Postretirement Medical Risk Study Results

Michigan State Employees' Retirement System (MSERS)
November 2015

Aon Hewitt
Retirement and Investment

Empower Results®

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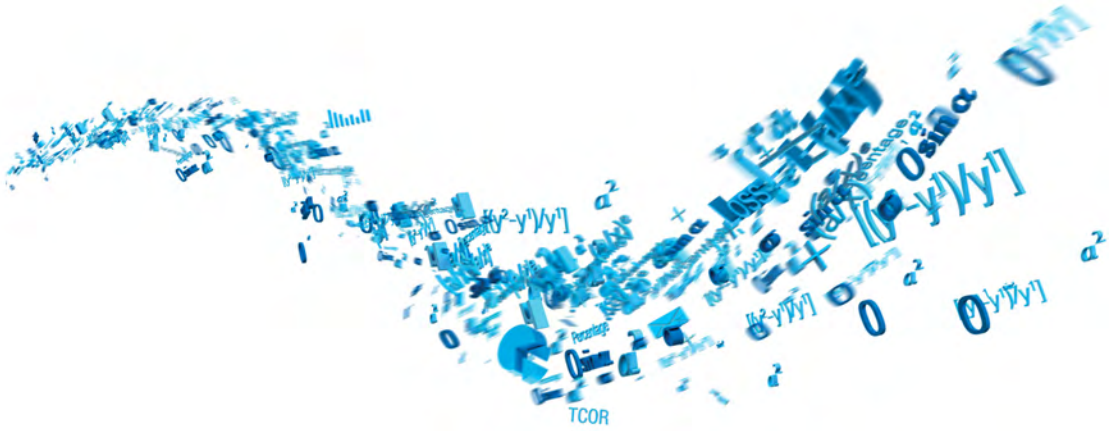


Asset-Liability Management Background

Asset-Liability Management Background

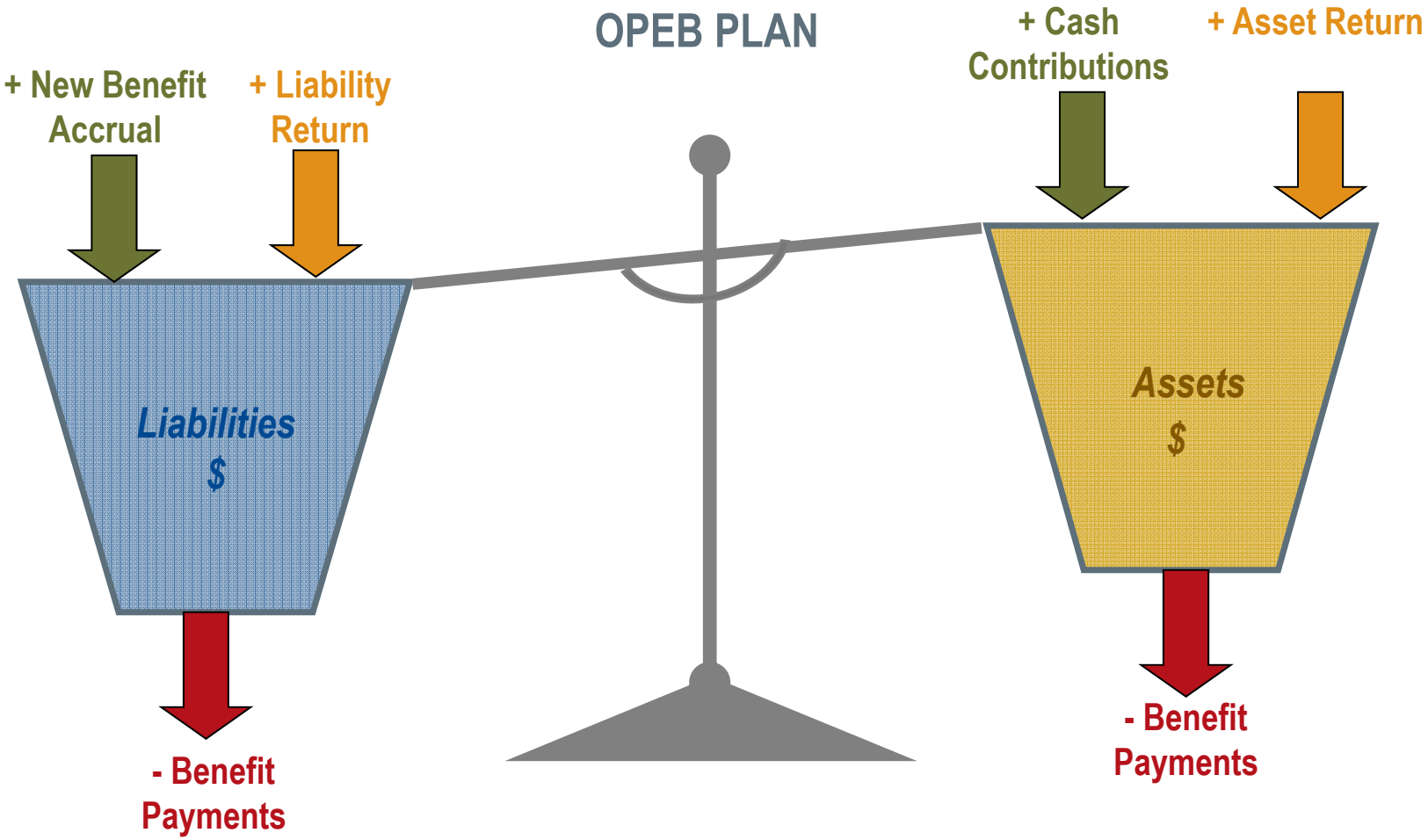
What is an Asset/Liability Study?

