a more aggressive allocation in order to reduce long term cost in exchange for risk of higher costs in a bad outcome?
 - Is it worthwhile to have a more conservative allocation in order to have a more predictable cost in exchange for potentially higher average costs?

Asset-Liability Management Background

Risk and Return in an Asset Liability Context

- **Traditional:**

- Return = Investment performance
- Risk = Annual volatility of investment gains and losses
(e.g. weak/negative capital market returns)

- **Asset/Liability:**

- Return = Potential cost reduction or funded status improvement under average economic conditions
- Risk = During the worst economic conditions, contributions need to increase or funded status declines
(e.g., stocks decline, inflation/deflation shocks and/or interest rates decline)

Asset-Liability Management Background

Key Factors Affecting the Risk/Reward Trade-off

- The key take-away from the A/L study is the allocation between equity (“return-seeking”) vs. fixed income (“risk-mitigating”)

- Major factors affecting the ultimate mix are:
 - Time horizon (or amortization period of unfunded liability) to fund the liability: a longer time horizon supports more risk taking
 - Characteristics of plan participants: a growing population of active participants supports more risk taking; a mature population with significant retirees might need a more conservative policy
 - Funded status: a less funded plan can utilize additional returns from equity investments
 - Nature of plan benefits: a pension with sensitivity to wage inflation growth can benefit from equities in the long-term; an increased need in liquidity due to significant benefit payments in the near future can have a more conservative policy

Our Investment Philosophy

Foundation of an Asset/Liability Study: Understand Objectives

The first step: understand Plan objectives and the Board's risk tolerance

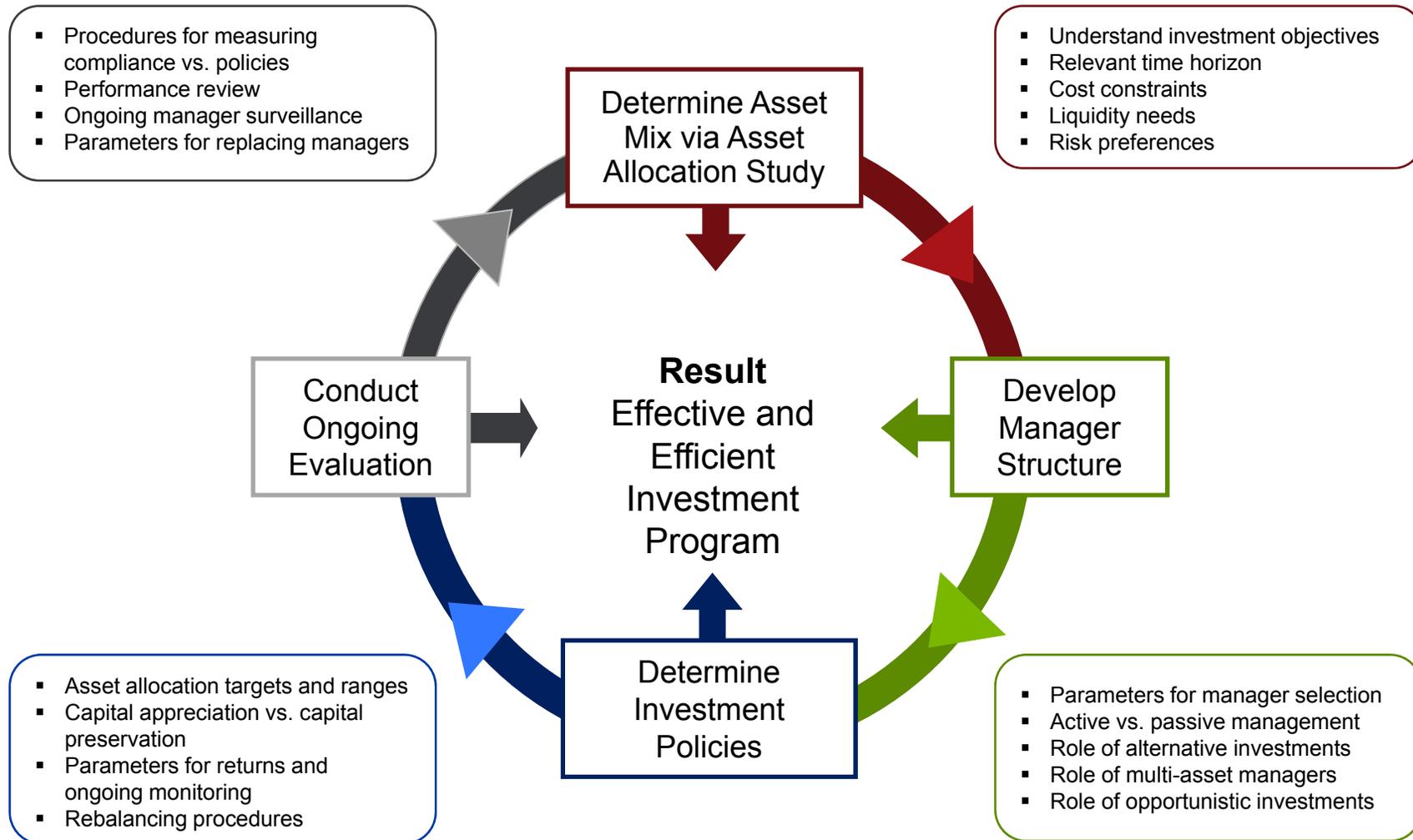
- Planning
 - Objectives of the Study
 - Modeling and Liability Assumptions

- Risk Tolerance
 - Risk Preference
 - Demographics
 - Funded Status
 - Financial
 - Industry Practices



Our Investment Philosophy

Comprehensive Approach to Investment Policy and Asset Allocation



Our Investment Philosophy

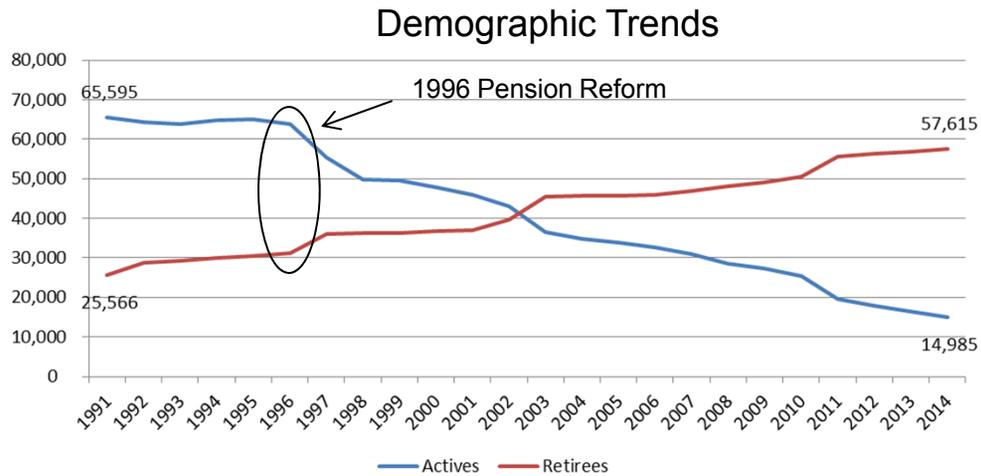
Asset Allocation Toolkit

- Understanding risk within the non-equity portion of the portfolio is important, having the tools for proper allocation is critical

Return-Seeking				Safety
Equity Returns	Diversifying Returns	Skill		
Public Equity <ul style="list-style-type: none"> ▪ Globally diversified public equity ▪ Base of the Return-Seeking Portfolio 	Diversifying Assets <ul style="list-style-type: none"> ▪ Credit <ul style="list-style-type: none"> – High Yield – EMD – Bank Loans ▪ Commodities ▪ Core Real Estate (Public & Private) 	Long-Term Assets <ul style="list-style-type: none"> ▪ Non-Core Private Real Estate ▪ Private Equity ▪ Infrastructure 	Liquid Alternatives <ul style="list-style-type: none"> ▪ Multi-strategy ▪ Event driven ▪ Equity long/short ▪ Trading ▪ Relative value 	Risk Reducing Assets <ul style="list-style-type: none"> ▪ Portion of portfolio which withstands times of stress ▪ Use Global team to bring valuable ideas and perspectives from around the world

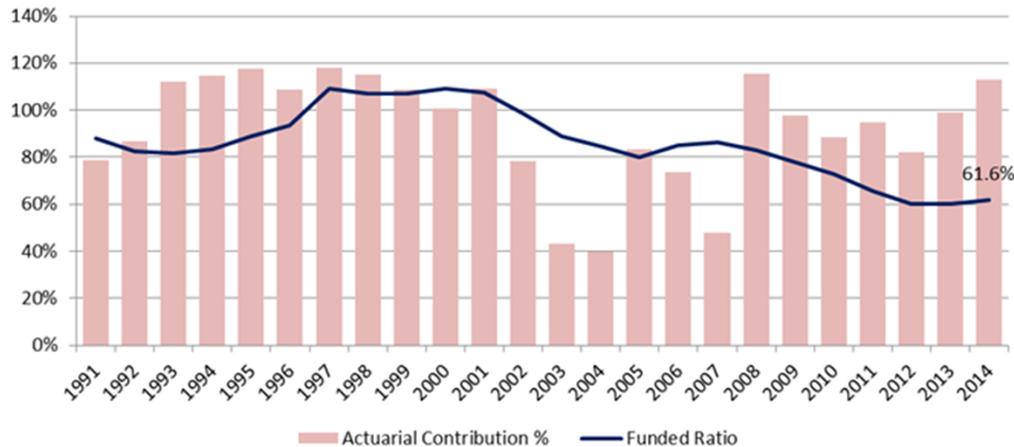
Asset-Liability Profile

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

Contributions & Funded Ratio

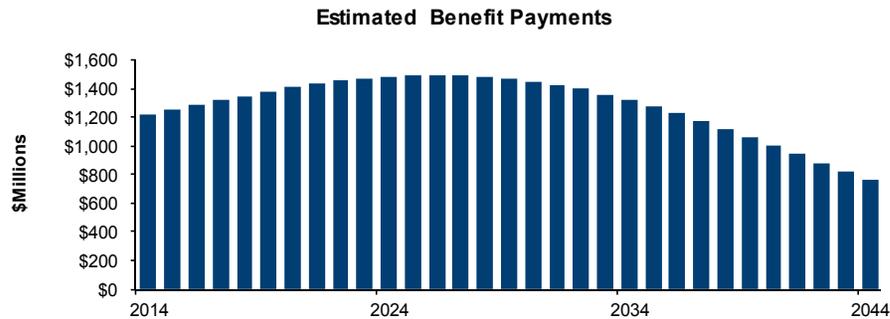


Asset-Liability Profile

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%
Sensitivity Analysis (based on Accounting Liability)			
-1% Sensitivity to Liability	\$17,672 ³	62.1%	56.4%
+1% Sensitivity to Liability	\$14,788 ⁴	74.2%	67.4%

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%



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%

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)