- 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

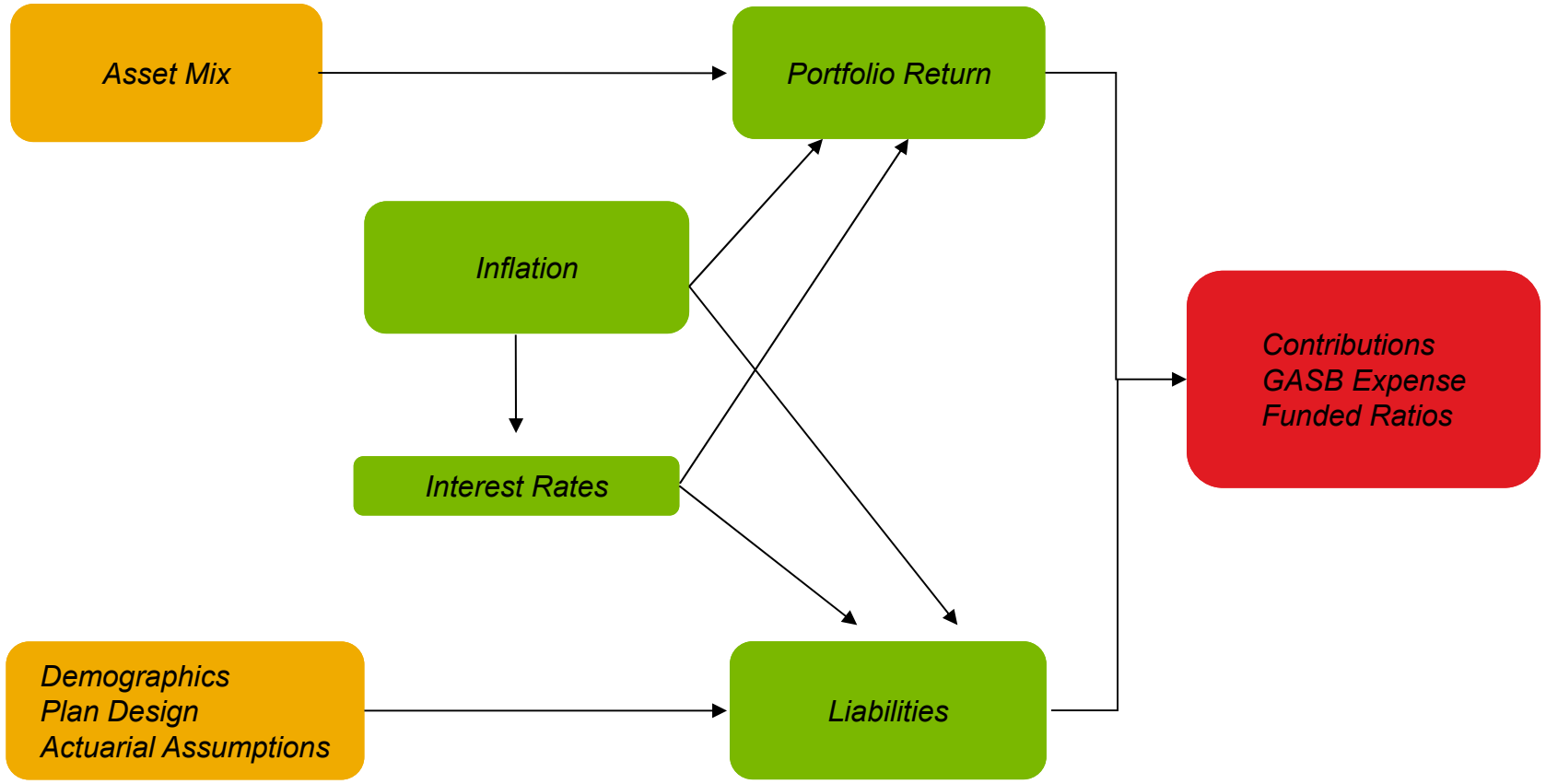
Key Risks for Public OPEB Plans

Types of Risk	Time Horizon	Risk Management Tools and Controls
Return Shortfall ▪ Assets do not grow with liabilities ▪ Investment return & contribution less than liability growth	***Long-Term*** (10+ years)	▪ Funding policy ▪ Plan design ▪ Investment policy ▪ Assumptions & methods
Liquidity ▪ Cannot liquidate assets efficiently to meet needs ▪ Lose control of asset allocation	***Short- to Medium-Term*** (<5 years)	▪ Funding policy ▪ Benefit accruals ▪ Use of Illiquid investments ▪ Scenario analysis ▪ Monitoring
Investment ▪ Asset allocation (policy) ▪ Investment structure ▪ Manager selection ▪ Rebalancing ▪ Scenario (or path risk) ▪ Factor	***Short-to Medium-Term*** (<5 years)	▪ Investment policy statement – 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

Mechanics of Asset-Liability Modeling Process

- The graphic below shows how OPEB 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 OPEB 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 OPEB 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

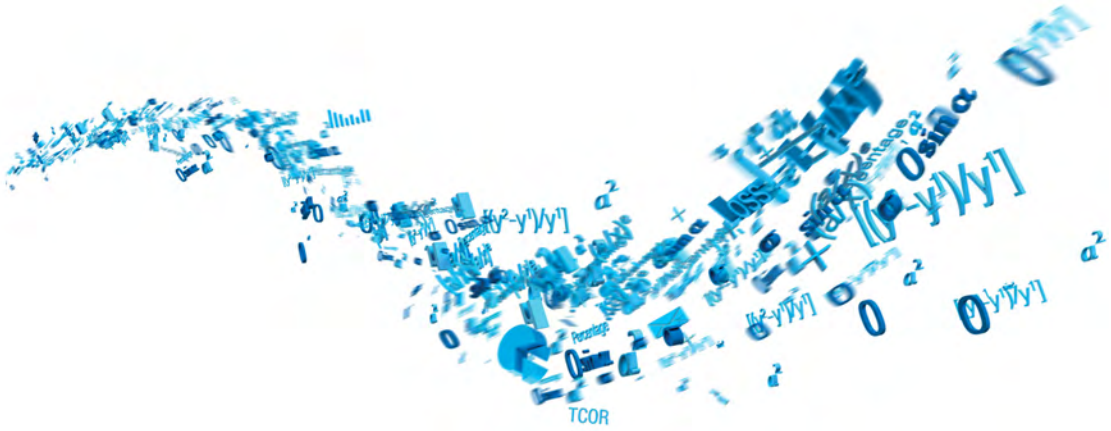
Risk and Return in an Asset Liability Context

- **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-reducing")

- 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: an OPEB plan with sensitivity to 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



Asset-Liability Management Background

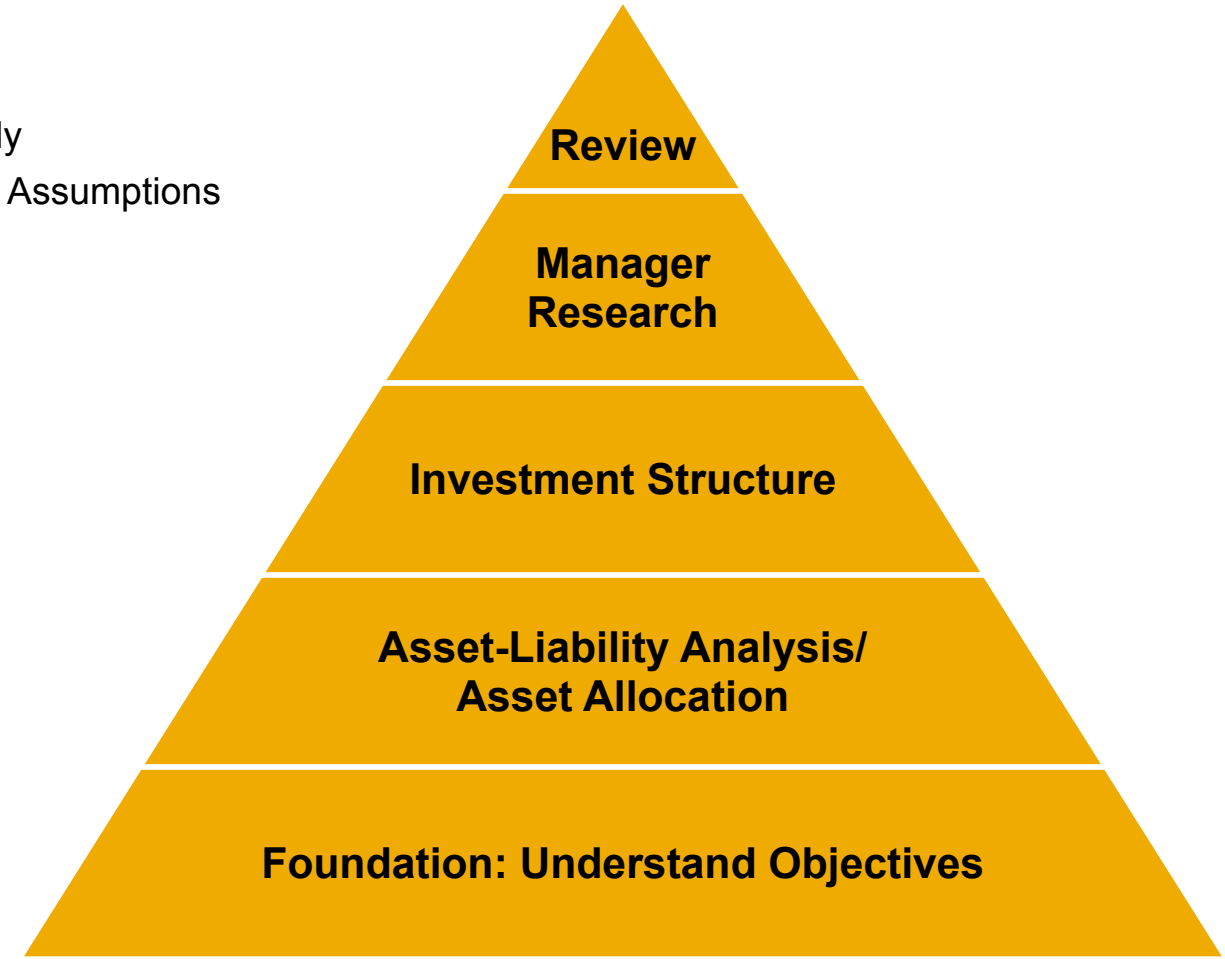
- Our Investment Philosophy

Our Investment Philosophy

Foundation of an Asset/Liability Study: Understand Objectives

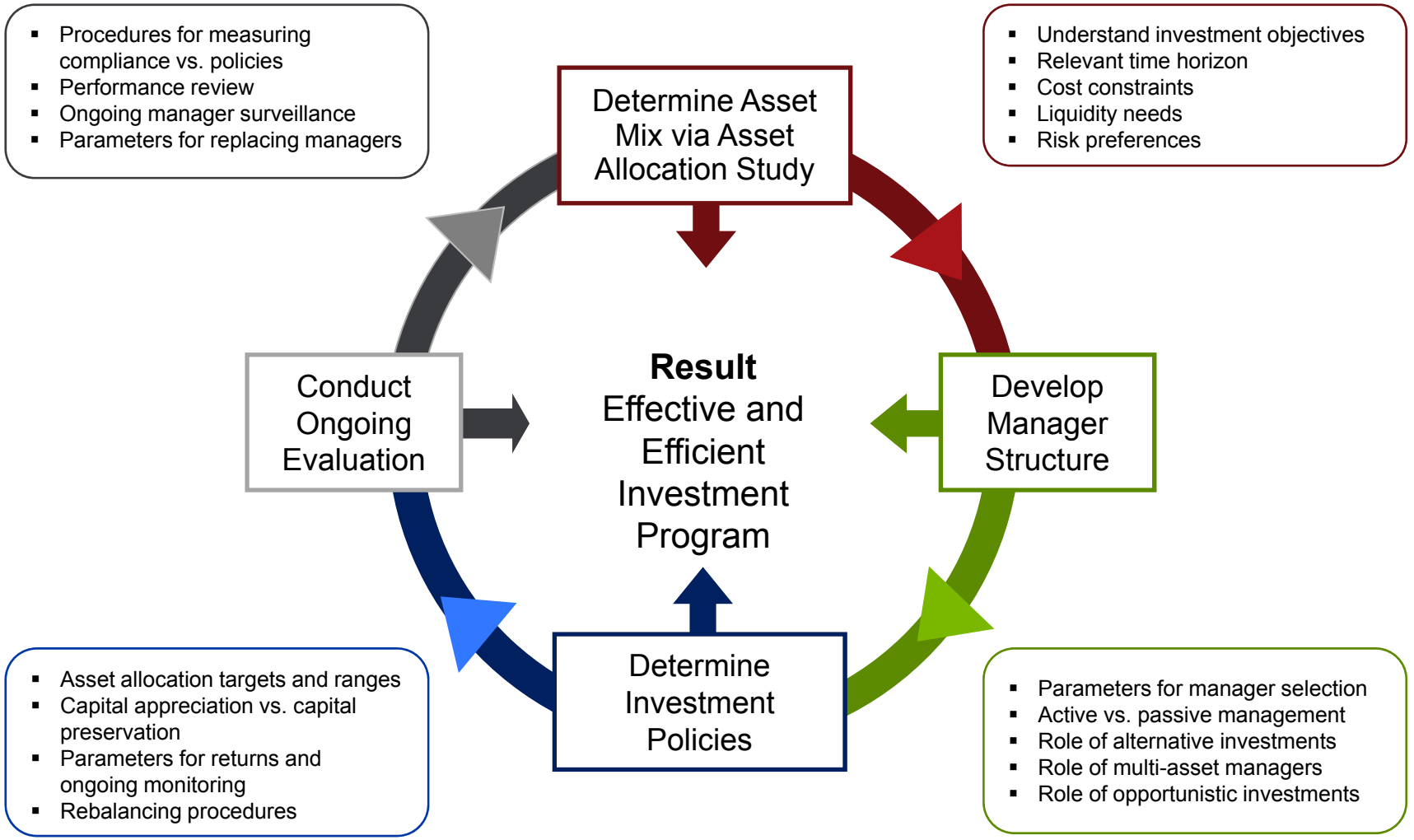
The first step: understand Plan objectives and the Board's risk tolerance

- 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

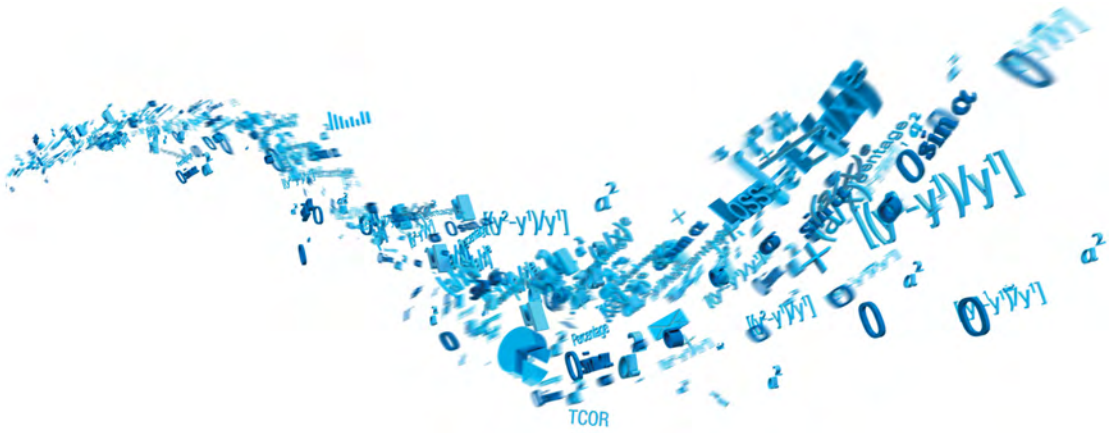


Our Investment Philosophy

Asset Allocation Toolkit

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

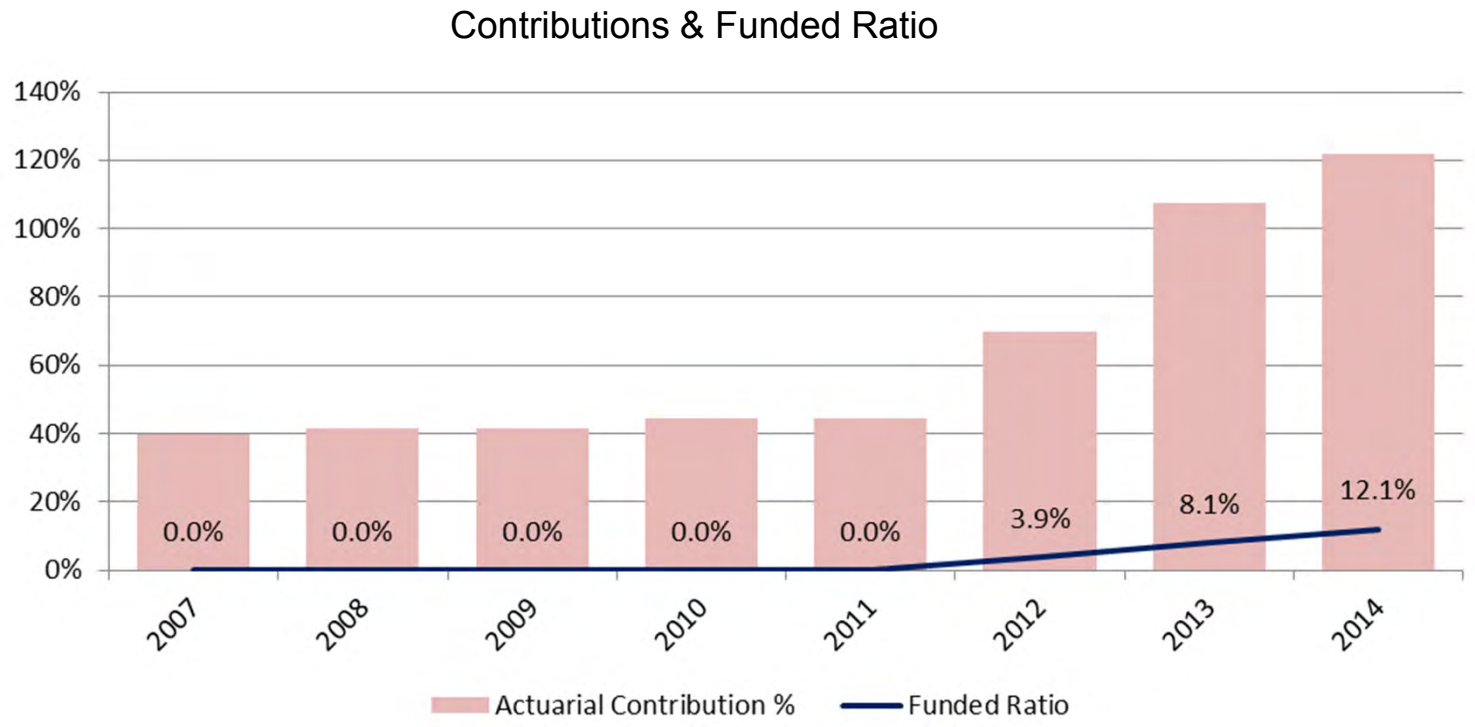
Return-Seeking				Safety
Equity Returns	Diversifying Returns	Skill		
Public Equity ▪ Globally diversified public equity ▪ Base of the Return-Seeking Portfolio	**Diversifying Assets** ▪ Credit – High Yield – EMD – Bank Loans ▪ Commodities ▪ Core Real Estate (Public & Private)	**Long-Term Assets** ▪ Non-Core Private Real Estate ▪ Private Equity ▪ Infrastructure	**Liquid Alternatives** ▪ Multi-strategy ▪ Event driven ▪ Equity long/short ▪ Trading ▪ Relative value	**Risk Reducing Assets** ▪ Portion of portfolio which withstands times of stress ▪ Use Global team to bring valuable ideas and perspectives from around the world