³ Based on a valuation interest rate of 7.00% from the FYE 2014 actuarial valuation report (Accounting)

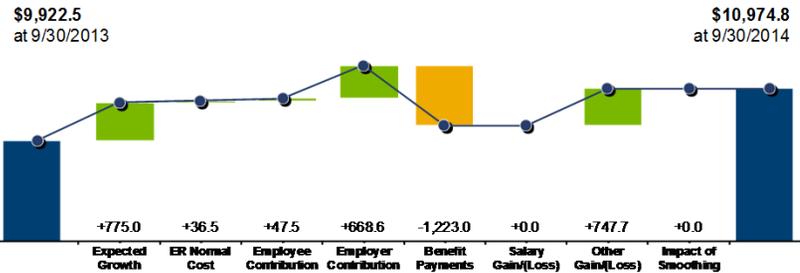
⁴ Based on a valuation interest rate of 9.00% from the FYE 2014 actuarial valuation report (Accounting)

Asset-Liability Profile

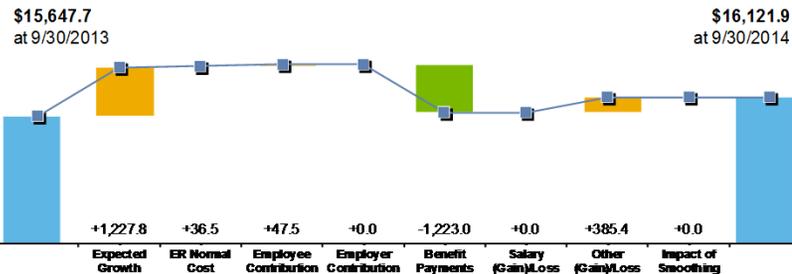
Performance Attribution for Fiscal Year 2014

Market Value of Assets

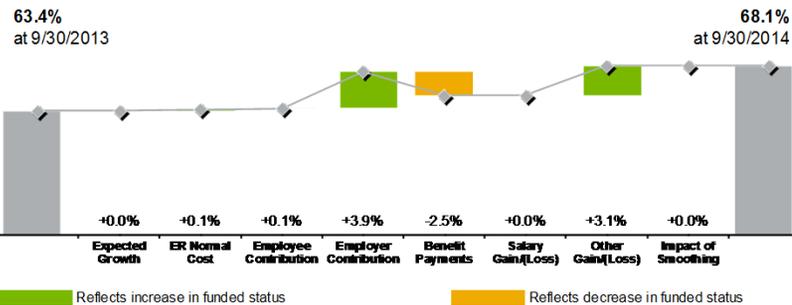
all values in 1,000,000s



Actuarial Liability (Accounting)



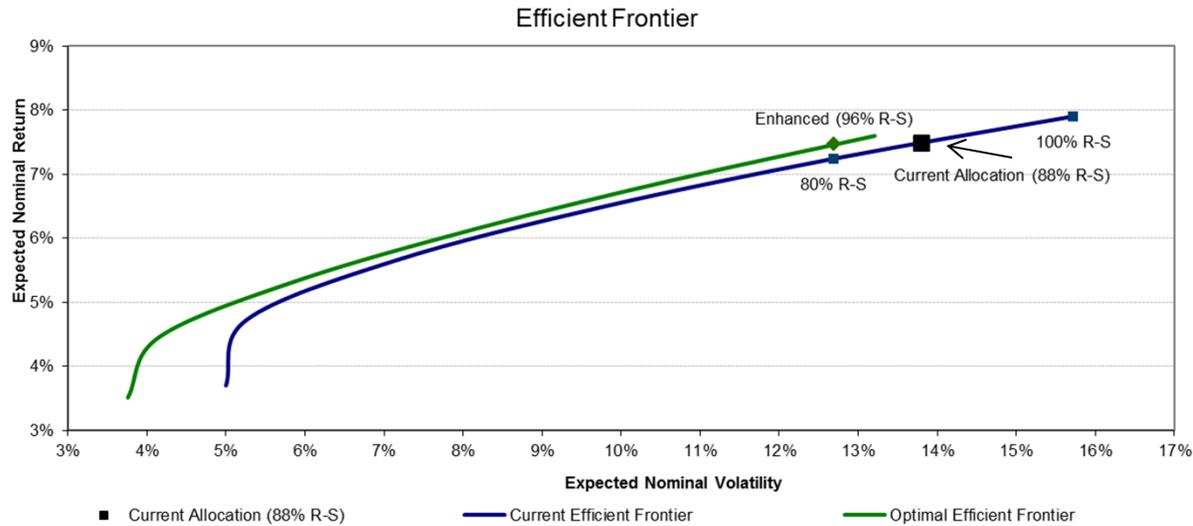
Funded Ratio



- Assets outperformed the long-term expectation during the Fiscal Year ending September 30, 2014.
- Employer contributions were approximately \$670M larger than the normal cost growth of the liabilities. The resulting excess served to reduce the unfunded liability.

Investment Analysis

Risk/Reward Analysis



Key Takeaways:

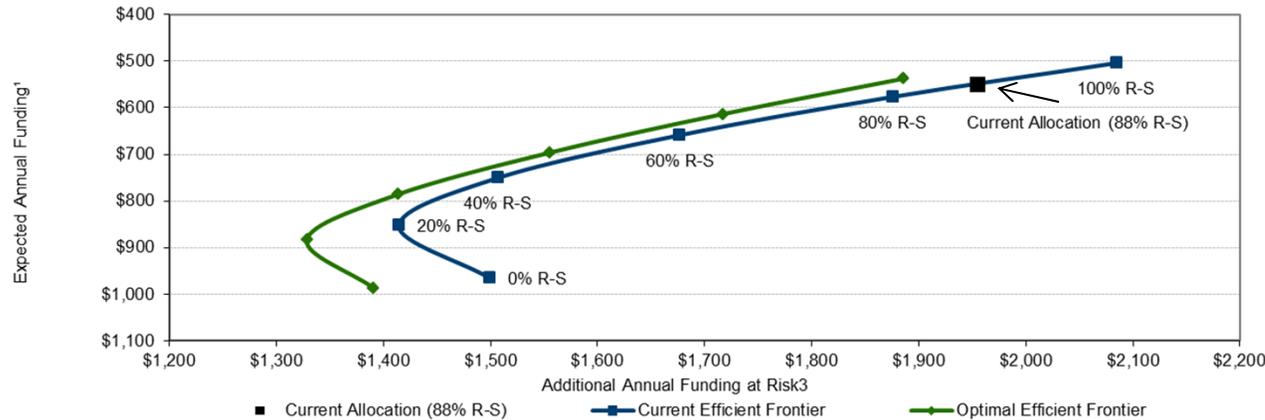
- Current portfolio is well-diversified
- Allocations to return-seeking credit and intermediate duration bonds could provide a meaningful risk/reward trade-off

Note: Current asset allocations were broken down by benchmark in the table below

	Expected Nominal Return	Expected Nominal Volatility	Sharpe Ratio	Equity Returns			Diversifying Returns			Skill			Safety		
				U.S. Equity	Non-U.S. Equity	Global Equity	Return-Seeking Credit	Commod	Real Estate	Hedge Funds	Private Equity	Infra	Cash & Short Dur Bonds	Core Bonds	Interm Bonds
Current Allocation (88% R-S)	7.5%	13.8%	0.3392	28%	16%	0%	0%	3%	9%	9%	21%	2%	2%	11%	0%
Current Efficient Frontier															
0% Return-Seeking	3.7%	5.0%	0.1801	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%
20% Return-Seeking	4.7%	5.3%	0.3666	6%	4%	0%	0%	1%	2%	2%	5%	0%	0%	80%	0%
40% Return-Seeking	5.7%	7.2%	0.3995	13%	7%	0%	0%	1%	4%	4%	10%	1%	0%	60%	0%
60% Return-Seeking	6.5%	9.8%	0.3780	19%	11%	0%	0%	2%	6%	6%	15%	1%	0%	40%	0%
80% Return-Seeking	7.2%	12.7%	0.3503	26%	15%	0%	0%	3%	8%	8%	19%	1%	0%	20%	0%
100% Return-Seeking	7.9%	15.7%	0.3248	32%	18%	0%	0%	4%	10%	10%	24%	2%	0%	0%	0%
Optimal Efficient Frontier															
0% Return-Seeking	3.5%	3.8%	0.1890	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
20% Return-Seeking	4.5%	4.2%	0.3993	0%	0%	7%	2%	1%	3%	3%	4%	0%	0%	0%	80%
40% Return-Seeking	5.3%	5.9%	0.4302	0%	0%	13%	4%	2%	6%	5%	9%	0%	0%	0%	60%
60% Return-Seeking	6.2%	8.2%	0.4102	0%	0%	20%	6%	3%	10%	8%	13%	0%	0%	0%	40%
80% Return-Seeking	6.9%	10.7%	0.3858	0%	0%	27%	9%	4%	13%	11%	17%	0%	0%	0%	20%
100% Return-Seeking	7.6%	13.2%	0.3635	0%	0%	33%	11%	5%	16%	13%	21%	0%	0%	0%	0%

Investment Analysis

Funding/Investment Analysis



Key Takeaways:

- The growth rate required of the assets to keep pace with the liability growth (the “hurdle rate”) is currently 12.5%:

Interest Cost	11.8%
<u>Normal Cost</u>	<u>0.7%</u>
Total	12.5%

- The hurdle rate is covered by a combination of investment returns and cash funding
- Higher allocations to return-seeking assets produce lower expected funding amounts, but with more volatility

Modeling Metric						
	Expected Nominal Return	Shortfall Versus Required Return	Expected Annual Funding ¹	Expected Nominal Volatility	1-Year Downside Return ²	Additional Annual Funding at Risk ³
Current Allocation (88% R-S)	7.5%	5.0%	\$550.6	13.8%	-5.3%	\$1,954.7
Current Efficient Frontier						
0% Return-Seeking	3.7%	8.8%	\$965.8	5.0%	-1.2%	\$1,499.9
20% Return-Seeking	4.7%	7.8%	\$852.9	5.3%	-0.4%	\$1,414.4
40% Return-Seeking	5.7%	6.8%	\$750.7	7.2%	-1.2%	\$1,506.9
60% Return-Seeking	6.5%	6.0%	\$658.8	9.8%	-2.8%	\$1,677.1
80% Return-Seeking	7.2%	5.3%	\$576.8	12.7%	-4.6%	\$1,875.6
100% Return-Seeking	7.9%	4.6%	\$504.1	15.7%	-6.5%	\$2,084.7
Optimal Efficient Frontier						
0% Return-Seeking	3.5%	9.0%	\$986.6	3.8%	-0.2%	\$1,390.8
20% Return-Seeking	4.5%	8.0%	\$882.4	4.2%	0.4%	\$1,328.6
40% Return-Seeking	5.3%	7.2%	\$785.7	5.9%	-0.4%	\$1,413.9
60% Return-Seeking	6.2%	6.3%	\$696.2	8.2%	-1.7%	\$1,555.7
80% Return-Seeking	6.9%	5.6%	\$613.6	10.7%	-3.1%	\$1,717.2
100% Return-Seeking	7.6%	4.9%	\$537.6	13.2%	-4.7%	\$1,885.9