Asset-Liability Management Background

- Asset-Liability Profile

Asset-Liability Profile
OPEB Plan Overview



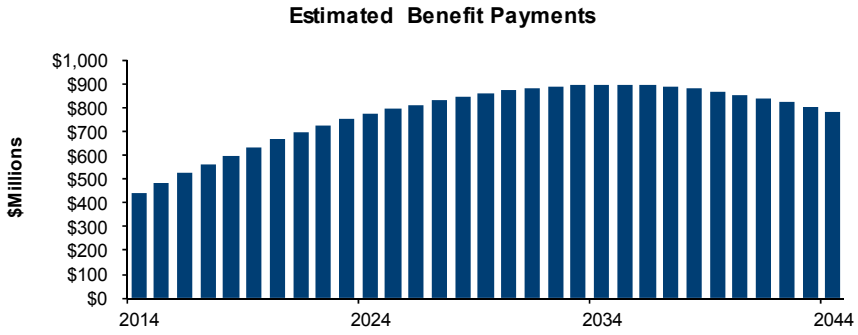
Key Takeaways:

- 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

Asset-Liability Profile
As of September 30, 2014

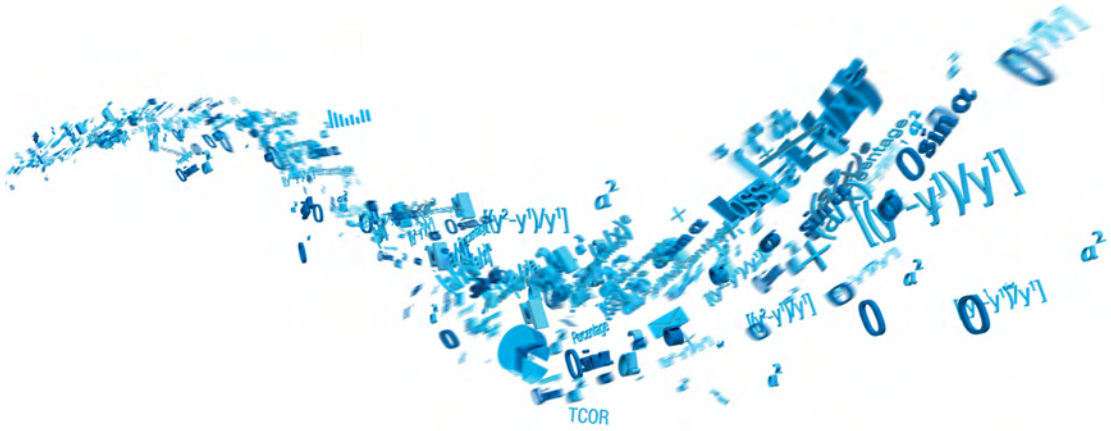
Asset-Liability Snapshot as of 9/30/2014			
Metric ($, Millions)	**Value**	**Fund %: (MVA)**	**(AVA)**
Market Value of Assets	$1,058		
Actuarial Value of Assets	$1,058		
Liability Metrics			
Actuarial Liability (AL) - Entry Age Normal	$8,749 [1]	12%	12%

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%

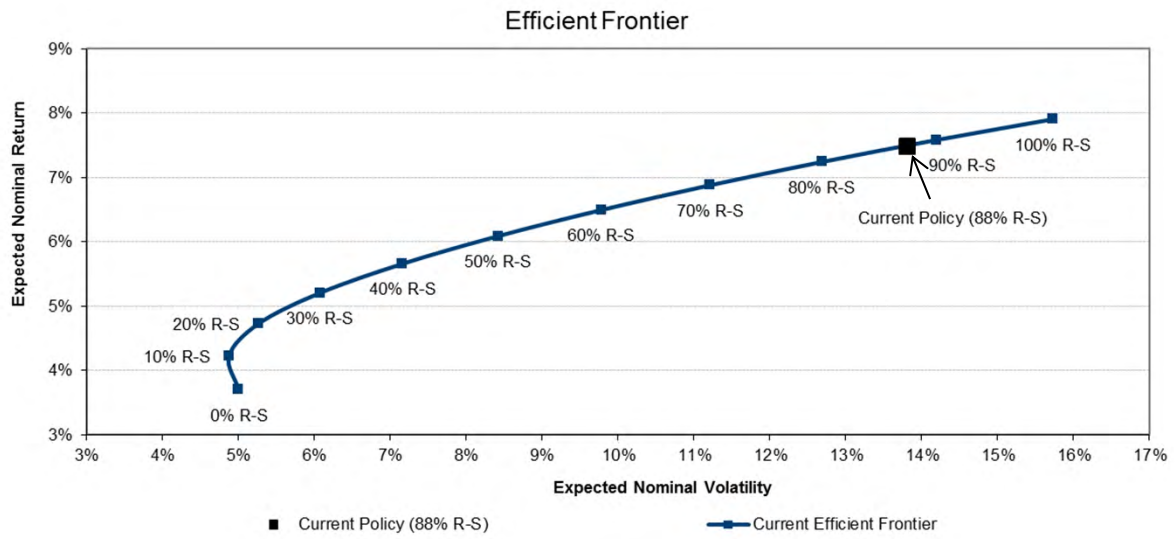
[1] Based on plan's valuation interest rate of 8.00% from the FYE 2014 actuarial valuation report (Accounting)



Asset-Liability Analysis

- Investment Analysis

Investment Analysis
Risk/Reward Analysis



Key Takeaways:

- Current portfolio is well-diversified
- Current frontier reflects current portfolio exposures adjusted ratably up and down

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

				Equity Returns		Diversifying Returns		Skill			Safety	
	Expected Nominal Return	Expected Nominal Volatility	Sharpe Ratio	U.S. Equity	Non-U.S. Equity	Commod	Real Estate	Hedge Funds	Private Equity	Infra-structure	Cash & Short Duration Bonds	Core Bonds
Current Policy (88% R-S)	7.5%	13.8%	0.3392	28%	16%	3%	9%	9%	21%	2%	2%	11%
Current Efficient Frontier												
0% Return-Seeking	3.7%	5.0%	0.1801	0%	0%	0%	0%	0%	0%	0%	0%	100%
10% Return-Seeking	4.2%	4.9%	0.2929	3%	2%	0%	1%	1%	2%	0%	0%	90%
20% Return-Seeking	4.7%	5.3%	0.3666	6%	4%	1%	2%	2%	5%	0%	0%	80%
30% Return-Seeking	5.2%	6.1%	0.3963	10%	5%	1%	3%	3%	7%	1%	0%	70%
40% Return-Seeking	5.7%	7.2%	0.3995	13%	7%	1%	4%	4%	10%	1%	0%	60%
50% Return-Seeking	6.1%	8.4%	0.3908	16%	9%	2%	5%	5%	12%	1%	0%	50%
60% Return-Seeking	6.5%	9.8%	0.3780	19%	11%	2%	6%	6%	15%	1%	0%	40%
70% Return-Seeking	6.9%	11.2%	0.3640	22%	13%	3%	7%	7%	17%	1%	0%	30%
80% Return-Seeking	7.2%	12.7%	0.3503	26%	15%	3%	8%	8%	19%	1%	0%	20%
90% Return-Seeking	7.6%	14.2%	0.3372	29%	16%	3%	9%	9%	22%	2%	0%	10%
100% Return-Seeking	7.9%	15.7%	0.3248	32%	18%	4%	10%	10%	24%	2%	0%	0%

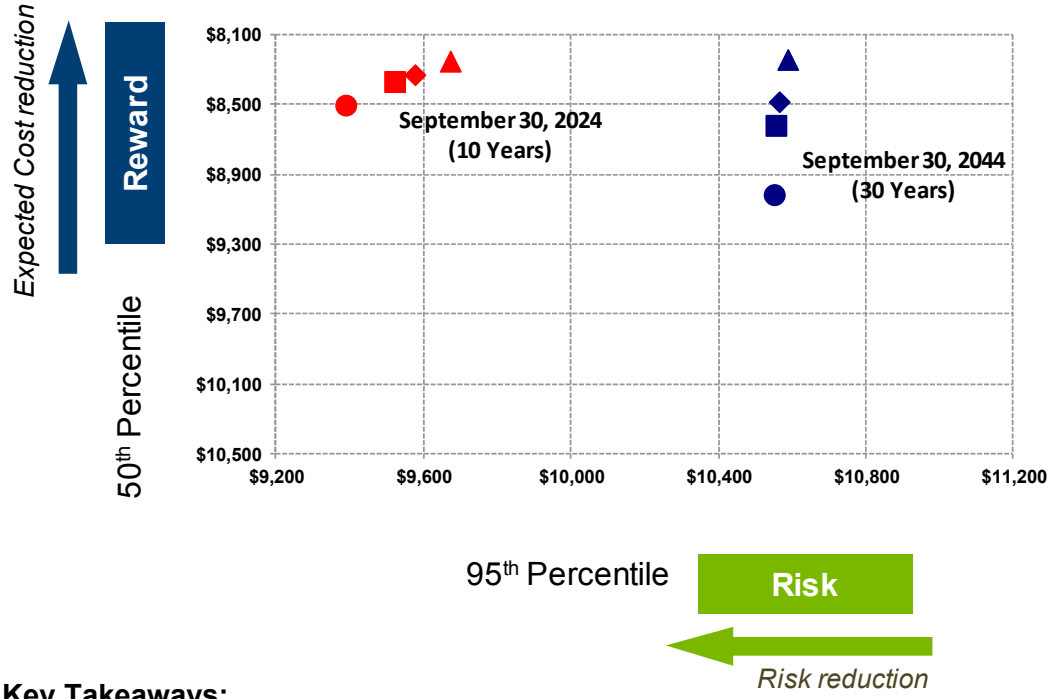
Asset-Liability Analysis

- Projection Analysis

Projection Analysis
Economic Cost Analysis

Economic Cost

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



Strategy ($Millions)	Economic Cost September 30, 2024 Cost	Risk
60% Return-Seeking	$8,506.3	$9,390.9
80% Return-Seeking	$8,378.5	$9,522.6
Current Policy (88% R-S)	$8,335.0	$9,576.7
100% Return-Seeking	$8,257.1	$9,673.1

Strategy ($Millions)	September 30, 2044 Cost	Risk
60% Return-Seeking	$9,019.3	$10,551.7
80% Return-Seeking	$8,626.7	$10,557.4
Current Policy (88% R-S)	$8,491.6	$10,567.5
100% Return-Seeking	$8,245.7	$10,588.1

Key Takeaways:

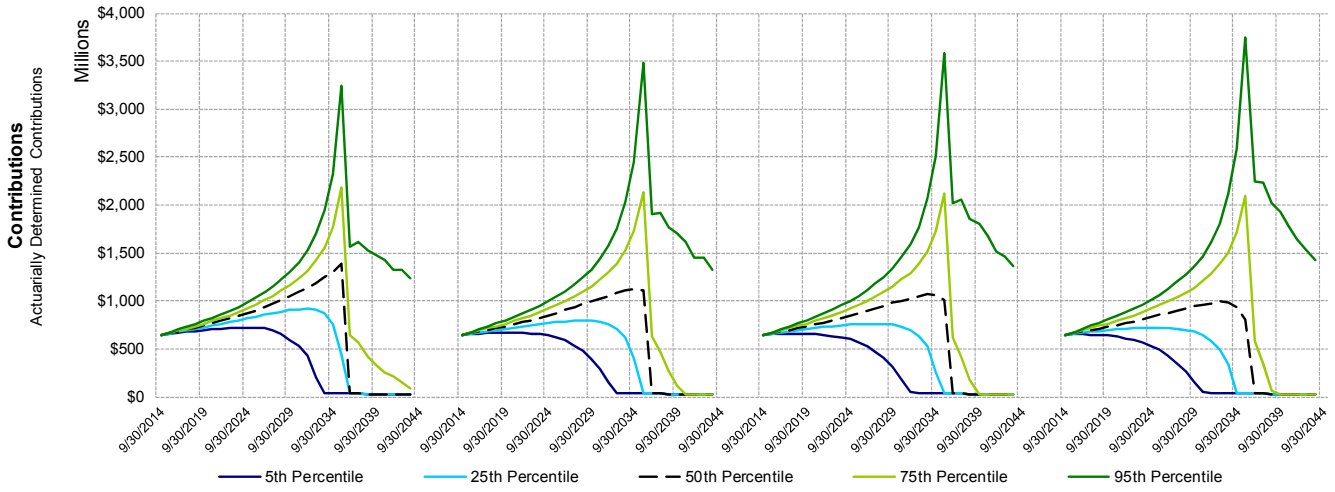
- An optimized portfolio may have desirable risk/reward characteristics relative to the current policy
- The magnitude of the risk/reward trade-off changes over a longer-term projection

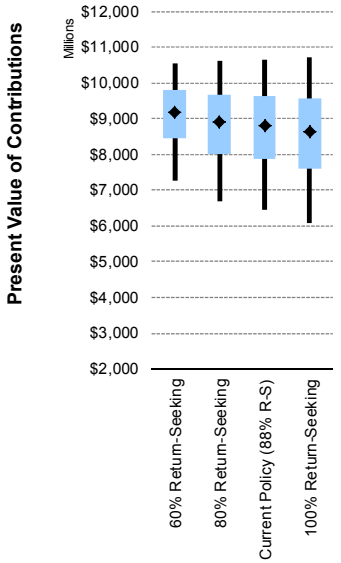
Excludes 50% of surplus in excess of 120% of Actuarial liability, and includes twice the shortfall below 30% of Actuarial liability, on a market value basis

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

Projection Analysis

Gross Contributions (Employer + Employee Portions)



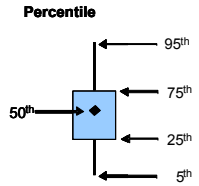


Strategy	60% Return-Seeking			80% Return-Seeking			Current Policy (88% R-S)			100% Return-Seeking		
Year	9/30/2023	9/30/2033	9/30/2043	9/30/2023	9/30/2033	9/30/2043	9/30/2023	9/30/2033	9/30/2043	9/30/2023	9/30/2033	9/30/2043
5th Percentile	$722	$40	$24	$650	$39	$24	$621	$39	$24	$568	$39	$24
25th Percentile	$797	$865	$24	$761	$624	$24	$746	$524	$24	$722	$342	$24
50th Percentile	$842	$1,247	$24	$825	$1,115	$24	$819	$1,069	$24	$809	$988	$24
75th Percentile	$883	$1,557	$94	$881	$1,527	$24	$881	$1,519	$24	$880	$1,505	$24
95th Percentile	$936	$1,942	$1,232	$949	$2,025	$1,328	$954	$2,065	$1,357	$962	$2,115	$1,422

Key Takeaways:

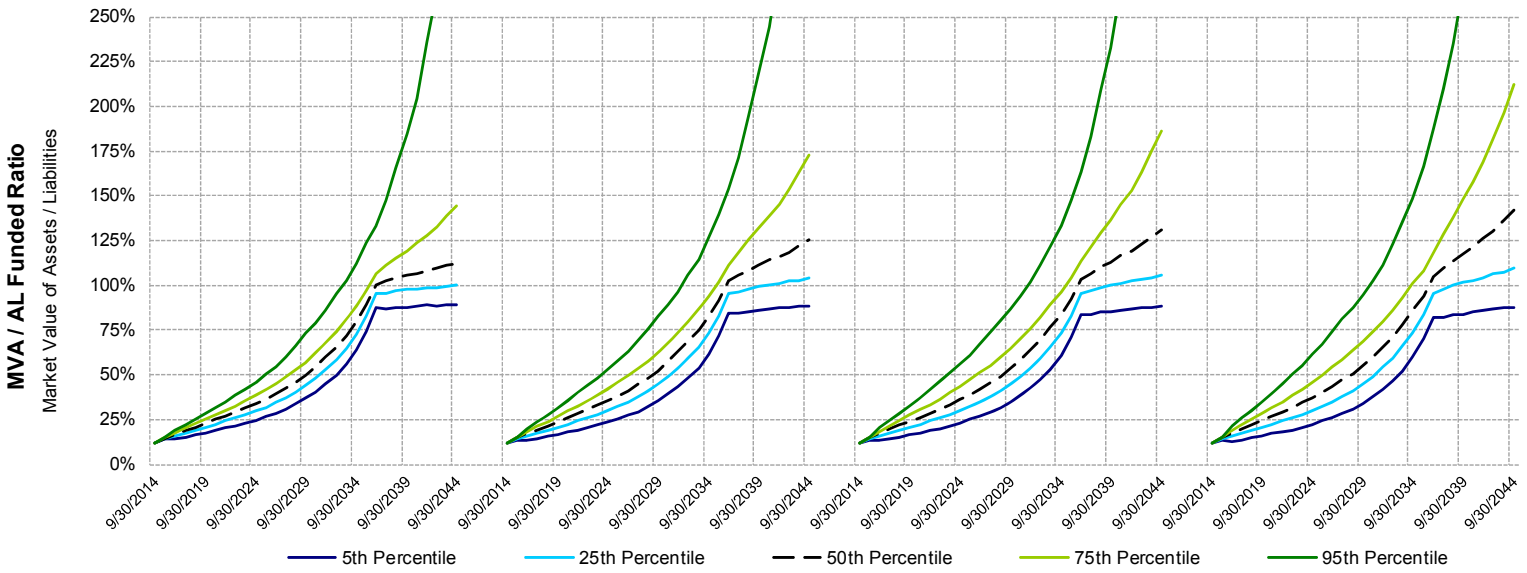
- Contribution volatility will increase as the closed amortization period declines to immediate recognition
- Higher return-seeking allocations will reduce the expected contribution but lead to increased volatility