¹ Expected annual funding to maintain funded ratio is equal to the sum of the net interest cost and normal cost

² Expected annual return under a one standard deviation adverse event

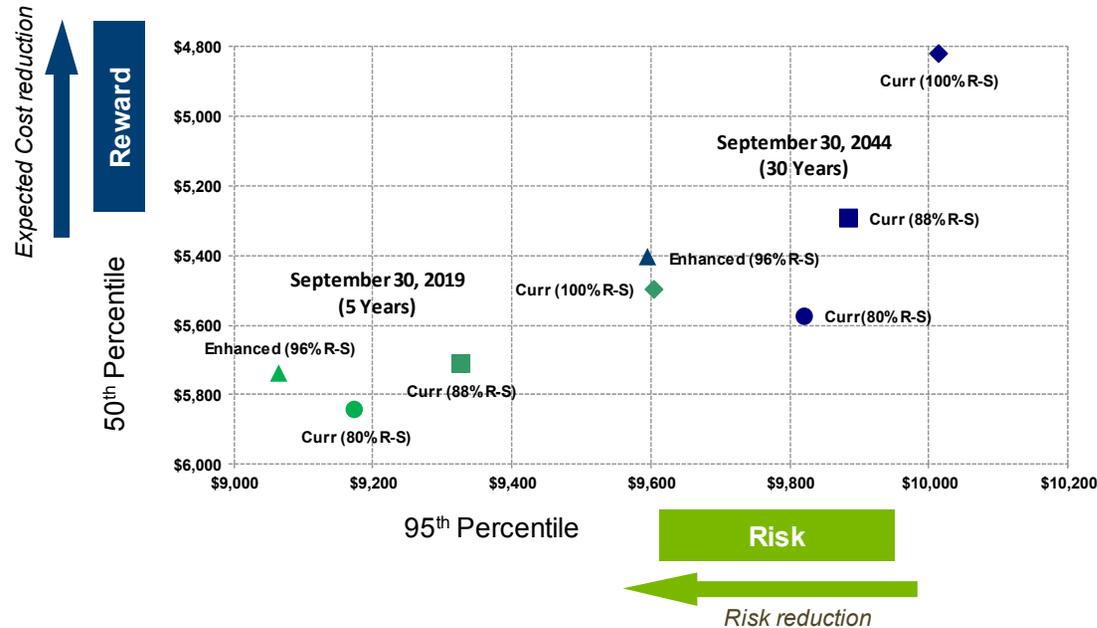
³ Additional annual funding under a one standard deviation adverse event to maintain current funded status

Projection Analysis

Economic Cost Analysis

Economic Cost

Present Value of Contributions plus AL Funding Shortfall/(Surplus)* at 8.00%, \$Millions



Economic Cost		
September 30, 2019		
Strategy (\$Millions)	Cost	Risk
● Current Allocation - 80% R-S	\$5,845.0	\$9,175.1
■ Current Allocation - 88% R-S	\$5,711.8	\$9,326.7
◆ Current Allocation - 100% R-S	\$5,495.8	\$9,603.3
▲ Enhanced Allocation - 96% R-S	\$5,740.5	\$9,065.4
September 30, 2024		
Strategy (\$Millions)	Cost	Risk
● Current Allocation - 80% R-S	\$5,908.5	\$9,686.4
■ Current Allocation - 88% R-S	\$5,712.7	\$9,804.2
◆ Current Allocation - 100% R-S	\$5,354.1	\$10,036.7
▲ Enhanced Allocation - 96% R-S	\$5,746.9	\$9,544.2
September 30, 2044		
Strategy (\$Millions)	Cost	Risk
● Current Allocation - 80% R-S	\$5,575.6	\$9,820.9
■ Current Allocation - 88% R-S	\$5,294.6	\$9,884.3
◆ Current Allocation - 100% R-S	\$4,819.5	\$10,013.9
▲ Enhanced Allocation - 96% R-S	\$5,407.2	\$9,595.6

Key Takeaways:

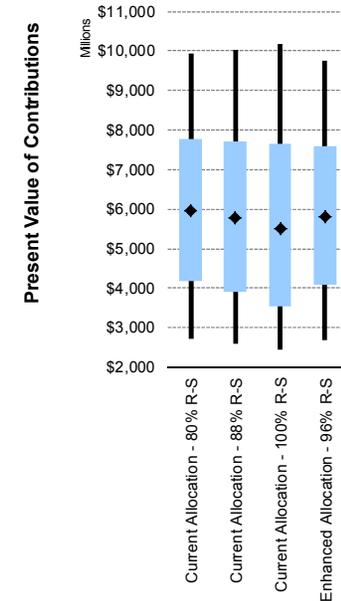
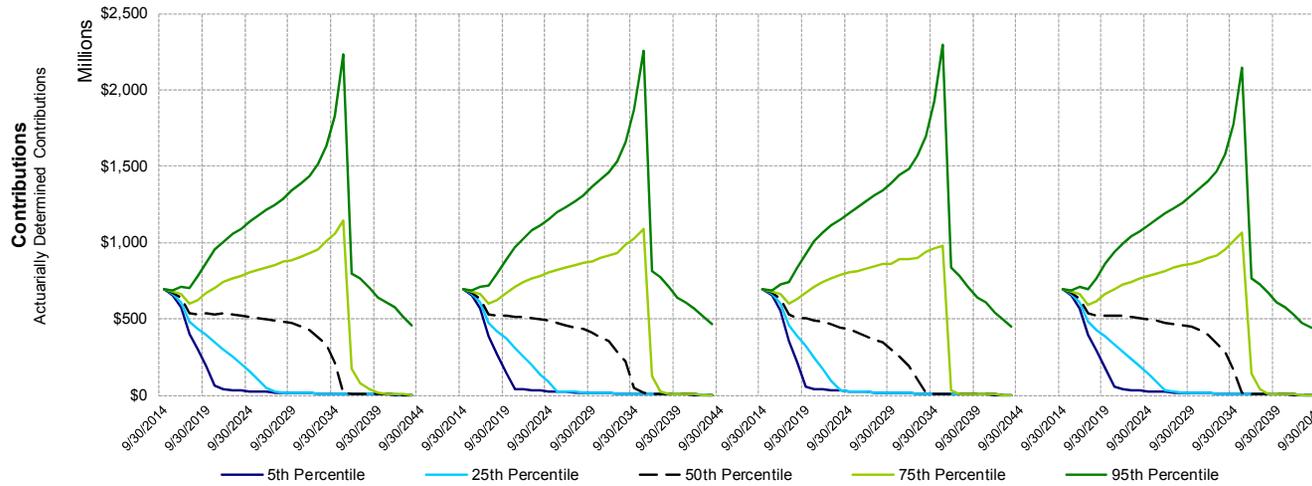
- An optimized portfolio may have desirable risk/reward characteristics relative to the current policy
- The magnitude of the risk/reward trade-off changes over a longer-term projection

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

Excludes 50% of surplus in excess of 120% of Actuarial liability, and includes twice the shortfall below 30% of Actuarial liability, on a market value basis

Projection Analysis

Gross Contributions (Employer + Employee Portions)

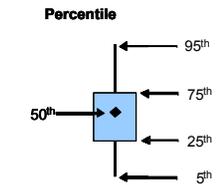


Strategy	Current Allocation - 80% R-S			Current Allocation - 88% R-S			Current Allocation - 100% R-S			Enhanced Allocation - 96% R-S		
Year	9/30/2023	9/30/2033	9/30/2043	9/30/2023	9/30/2033	9/30/2043	9/30/2023	9/30/2033	9/30/2043	9/30/2023	9/30/2033	9/30/2043
5th Percentile	\$30	\$10	\$3	\$30	\$10	\$3	\$29	\$10	\$3	\$30	\$10	\$3
25th Percentile	\$203	\$10	\$3	\$137	\$10	\$3	\$31	\$10	\$3	\$190	\$10	\$3
50th Percentile	\$522	\$334	\$3	\$494	\$219	\$3	\$446	\$13	\$3	\$503	\$285	\$3
75th Percentile	\$781	\$1,009	\$4	\$781	\$983	\$4	\$786	\$940	\$3	\$764	\$956	\$4
95th Percentile	\$1,092	\$1,636	\$461	\$1,112	\$1,654	\$464	\$1,151	\$1,694	\$451	\$1,076	\$1,581	\$439

Key Takeaway:

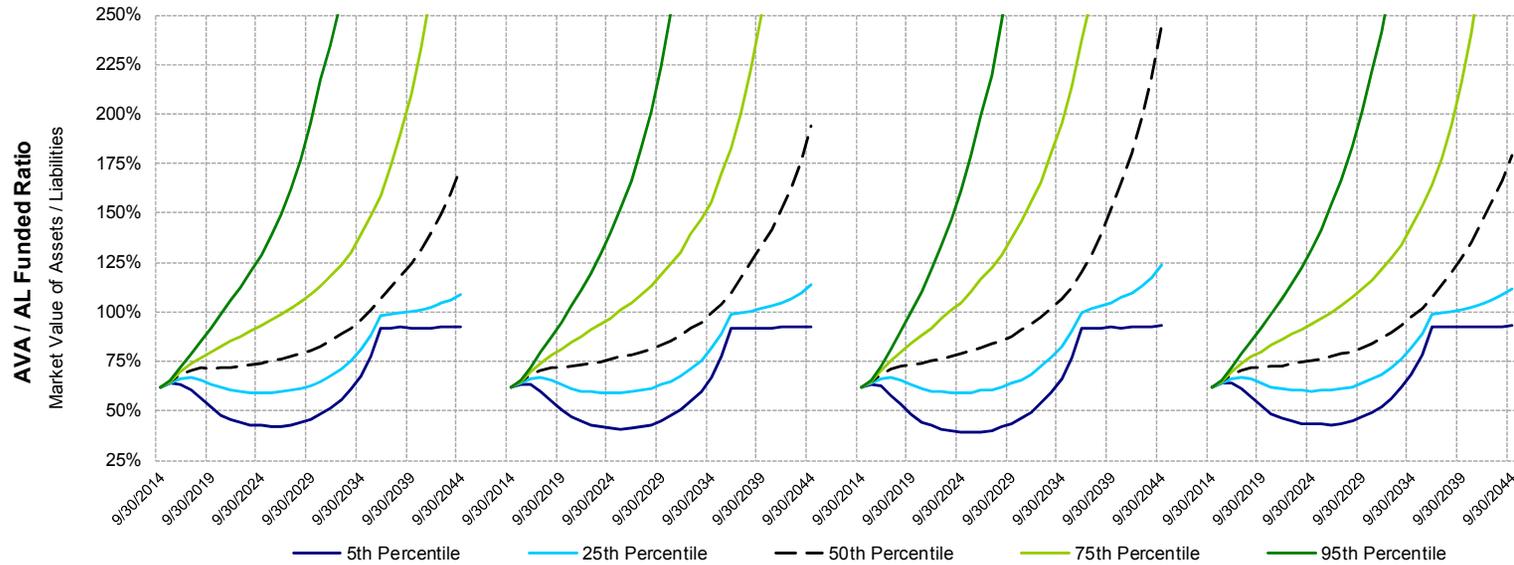
- Contribution volatility will increase as the closed amortization period declines to immediate recognition