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



Projection Analysis

Market Value of Assets / Actuarial Liability Funded Ratio



Strategy	60% Return-Seeking			80% Return-Seeking			Current Policy (88% R-S)			100% Return-Seeking		
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	25%	64%	89%	24%	62%	88%	23%	61%	88%	22%	60%	88%
25th Percentile	30%	73%	100%	30%	73%	104%	30%	73%	106%	30%	74%	109%
50th Percentile	34%	80%	**112%**	35%	83%	**125%**	36%	84%	**131%**	37%	86%	**142%**
75th Percentile	38%	89%	144%	42%	94%	172%	43%	97%	186%	46%	101%	212%
95th Percentile	46%	112%	341%	53%	127%	431%	56%	133%	468%	61%	148%	553%
Probability > 100%	**<5%**	**15%**	**75%**	**<5%**	**21%**	**80%**	**<5%**	**23%**	**82%**	**<5%**	**26%**	**84%**

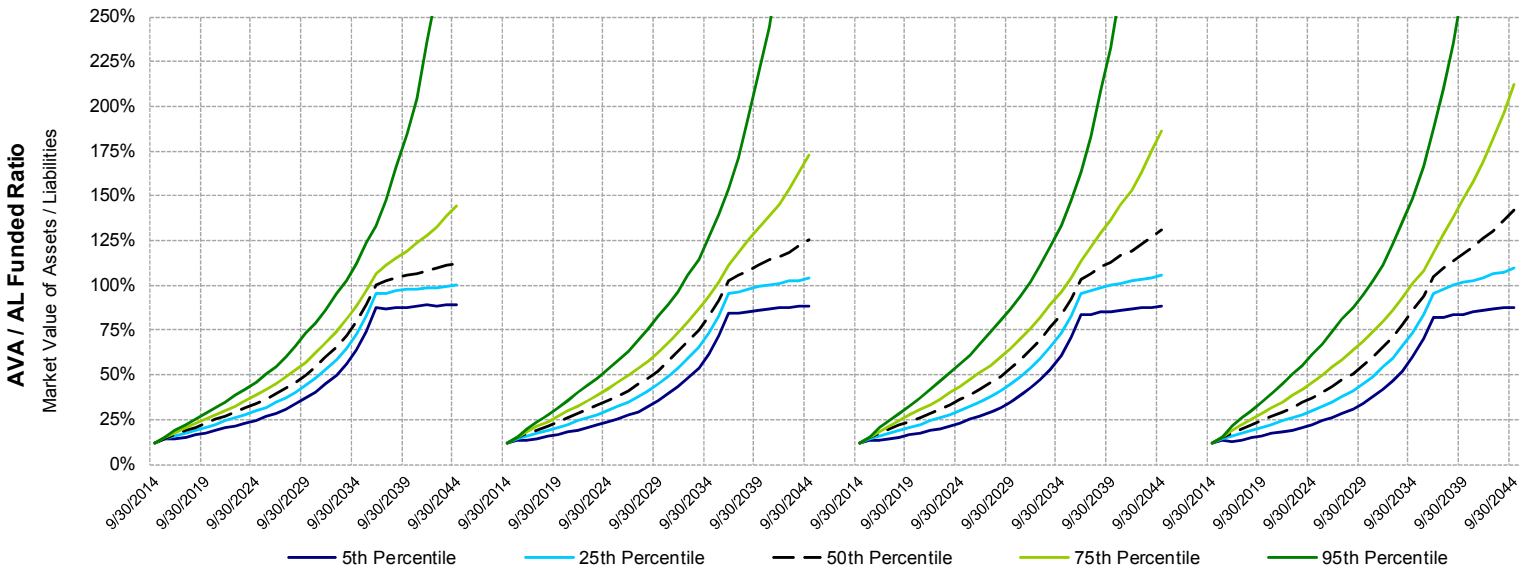
Key Takeaway:

- 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 OPEB liabilities for all investment policies studied

Projection Analysis

Actuarial Value of Assets / Actuarial Liability Funded Ratio



Strategy	60% Return-Seeking			80% Return-Seeking			Current Policy (88% R-S)			100% Return-Seeking		
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	25%	64%	89%	24%	62%	88%	23%	61%	88%	22%	60%	88%
25th Percentile	30%	73%	100%	30%	73%	104%	30%	73%	106%	30%	74%	109%
50th Percentile	34%	80%	**112%**	35%	83%	**125%**	36%	84%	**131%**	37%	86%	**142%**
75th Percentile	38%	89%	144%	42%	94%	172%	43%	97%	186%	46%	101%	212%
95th Percentile	46%	112%	341%	53%	127%	431%	56%	133%	468%	61%	148%	553%
Probability > 100%	**<5%**	**15%**	**75%**	**<5%**	**21%**	**80%**	**<5%**	**23%**	**82%**	**<5%**	**26%**	**84%**

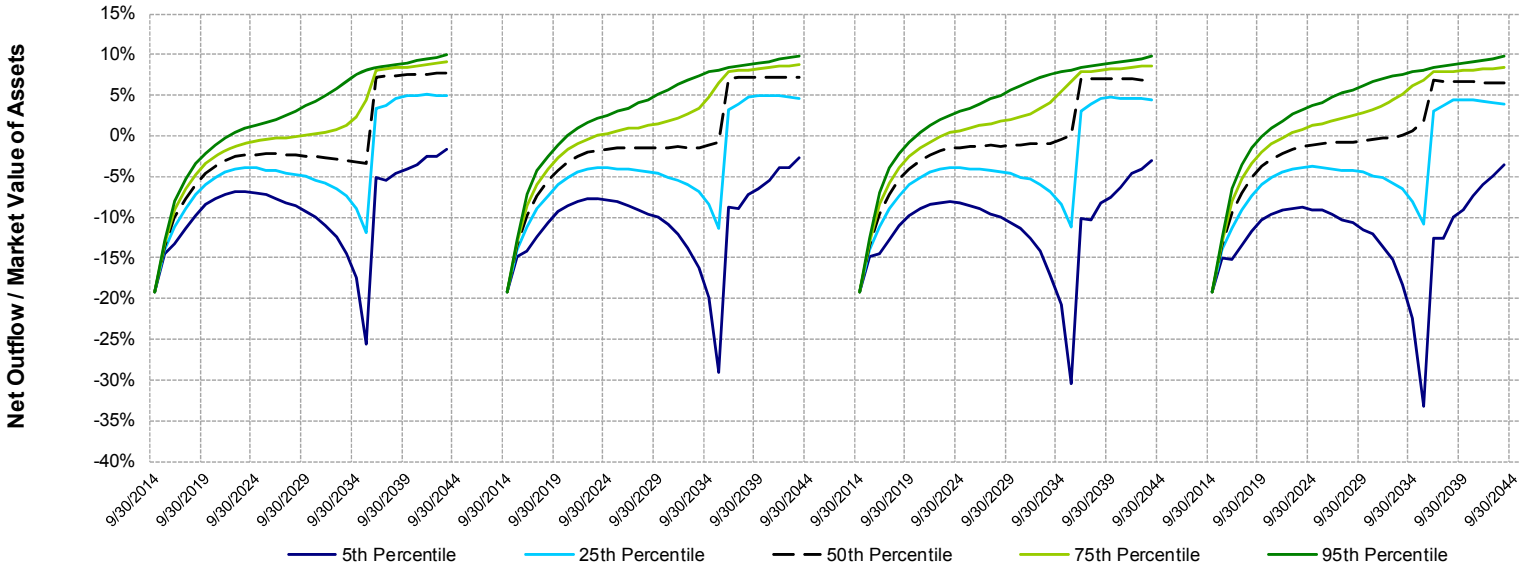
Key Takeaway:

- Actuarial value of assets is set to be the Market Value without any smoothing; therefore, graphs mirror the Market Value of Asset results from the prior slide

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

Projection Analysis

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



Strategy	60% Return-Seeking			80% Return-Seeking			Current Policy (88% R-S)			100% Return-Seeking		
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	-7%	-14%	-2%	-8%	-16%	-3%	-8%	-17%	-3%	-9%	-18%	-4%
25th Percentile	-4%	-7%	5%	-4%	-7%	5%	-4%	-7%	4%	-4%	-7%	4%
50th Percentile	-2%	-3%	**8%**	-2%	-1%	**7%**	-2%	-1%	**7%**	-1%	0%	**6%**
75th Percentile	-1%	1%	9%	0%	3%	9%	0%	4%	9%	1%	5%	8%
95th Percentile	1%	7%	10%	2%	7%	10%	3%	7%	10%	3%	8%	10%

Key Takeaway:

- Net inflow will reduce as the current amortization period expires transitioning to a net outflow at that time

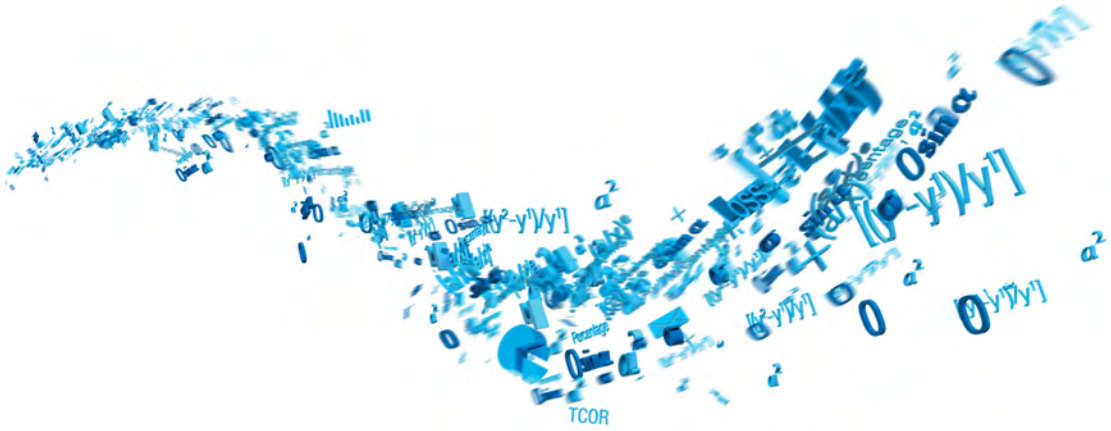
* Projections assume constant 8.0% discount rate for OPEB liabilities for all investment policies studied

Projection Analysis
Summary and Conclusions

All Scenarios	30-year Economic Cost		30-year Present Value of Contributions		30-year Ending Funded Ratio (MVA / AL)	
$ millions	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



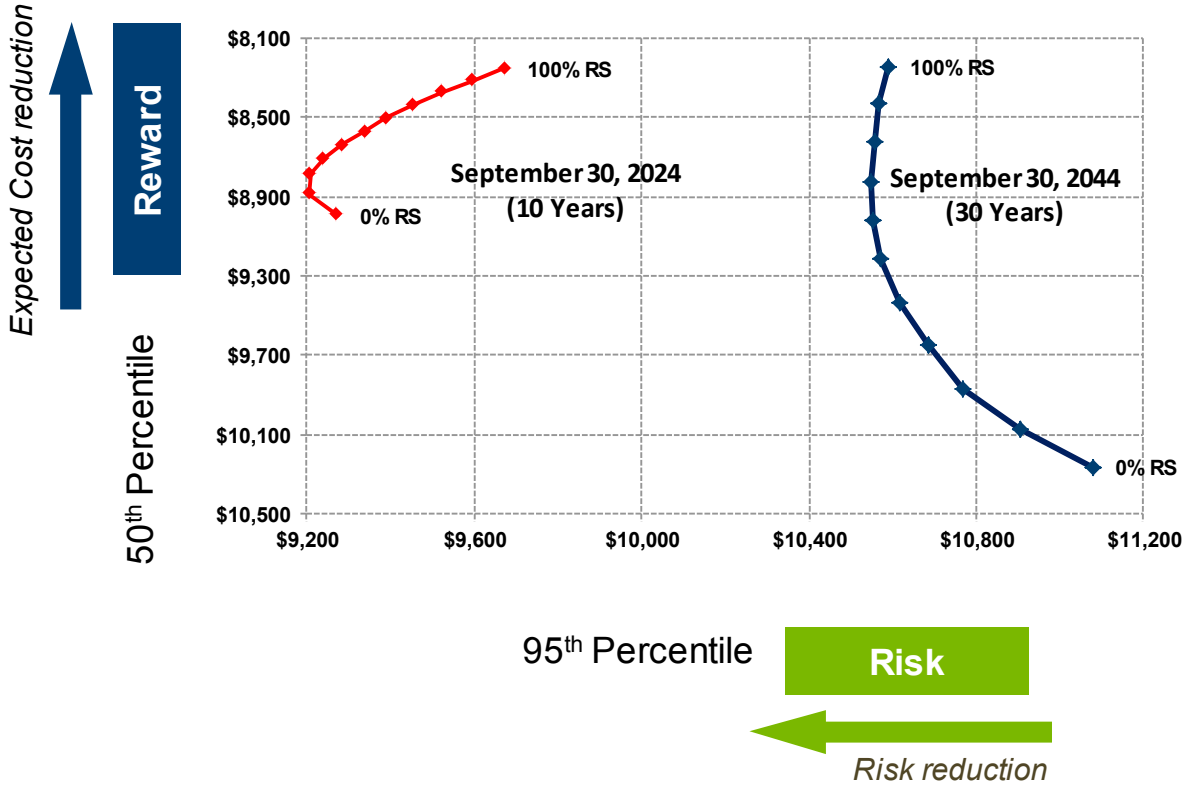
Appendix

- Additional Analysis

Additional Analysis
Economic Cost Analysis

Economic Cost

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



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

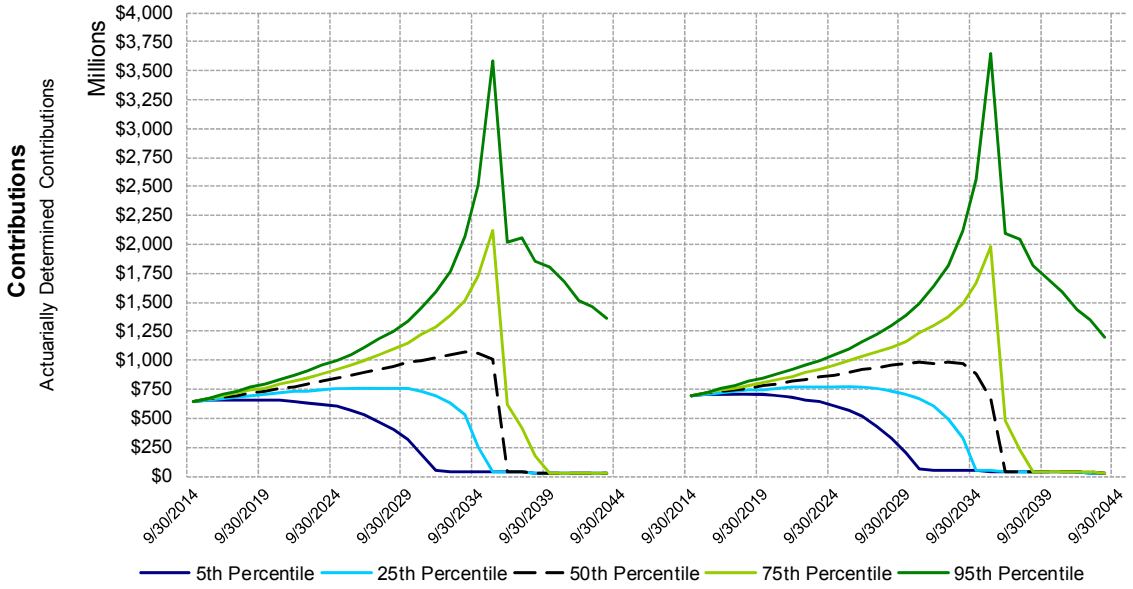
Key Takeaway:

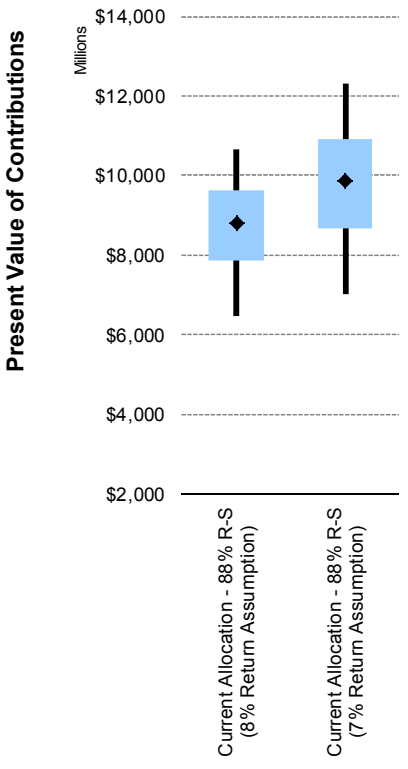
- The magnitude of the risk/reward trade-off changes over a longer-term projection

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

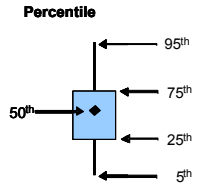
Additional Analysis

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



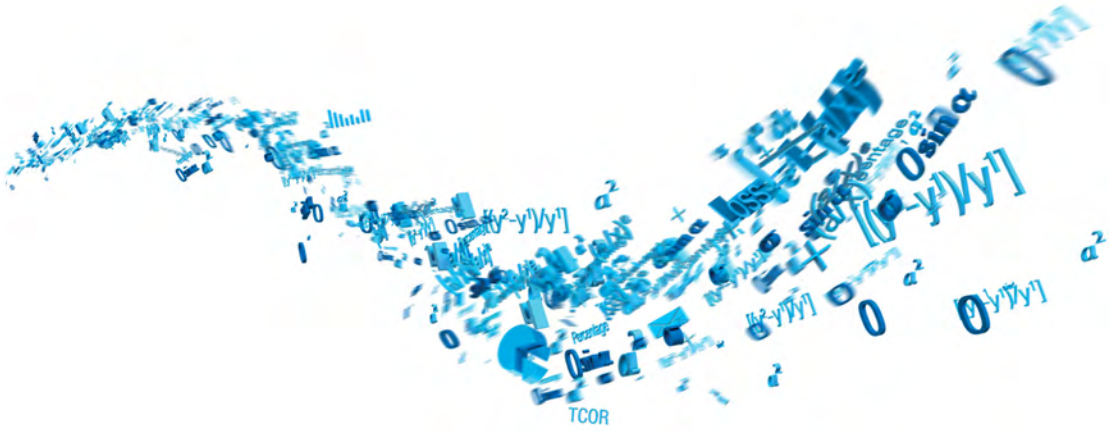


Strategy	Current Allocation - 88% R-S (8% Return Assumption)			Current Allocation - 88% R-S (7% Return Assumption)		
Year	9/30/2023	9/30/2033	9/30/2043	9/30/2023	9/30/2033	9/30/2043
5th Percentile	$621	$39	$24	$641	$49	$30
25th Percentile	$746	$524	$24	$775	$328	$30
50th Percentile	$819	$1,069	$24	$855	$966	$30
75th Percentile	$881	$1,519	$24	$921	$1,485	$30
95th Percentile	$954	$2,065	$1,357	$1,001	$2,115	$1,203



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
  - 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

- 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 (Gov't)	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 Gov't 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 Gov't 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 – Gov't / Credit	2.1%	4.2%	11.5%
15	Long Duration Bonds – Credit	2.5%	4.7%	13.5%
16	Long Duration Bonds – Gov't	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	0.17	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	0.00	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	0.18	0.17	0.17	0.16	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[3]	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)

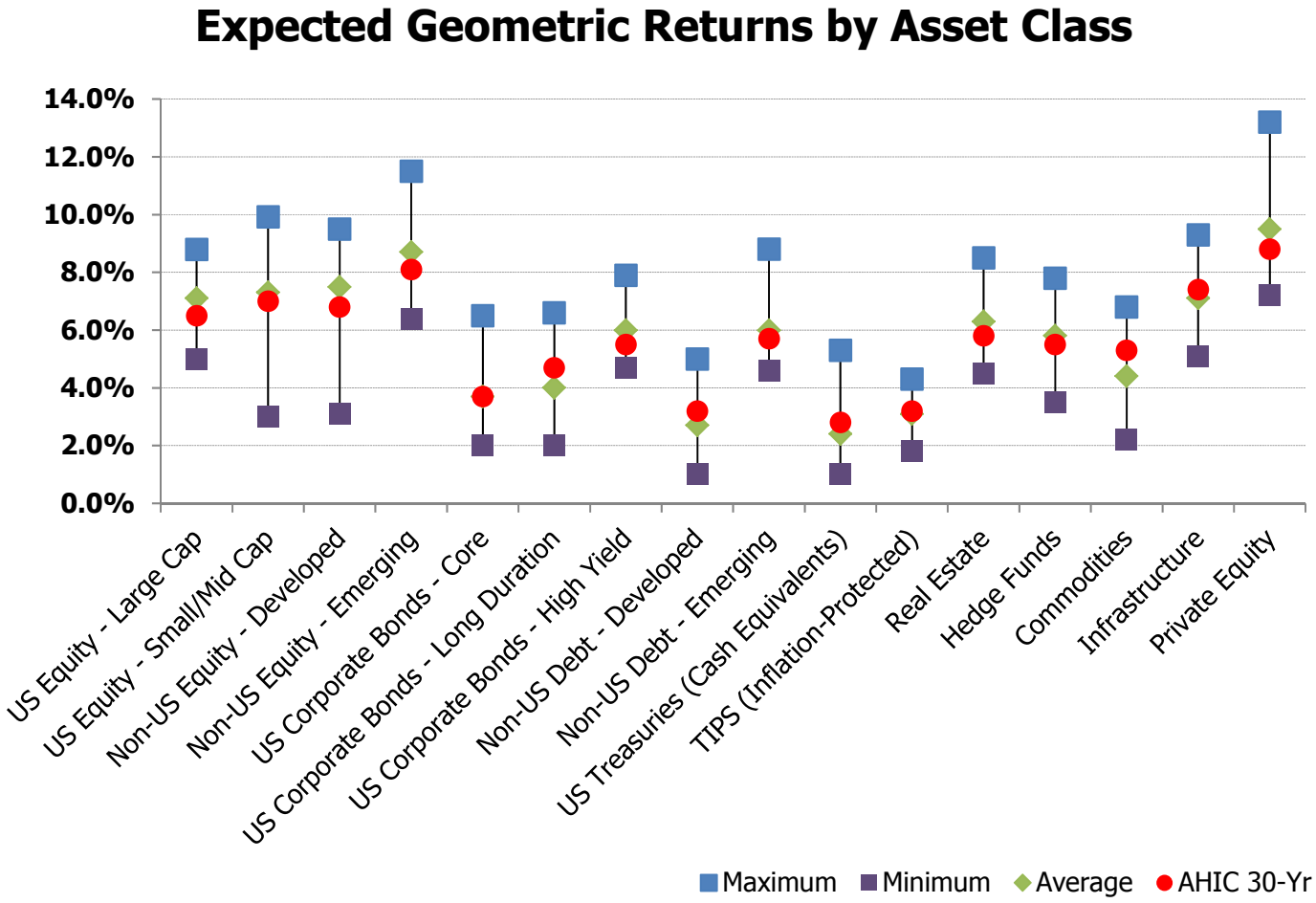
Volatility / Correlation Assumptions

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…



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)

	Horizon Survey				AHIC			
	Expected Geometric Returns			Expected Risk	10 Year Forecasts		30 Year Forecasts	
Asset Class	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

- 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 postretirement medical 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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