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



Projection Analysis

Actuarial Value of Assets / Actuarial Liability Funded Ratio



Strategy	Current Allocation - 80% R-S			Current Allocation - 88% R-S			Current Allocation - 100% R-S			Enhanced Allocation - 96% R-S		
Year	9/30/2024	9/30/2034	9/30/2044	9/30/2024	9/30/2034	9/30/2044	9/30/2024	9/30/2034	9/30/2044	9/30/2024	9/30/2034	9/30/2044
5th Percentile	42%	68%	93%	41%	67%	93%	39%	66%	93%	43%	68%	93%
25th Percentile	59%	81%	108%	59%	82%	113%	59%	83%	124%	60%	82%	112%
50th Percentile	74%	96%	173%	76%	99%	194%	79%	107%	244%	75%	97%	179%
75th Percentile	93%	139%	380%	97%	156%	469%	105%	196%	649%	94%	143%	403%
95th Percentile	129%	327%	1568%	140%	389%	1956%	161%	522%	2820%	132%	341%	1692%
Probability > 100%	21%	48%	86%	24%	50%	88%	30%	57%	90%	22%	48%	88%

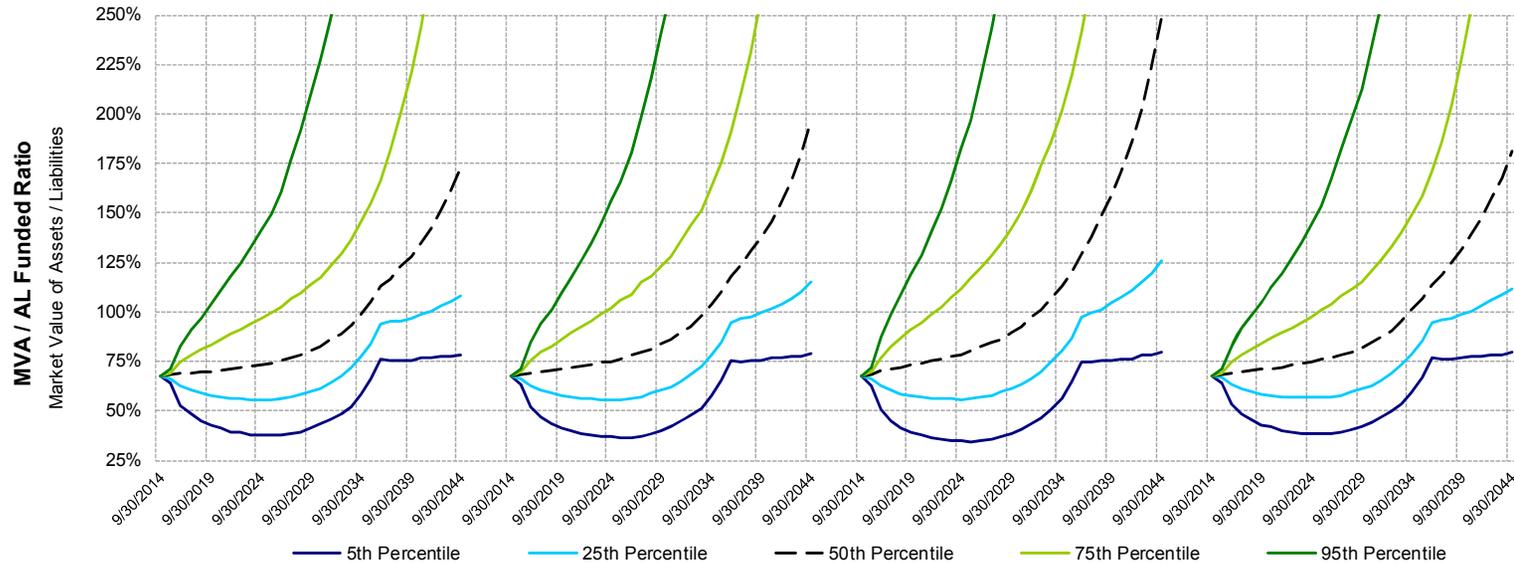
Key Takeaway:

- 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

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

Projection Analysis

Market Value of Assets / Actuarial Liability Funded Ratio



Strategy	Current Allocation - 80% R-S			Current Allocation - 88% R-S			Current Allocation - 100% R-S			Enhanced Allocation - 96% R-S		
Year	9/30/2024	9/30/2034	9/30/2044	9/30/2024	9/30/2034	9/30/2044	9/30/2024	9/30/2034	9/30/2044	9/30/2024	9/30/2034	9/30/2044
5th Percentile	38%	58%	78%	37%	57%	79%	35%	56%	79%	39%	59%	79%
25th Percentile	56%	77%	108%	56%	79%	115%	56%	81%	126%	57%	78%	112%
50th Percentile	73%	99%	172%	75%	104%	197%	78%	113%	248%	75%	101%	181%
75th Percentile	96%	146%	391%	102%	163%	483%	112%	202%	673%	98%	149%	412%
95th Percentile	141%	355%	1682%	156%	427%	2137%	183%	574%	3066%	144%	372%	1765%
Probability > 100%	23%	49%	80%	27%	54%	83%	34%	60%	86%	24%	51%	82%

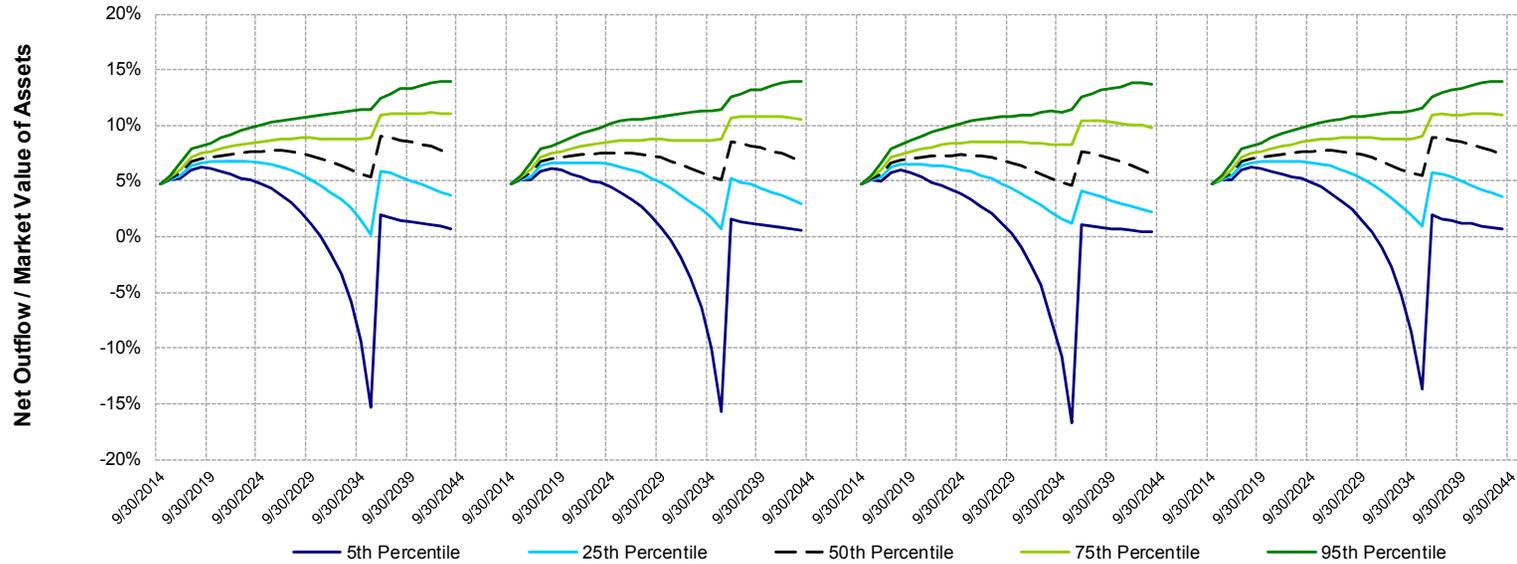
Key Takeaway:

- Market values of assets do not contain the smoothing parameters of the actuarial value of assets resulting in wider dispersions of results

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

Projection Analysis

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



Strategy	Current Allocation - 80% R-S			Current Allocation - 88% R-S			Current Allocation - 100% R-S			Enhanced Allocation - 96% R-S		
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	9/30/2043	9/30/2023	9/30/2033	9/30/2043
5th Percentile	5%	-6%	1%	5%	-6%	1%	4%	-7%	0%	5%	-5%	1%
25th Percentile	7%	3%	4%	7%	2%	3%	6%	2%	2%	7%	3%	4%
50th Percentile	8%	6%	8%	8%	6%	7%	7%	5%	6%	8%	6%	7%
75th Percentile	8%	9%	11%	8%	9%	11%	8%	8%	10%	8%	9%	11%
95th Percentile	10%	11%	14%	10%	11%	14%	10%	11%	14%	10%	11%	14%
Probability > 100%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%

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

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

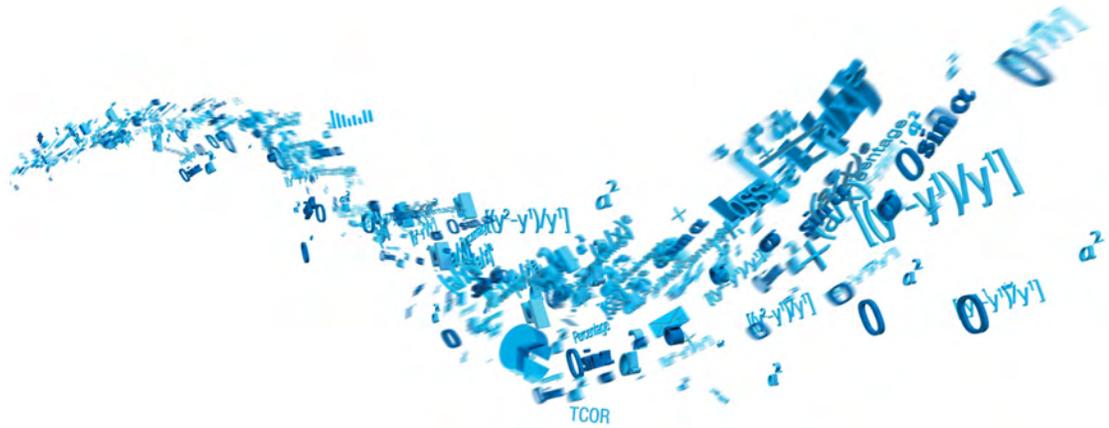
Projection Analysis

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%
Enhanced Allocation - 96% R-S	\$5,407.2	\$9,595.6	\$5,814.8	\$9,769.5	181%	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



Appendix

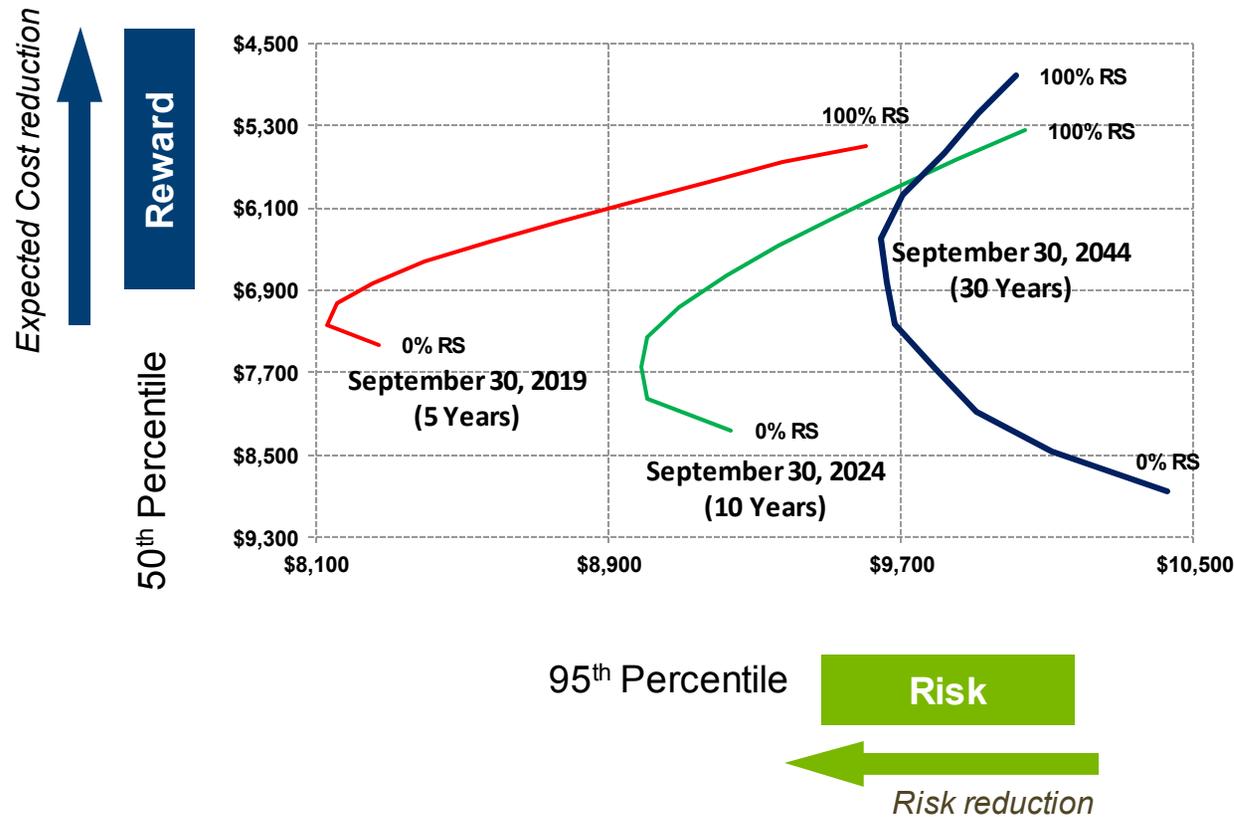
- Additional Analysis

Additional Analysis

Economic Cost Analysis

Economic Cost

Present Value of Contributions plus AL Funding Shortfall/(Surplus)* at 8.00%, \$millions



Key Takeaway:

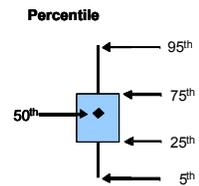
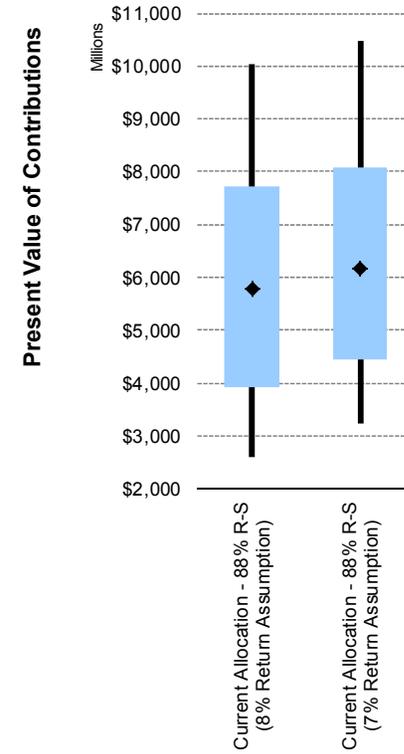
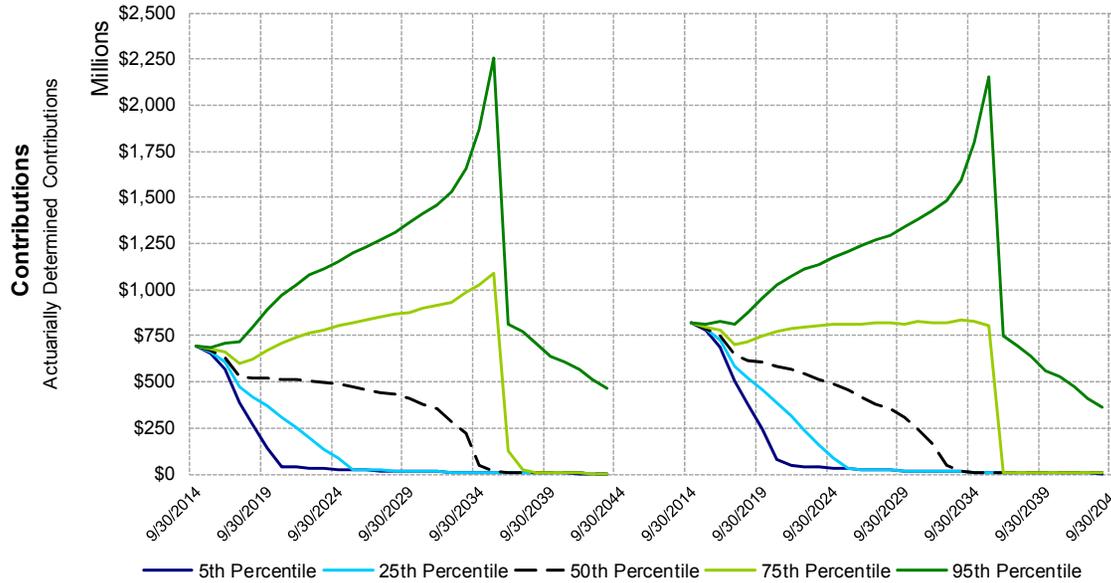
- The magnitude of the risk/reward trade-off changes over a longer-term projection

Excludes 50% of surplus in excess of 120% of Actuarial liability, and includes twice the shortfall below 30% of Actuarial liability, on a market value basis

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

Additional Analysis

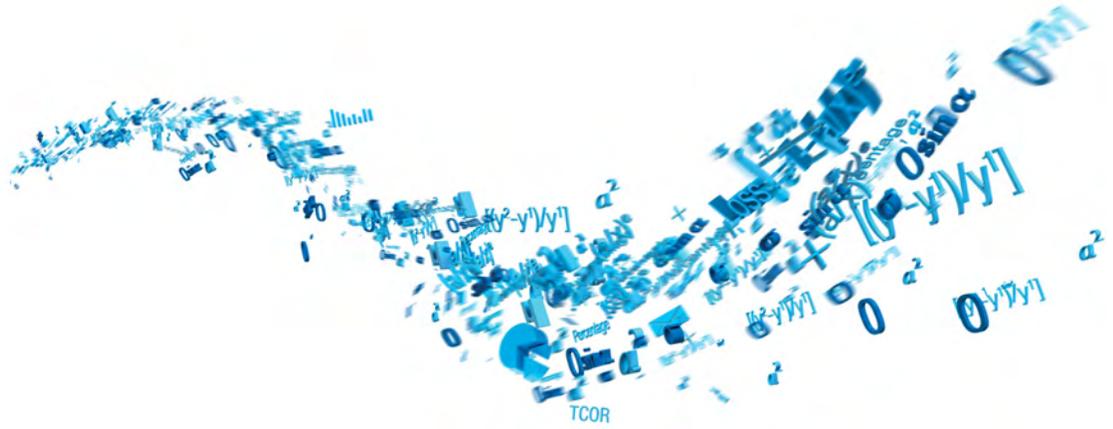
Impact of Changing the Actuarial Rate of Return Assumption (8.00% vs. 7.00%)



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

Key Takeaway:

- Using a 7.00% actuarial return will increase the near-term contributions and mitigate asset losses that would otherwise be recognized in future contributions



Appendix

- Assumptions

Review of Actuarial Assumptions and Methods

- 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

- In calculating plan contributions, Actuarial Liability was adjusted for the present value of the following offset amounts. No other offsets are applied once these are exhausted.

Fiscal Year	Early Retirement Incentive	Future Reconciliation Payments
2015	\$77.95M	\$153.18M
2016	\$77.95M	\$106.65M
2017	\$77.95M	\$71.40M
2018		\$30.71M
2019		(\$4.34M)
2020		(\$6.40M)

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	0.15	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	0.15	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	0.15	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	0.17	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	0.01	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	0.15	-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	0.02	0.07	0.19	0.15	0.15	0.17	0.17	0.17	0.15	0.15	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

Explanation of Capital Market Assumptions—Q3 2015 (30 Years)

The following capital market assumptions were developed by Aon Hewitt's Global Asset Allocation Team and represent the long-term capital market outlook (i.e., 30 years) based on data at the end of the second quarter of 2015. The assumptions were developed using a building block approach, reflecting observable inflation and interest rate information available in the fixed income markets as well as Consensus Economics forecasts. Our long-term assumptions for other asset classes are based on historical results, current market characteristics, and our professional judgment.

Inflation – Expected Level (2.1%)

Based on Consensus Economics long-term estimates and our near-term economic outlook, we expect U.S. consumer price inflation to be approximately 2.1% during the next 30 years.

Real Returns for Asset Classes

Fixed Income

- **Cash (0.7%)** – Over the long run, we expect the real yield on cash and money market instruments to produce a real return of 0.7% in a moderate- to low-inflationary environment.
- **TIPS (1.1%)** – We expect intermediate duration Treasury Inflation-Protected Securities to produce a real return of about 1.1%.
- **Core Fixed Income (i.e., Market Duration) (1.6%)** – We expect intermediate duration Treasuries to produce a real return of about 0.9%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults and downgrades) to be 0.7%, resulting in a long-term real return of 1.6%.
- **Long Duration Bonds – Government and Credit (2.1%)** – We expect Treasuries with a duration comparable to the Long Government Credit Index to produce a real return of 1.4%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults and downgrades) to be 0.7%, resulting in an expected real return of 2.1%.

Explanation of Capital Market Assumptions—Q3 2015 (30 Years)

- **Long Duration Bonds – Credit (2.5%)** – We expect Treasuries with a duration comparable to the Long Credit Index to produce a real return of 1.4%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults and downgrades) to be 1.1%, resulting in an expected real return of 2.5%.
- **Long Duration Bonds – Government (1.4%)** – We expect Treasuries with a duration of ~12 years to produce a real return of 1.4% during the next 30 years.
- **High Yield Bonds (3.3%)** – We expect intermediate duration Treasuries to produce a real return of about 0.9%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults and downgrades) to be 2.4%, resulting in an expected real return of 3.3%.
- **Bank Loans (2.6%)** – We expect LIBOR to produce a real return of about 1.1%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults) to be 1.5%, resulting in an expected real return of 2.6%.
- **Non-US Developed Bonds: 50% Hedged (1.1%)** – We forecast real returns for non-US developed market bonds to be 1.1% over a 30-year period after adjusting for a 50% currency hedge. We assume a blend of one-third investment grade corporate bonds and two-thirds government bonds. We also produce assumptions for 0% hedged and 100% hedged non-US developed bonds.
- **Emerging Market Bonds (Sovereign; USD) (3.5%)** – We forecast real returns for emerging market sovereign bonds denominated in USD to be 3.5% over a 30-year period.
- **Emerging Market Bonds (Corporate; USD) (3.1%)** – We forecast real returns for emerging market corporate bonds denominated in USD to be 3.1% over a 30-year period.
- **Emerging Market Bonds (Sovereign; Local) (4.3%)** – We forecast real returns for emerging market sovereign bond denominated in local currency to be 4.3% over a 30-year period.

Explanation of Capital Market Assumptions—Q3 2015 (30 Years)

Equities

- **Large Cap U.S. Equity (4.3%)** – This assumption is based on our 30-year outlook for large cap U.S. company dividends and real earnings growth. Adjustments are made for valuations as needed.
- **Small Cap U.S. Equity (4.8 %)** – Adding a 0.5% return premium for small cap U.S. equity over large cap U.S. equity results in an expected real return of 4.8%. This return premium is theoretically justified by the higher risk inherent in small cap U.S. equity versus large cap U.S. equity, and is also justified by historical data. In recent years, higher small cap valuations relative large cap equity has reduced the small cap premium.
- **Global Equity (Developed & Emerging Markets) (4.8%)** – We employ a building block process similar to the U.S. equity model using the developed and emerging markets that comprise the MSCI All-Country World Index. Our roll-up model produces an expected real return of 4.8% for global equity.
- **International (Non-U.S.) Equity, Developed Markets (4.6%)** – We employ a building block process similar to the U.S. equity model using the non-U.S. developed equity markets that comprise the MSCI EAFE Index.
- **Emerging Market Stocks (5.9%)** - We employ a building block process similar to the U.S. equity model using the non-U.S. emerging equity markets that comprise the MSCI Emerging Markets Index.

Alternative Asset Classes

- **Hedge Fund-of-Funds Universe (3.3%)** – The generic category “hedge funds” encompasses a wide range of strategies accessed through “fund-of-funds” vehicles. Our assumption is somewhat more conservative than historical results to account for flaws inherent in hedge funds indices, including survivorship bias and self-reporting bias. We also assume the *median* manager is selected and also allow for the additional costs associated with Fund-of-Funds management. A top-tier portfolio of individual managers (hedge fund-of-funds buy-list) could add an additional 0.7% in return at similar volatility based on alpha, lower fees, and better risk management.

Explanation of Capital Market Assumptions—Q3 2015 (30 Years)

- **Broad Hedge Funds (4.9%)** – Represents a diversified portfolio of direct hedge fund investments. This investment will tend to be less diversified than a typical “fund-of-funds” strategy as there will be fewer underlying managers.
- **Real Estate (4.5%)** – Our real return assumption for broad real estate market is based on a gross income of about 6.5%, management fees of roughly 2%, and future capital appreciation near the rate of inflation during the next 30 years. We assume a portfolio of equity real estate holdings that is diversified by property type and by geographic region.
- **Core Real Estate (3.6%)** – Our real return assumption for core real estate is based on a gross income of about 5.6%, management fees of roughly 2%, and future capital appreciation near the rate of inflation during the next 30 years. We assume a portfolio of equity real estate holdings that is diversified by property type and geographic region.
- **U.S. REITs (4.4%)** – Our real return assumption for U.S. REITs is based on income of about 4.4% and future capital appreciation near the rate of inflation during the next 30 years. REITs are a sub-set of the U.S. small/mid cap equity universe.
- **Commodities (3.1%)** – Our commodity assumption is for a diversified portfolio of commodity futures contracts. Commodity futures returns are composed of three parts: spot price appreciation, collateral return, and roll return (positive or negative change implied by the shape of the future curve). We believe that spot prices will converge with CPI over the long run (i.e., 2.0%). Collateral is assumed to be LIBOR cash 1.1%. Also, we believe the roll effect will be near zero, resulting in a real return of approximately 3.1% for commodities.
- **Private Equity (6.6%)** – Our private equity assumption reflects a diversified fund of funds with exposure to buyouts, venture capital, distressed debt, and mezzanine debt.
- **Infrastructure (5.2%)** – Our infrastructure assumption is formulated using a cash flow based approach that projects cash flows (on a diversified portfolio of assets) over a 30 year period. Income and capital growth as well as gearing levels, debt costs and terms, relevant tax and management expenses are all taken into consideration. Our approach produces an expected real return of 5.2% for infrastructure.

Explanation of Capital Market Assumptions—Q3 2015 (30 Years)

Volatility / Correlation Assumptions

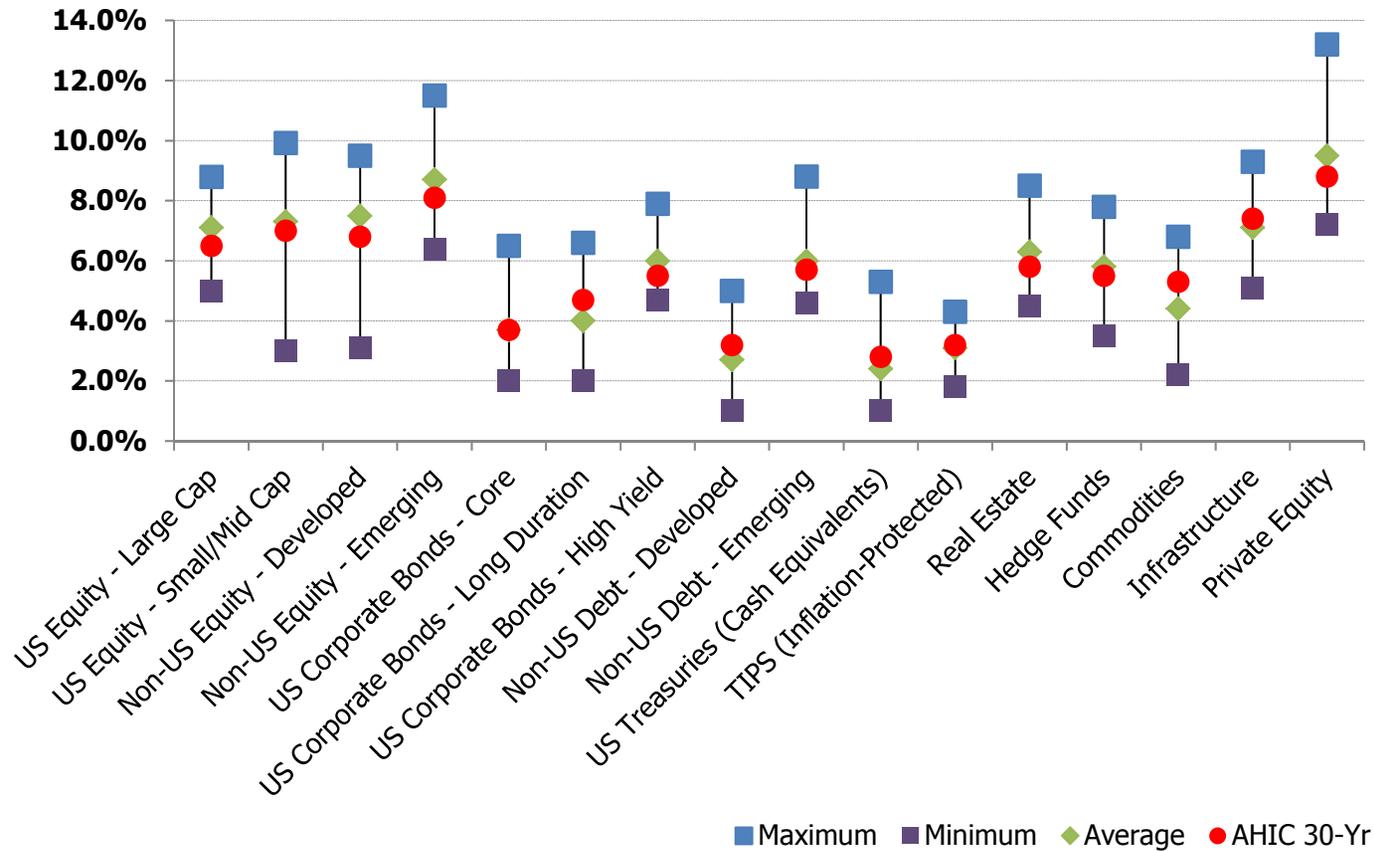
Assumed volatilities are formulated with reference to implied volatilities priced into option contracts of various terms, as well as with regard to historical volatility levels. For asset classes which are not marked to market (for example real estate), we “de-smooth” historical returns before calculating volatilities. Importantly, we consider expected volatility trends in the future – in recent years we assumed the re-emergence of an economic cycle and a loss of confidence in central bankers would lead to an increase in volatility. Correlation assumptions are generally similar to actual historical results; however, we do make adjustments to reflect our forward-looking views as well as current market fundamentals.

Capital Market Assumption Overview

- We have what we consider a consistent and conservative approach to modeling asset class returns, risk, and correlations
- AHIC regularly reviews these critical inputs relative to peer consultants as well as the investment management community
- The following slides include a review of 2015 assumptions relative to a study of peer averages
 - AHIC is often more conservative from an expected return standpoint than the peer average
 - While we do not seek to change our approach based on how we stack up to peers, it is a helpful double-check to make sure we are not too far off from others in the industry

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.

Reasons for Differences

- Methodology
- Time Horizon
- Arithmetic vs. Geometric forecasts*
- Alpha (active management)*
- Inflation
- Investment Fees
- Asset class definition

* While some firms in Horizon survey responded with Arithmetic forecasts, the results have been converted to Geometric forecasts for comparison purposes. Additionally, the return expectations included in the Horizon survey are based on indexed returns (no “alpha”). However, AHIC return assumptions for certain asset classes include “alpha” or active management premium (e.g., Private Equity and Hedge Funds)

Leading Methodologies

- Building Block
- Global Capital Asset Pricing Model (Global CAPM)
- Surveys
- Historical data (as a guide to future)
- Black-Litterman (combination of building block and CAPM)

AHIC Capital Market Assumptions

- Long-term (10 and 30 year forecasts) forward-looking assumptions (asset class geometric return, volatility and correlations)
- Building Block approach. Primarily based on consensus expectations and market based inputs
- Best estimates of annualized returns (50/50 better or worse)
- Market returns: no active management value added (other than hedge funds and private equity)
- Net of investment fees

AHIC Versus Peers (2015 Horizon Survey)

Asset Class	Horizon Survey				AHIC			
	Expected Geometric Returns			Expected Risk	10 Year Forecasts		30 Year Forecasts	
	Maximum	Minimum	Average	Average	Expected Return	Expected Risk	Expected Return	Expected Risk
US Equity - Large Cap	8.8%	5.0%	7.1%	17.1%	6.5%	17.0%	6.5%	17.5%
US Equity - Small/Mid Cap	9.9%	3.0%	7.3%	21.0%	6.7%	23.0%	7.0%	23.5%
Non-US Equity - Developed	9.5%	3.1%	7.5%	19.6%	6.9%	20.0%	6.8%	20.5%
Non-US Equity - Emerging	11.5%	6.4%	8.7%	26.6%	8.0%	30.0%	8.1%	30.5%
US Fixed Income - Core	6.5%	2.0%	3.7%	5.6%	2.9%	4.0%	3.7%	5.0%
US Fixed Income - Long Duration Corp	6.6%	2.0%	4.0%	10.8%	4.4%	11.5%	4.7%	13.5%
US Fixed Income - High Yield	7.9%	4.7%	6.0%	11.2%	4.7%	12.0%	5.5%	12.0%
Non-US Fixed Income - Developed	5.0%	1.0%	2.7%	7.4%	2.3%	5.5%	3.2%	6.5%
Non-US Fixed Income - Emerging	8.8%	4.6%	6.0%	11.7%	4.6%	13.0%	5.7%	13.5%
Treasuries (Cash Equivalents)	5.3%	1.0%	2.4%	2.8%	2.1%	1.0%	2.8%	1.5%
TIPS (Inflation-Protected)	4.3%	1.8%	3.1%	6.3%	2.7%	4.5%	3.2%	4.5%
Real Estate	8.5%	4.5%	6.3%	13.6%	5.8%	11.5%	5.8%	11.5%
Hedge Funds	7.8%	3.5%	5.8%	8.3%	5.0%	9.0%	5.5%	10.0%
Commodities	6.8%	2.2%	4.4%	18.0%	4.5%	17.0%	5.3%	17.0%
Infrastructure	9.3%	5.1%	7.1%	13.1%	7.2%	14.5%	7.4%	14.5%
Private Equity	13.2%	7.2%	9.5%	23.6%	8.8%	24.0%	8.8%	24.5%
Inflation	2.8	1.7	2.2%	1.8%	2.1%	1.0%	2.1%	1.5%

Notes (Horizon Survey):

Source: Horizon Actuarial survey of 2015 capital market assumptions from 29 independent investment advisors

Expected returns are annualized over 10-20 years (geometric). Returns are 'blended,' using 10-year assumptions when 20-year assumptions are not available.

Notes (AHIC Forecasts):

AHIC Forecasts are for Q3 2015

US Equity - Small/Mid Cap forecasts represents AHIC forecasts for US Small Cap

US Fixed Income - Long Duration forecasts represents AHIC forecasts for Long Duration Credit

Non-US Fixed Income - Developed forecasts represents AHIC forecasts for Non-US Fixed Income - Developed (50% Hedged)

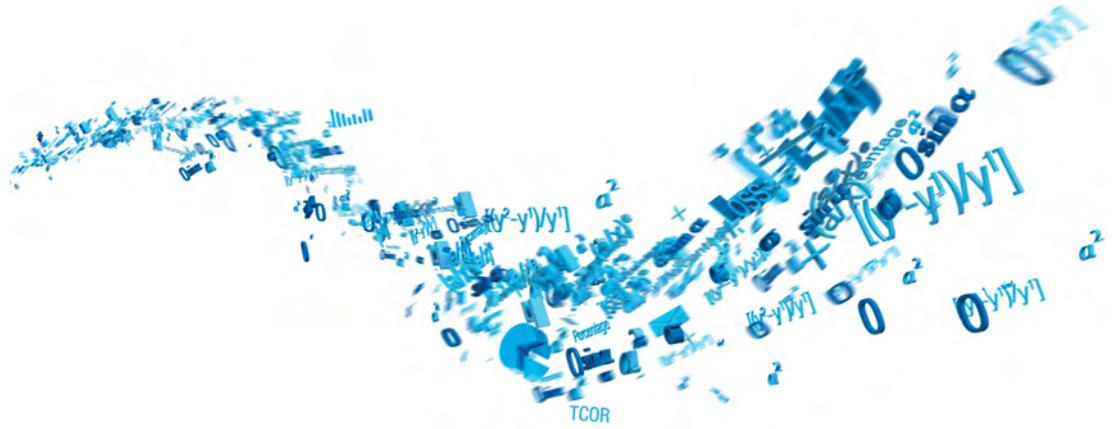
Non-US Fixed Income- Emerging forecasts represents AHIC forecasts for Non-US Fixed Income- Emerging Sovereign USD

Real Estate forecasts represents AHIC forecasts for Core Private Real Estate

Hedge Funds forecasts represents AHIC forecasts for Hedge Fund-of-Funds

AHIC Versus Peers: Observations

- Compared to 2014, 2015 survey results indicate a decline in return assumptions of both risky assets (equity-like) and fixed income asset classes
 - Equity return assumptions are lower by an average of 0.3%
 - Fixed income return assumptions are lower by an average of 0.3%
 - Alternative asset class return assumptions are lower by an average of 0.4%
- 2015 AHIC assumptions tend to be lower than the survey average
 - AHIC equity assumptions are driven by market valuations, earnings growth expectations and assumed payouts to investors. Recent experience suggests strong equity market performance has been driven more by increasing valuations than increasing profits. As markets have become more expensive, our equity return assumptions have consequently fallen
 - AHIC fixed income assumptions reflect rising yields and steepening of yield curves during the second quarter of 2015
 - AHIC alternative asset class assumptions are generally lower due to methodological and inflation forecast differences compared to survey participant forecasts
- In conclusion, AHIC assumptions appear somewhat more conservative than peers included in the 2015 Horizon Survey of capital market assumptions



Appendix

- Public Pension Peer Review

Public Pension Peer Review

Overview

- Public Fund Peer Asset Allocation Comparison
 - Asset allocation should be matched to each defined benefits unique design
 - Peer comparison is meant to inform and not dictate policy

Public Pension Peer Review

MSERS's Asset Allocation versus Public Peers

Asset Allocation	MSERS	Large Public Pension Plans (<\$500m)*	Large Public Pension Plans (\$501m-1B)*	Large Public Pension Plans (\$1-5B)*	Large Public Pension Plans (>\$5B)*	Total Public Pension Universe*	Wilshire Report on State Retirement Systems **
Equity Exposure							
Global Equity	0.0%						
Total U.S. Equity	28.0%	37.9%	40.4%	30.8%	24.0%	24.7%	27.9%
Total Int'l Equity	16.0%	19.7%	19.6%	21.3%	23.3%	23.2%	21.0%
Private Markets	21.2%	2.4%	2.6%	4.9%	9.4%	9.0%	10.1%
Total Equity	65.2%	60.0%	62.6%	57.0%	56.7%	56.9%	59.0%
Fixed Income Exposure							
U.S. Fixed Income	10.5%	22.3%	21.2%	17.5%	19.0%	18.9%	21.4%
High Yield Bonds / Bank Loans	0.0%						
Non-US Developed Bonds	0.0%	2.2%	1.5%	4.0%	3.2%	3.2%	2.1%
Emerging Market Debt	0.0%	0.5%	0.2%	0.8%	1.4%	1.4%	
Inflation Protected	0.0%						
Total Fixed Income	10.5%	25.0%	22.9%	22.3%	23.6%	23.5%	23.5%
Real Asset Exposure							
US Infrastructure	1.5%						
Commodities	3.2%	1.2%	1.3%	1.4%	1.0%	1.0%	
Real Estate	8.5%	6.8%	7.2%	6.9%	8.0%	7.9%	7.2%
Total Real Assets	13.2%	8.0%	8.5%	8.3%	9.0%	8.9%	7.2%
Hedge Funds	9.2%	2.6%	2.9%	5.2%	4.3%	4.3%	
Multi-Asset / Risk Parity		0.8%	0.4%	2.8%	1.5%	1.6%	
Money Market / Cash	2.0%	0.5%	0.8%	0.6%	1.6%	1.5%	
Other	0.0%	3.2%	2.1%	3.7%	3.4%	3.4%	10.3%
Net Other	11.2%	7.1%	6.2%	12.3%	10.8%	10.8%	10.3%
Total	100%	100%	100%	100%	100%	100%	100%

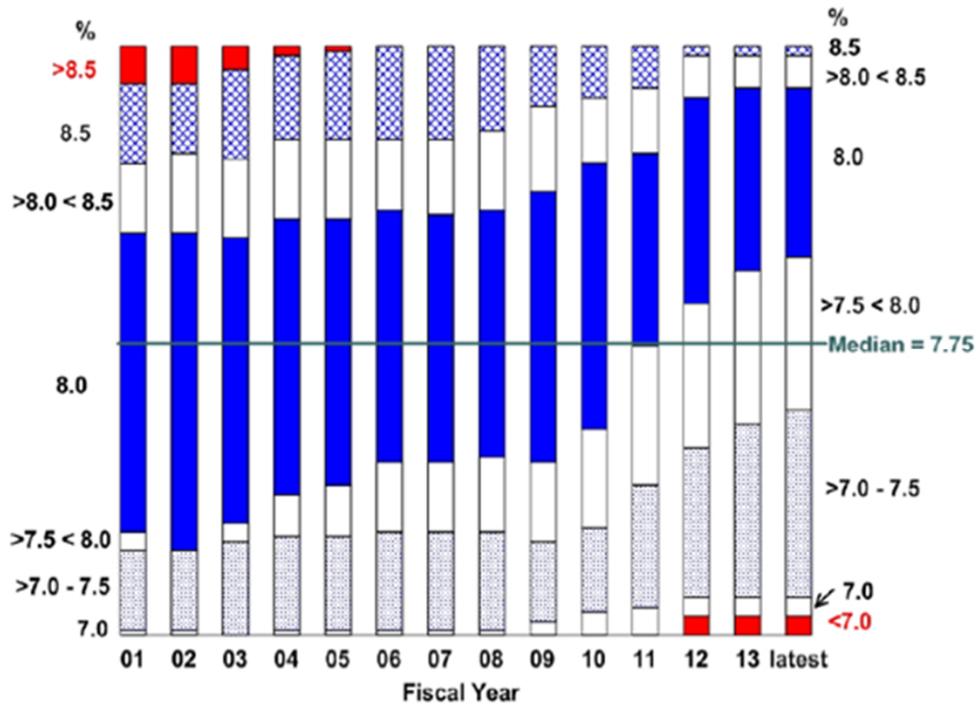
* Source: "2014 United States Institutional Investors - Market Trends - Consulting Business", Greenwich Associates

** Source: "2015 Report on State Retirement Systems: Funding Levels and Asset Allocation", Wilshire Consulting

Public Pension Peer Review

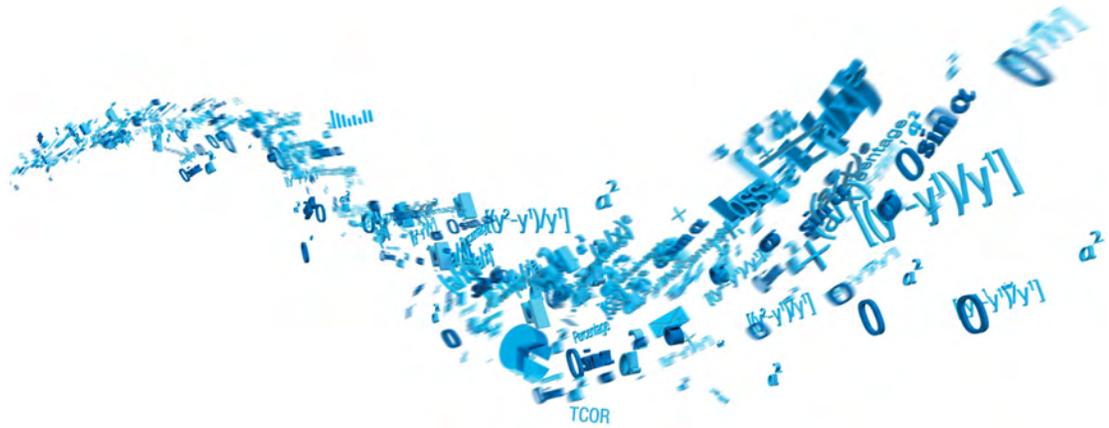
MSERS's Investment Return Assumption versus Public Peers

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%



Appendix

- Regulatory Update

Regulatory Update

Overview

- In an effort to improve the consistency and transparency of reporting, GASB voted on June 25, 2012 to approve:
 - Statement No. 67, *Financial Reporting for Pension Plans (an amendment of GASB Statement No. 25)* effective for fiscal years beginning after June 15, 2013
 - Statement No. 68, *Accounting and Financial Reporting for Pensions (an amendment of GASB Statement No. 27)* effective for fiscal years beginning after June 15, 2014

- Changes in the Statements relate only to accounting and financial reporting for pensions
 - No changes required to current funding methods—effectively separates accounting and funding valuations

- These Statements apply to pensions in which all of the following apply:
 - The plan is administered through a trust or equivalent arrangement
 - Contributions and earnings on those contributions are irrevocable
 - Trust assets are dedicated to providing pensions to plan members
 - Trust assets are legally protected from creditors
 - Therefore, for example, these Statements do not apply to pensions funded through a rabbi trust

Regulatory Update

Overview of GASB 67 Changes

- GASB 67 requires defined benefit pension plans to present two financial statements:
 - A statement of fiduciary net position
 - A statement of changes in fiduciary net positions

- This Statement sets forth the requirements to be used in calculating pension liability
 - Actuarial Cost Method must be Entry Age Normal
 - Discount rates are the assumed investment rate of return blended with a 20-year municipal bond rate (AA/Aa or higher) if projected plan assets are not expected to cover future benefit payments

- Additional disclosures in the notes to the financial statements and required supplementary information are also required, such as the following:
 - Plan information
 - Documentation of the investment policy
 - Long-term rate of return
 - Target asset allocations
 - Sensitivity of the Net Pension Liability
 - Significant assumptions such as inflation, salary changes, ad hoc postemployment benefit changes

Regulatory Update

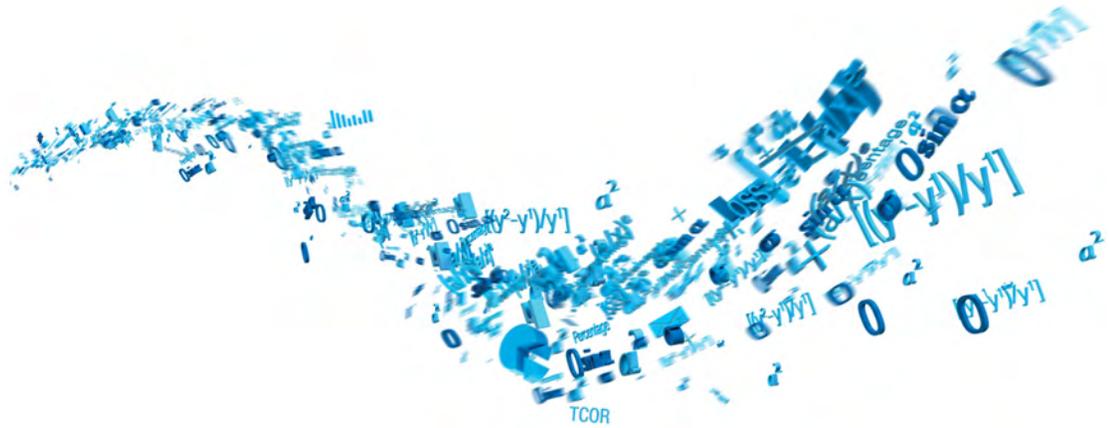
Overview of GASB 68 Changes

Final GASB Pension Accounting Changes (GASB 68) *

	Current (GASB 27)	New (GASB 68)	Impact
Funding Method	May use one of several approved methods; Projected Unit Credit (mandated under FASB) is common	Must use Entry Age Normal method	Entry Age Normal method may result in a higher liability measure than current method
Measurement Date	Practice varies; some employers report funded status based on beginning of fiscal year valuation results; others estimate fiscal year-end funded status	As early as prior fiscal year-end; results from an earlier valuation (up to 30 months and 1 day prior to FYE) may be rolled forward to measurement date	More flexibility than was contained in Exposure Draft; may require valuation in 2014 under new rules for transition if earlier measurement date is adopted
Asset Method	Asset gains and losses may be smoothed; 5-year smoothing is common	Market Value with no smoothing	Increased volatility in both expense and balance sheet if previously smoothing
Amortization Period for Liability Gains/Losses	Up to 30 years permitted	Amortization period based on average Expected Remaining Service Life for actives and inactives combined **	Accelerated recognition of gains and losses; increased volatility in expense
Amortization Period for Asset Gains/Losses	Up to 30 years permitted	5 years	Accelerated recognition of gains and losses; increased volatility in expense
Amortization Method	Open or Closed amortization period may be used (Open is common)	Closed amortization period commencing in year following measurement date	Increased volatility in expense
Impact of Plan Amendments	Amortized over up to 30 years	Recognition on measurement date immediately following amendment	Full increase (decrease) in liability due to amendment must be expensed in fiscal year associated with next following measurement date
Components of Annual Pension Cost	If open amortization period is used, 2 components, Normal Cost and fresh-start amortization amount	Several components (Service Cost, Interest Cost, Impact of Plan Amendments, Gain/Loss Amortizations, Expected Return on Assets)	Components similar to FASB 87
Balance Sheet Liability	Cumulative difference, if any, between actual contributions and Annual Pension Cost shown as Net Pension Obligation (NPO)	Actual funded status on market value basis	Replacing NPO with actual funded status may result in large swing on balance sheet upon adoption
Discount Rate	Based on expected long-term return on plan assets	20- year municipal bond rate (AA/Aa or higher) required for discounting projected benefit payments not expected to be covered by projected plan assets	May increase liability for underfunded plans and plans where employer is not contributing full actuarially determined amounts; funding policy will impact
Scope of Applicability	Defines both a target funding amount (ARC) and accounting expense (Annual Pension Cost)	Changes only affect financial accounting, not funding	Funding policy may be based on different methods/assumptions; replacing NPO with funded status may promote separate funding policies

* Effective for fiscal years beginning after 6/15/2014; restatement for prior periods not required unless information for prior years on new basis is available

** Includes impact on liability of any changes in actuarial assumptions



Appendix

- About This Material

About This Material

This material includes a summary of calculations and consulting related to the finances of Michigan State Employees' Retirement System (MSERS). The following variables have been addressed:

- Contributions
- Economic Cost
- Funded Ratio
- Hurdle Rate
- Net Outflow

This analysis is intended to assist the Investment Committee with a review of the associated issues and options, and its use may not be appropriate for other purposes. This analysis has been prepared solely for the benefit of the Investment Committee. Any further dissemination of this report is not allowed without the written consent of Aon Hewitt Investment Consulting, Inc.

Our calculations were generally based on the methodologies identified in the actuary's valuation report for MSERS. We believe the methodology used in these calculations conforms to the applicable standards identified in the report.

Experience different than anticipated could have a material impact on the ultimate costs of the benefits. In addition, changes in plan provisions or applicable laws could have a significant impact on cost. Actual experience may differ from our modeling assumptions.

Our calculations were based on data provided by the plan actuary. The actuarial assumptions and methods and plan provisions reflected in these projections are the same as those used for the 2014 fiscal year actuarial valuation for MSERS as noted in the actuarial report, except where noted in this report. Unless specifically noted, our calculations do not reflect any other changes or events after September 30, 2014.

In conducting these projections, we have relied on plan design, demographic and financial information provided by other parties, including the plan's actuary and plan sponsor. While we cannot verify the accuracy of all of the information, the supplied information was reviewed for consistency and reasonableness. As a result of this review, we have no reason to doubt the substantial accuracy or completeness of the information and believe that it has produced appropriate results.

These projections have been conducted in accordance with generally accepted actuarial principles and practices, including applicable Actuarial Standards of Practice as issued by the Actuarial Standards Board. The undersigned actuary is familiar with the near-term and long-term aspects of pension valuations and meets the Qualification Standards of the American Academy of Actuaries necessary to render the actuarial opinions contained herein. All sections of this report are considered an integral part of the actuarial opinions.

To our knowledge, no associate of Aon Hewitt Investment Consulting, Inc. providing services to MSERS has any direct financial interest or indirect material interest in MSERS. Thus, we believe there is no relationship existing that might affect our capacity to prepare and certify this report for MSERS.

Aon Hewitt Investment Consulting, Inc.

Phil Kivarkis FSA, EA, CFA

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