



# Asset-Liability Study Overview

Michigan Public School  
Employees' Retirement  
System (MPERS) – Pension

September 2022

To protect the confidential and proprietary information included in this material, it may not be disclosed or provided to any third parties without the approval of Aon.





# Table of Contents

- 1 Executive Summary
- 2 Analysis
  - Current State Asset-Liability Profile
  - Portfolio Analysis
  - Asset-Liability Projection Analysis
  - Aggregate Net Cash Flow Analysis
- 3 Summary and Conclusions
- 4 Appendix



1

Executive Summary





# Asset-Liability Management Overview

## What?

- A comprehensive toolkit for making decisions on a **fund's asset allocation and investment risk that align with the liabilities** those funds support

## Why?

- Aon believes optimal decisions regarding pension plan management are made when they are based on a **clear understanding of the assets and liabilities** and how they interact

## When?

- Aon suggests conducting asset-liability studies every **3 to 5 years** depending on client specifics, or more frequently should circumstances dictate

## How?

- **Identify future trends** in the financial health of the fund based on economic uncertainties that may not be evident from an actuarial valuation

# Asset-Liability Study

## Key Topics

**Mix of Return-Seeking vs. Risk-Reducing Assets**

**Liquidity**

**Funding Interaction**

# Asset-Liability Study

## Summary and Conclusions

### Mix of Return-Seeking vs. Risk-Reducing Assets

- Plan is currently underfunded, expected to become fully funded by 2031
- Current portfolio is well-constructed with a high likelihood of meeting/exceeding the actuarial assumed rate of return
- Consider lower risk portfolios given funded status trajectory

### Liquidity

- Net outflow is projected to increase over the next few decades
- Consider a slight increase to liquid assets

### Funding Interaction

- Funding policy and expected returns provide buffers that mitigate contribution volatility

# Asset-Liability Study

## Key Observations

### Current State Overview

- The MPSERS pension plan is currently underfunded and the gap will be filled by a combination of 1) plan contributions and 2) investment returns
- Both the pension and OPEB plan are assumed to increasingly become more cash flow negative with each passing decade

### Portfolio Analysis

- The current return-seeking asset portfolio is well-diversified
- Returns (**8.16%**<sup>1</sup>) are expected to outpace with the actuarial assumed rate of return (6.00%)
- Over a 30-year timeframe, MPSERS would be assumed to surpass its return hurdle ~81% of the time

### Asset-Liability Analysis

- The funded ratio is expected to increase over time, attain full funding (by FYE 2031), and become overfunded thereafter
- Advancing contributions and creating buffers, insulating negative events, are reasons why short-term volatility may appear less risky in the lead-up to full funding

<sup>1</sup> Expected returns based on Aon Investments Q3 2022 30-year Capital Market Assumptions assuming the detailed portfolios found in the Appendix. All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees. Expected returns presented are models and do not represent the returns of an actual client account. Not a guarantee of future results. See Appendix for the Capital Market Assumptions.

# Asset-Liability Study

## Contribution Policy Impacts the Projected Financials

Michigan's contribution policy is unique and has these three (3) key characteristics:

### Floor Provision

- The floor provisions serve to advance funding in good scenarios, building a buffer to be used to offset future increases
  - In good times, the contributions will not decrease until full funding
  - In bad times, the contributions will increase and re-set the floor for future years

### Closed Amortization

- The closed amortization policy forces full funding by a specific date
  - By itself, volatility will increase in the future as that period moves to immediate recognition
  - Along the way, volatility is subdued based on a buffer that has accumulated under each specific path

### Banking Excess Returns

- Excess returns greater than the actuarial rate will build a buffer which can be used to offset future contribution increases



# Investment Strategies Studied

## Alternative Policy Is More Liquid Than Current Policy

Asset Class	Current Policy (87.5% R-S)	Alternative Policy (85% R-S)	Difference	Current Rebalancing Ranges	Alternative Rebalancing Ranges
<b>Equity</b>					
- U.S. Equity	25.0%	25.0%	--	17% - 32%	17% - 32%
- International Equity	15.0%	15.0%	--	12% - 22%	12% - 22%
- Private Equity	16.0%	16.0%	--	13% - 25%	13% - 27%
- Subtotal	56.0%	56.0%	--		
<b>Absolute Return / Liquid Alternatives</b>					
- Subtotal	9.0%	9.0%	--	5% - 11%	5% - 11%
<b>Real Return / Opportunistic</b>					
- Subtotal	12.5%	10.0%	(2.5%)	8% - 18%	8% - 18%
<b>Real Estate &amp; Infrastructure</b>					
- Subtotal	10.0%	10.0%	--	8% - 18%	8% - 18%
<b>Risk-Reducing</b>					
- Short-Term Fixed Income (Cash)	2.0%	2.0%	--	1% - 8%	1% - 8%
- Long-Term Fixed Income (Core Fixed Income)	10.5%	13.0%	+2.5%	8% - 18%	8% - 18%
- Subtotal	12.5%	15.0%	--		
<b>Expected Return<sup>1</sup></b>	<b>8.16%</b>	<b>8.04%</b>	<b>(0.12%)</b>		
Expected Risk <sup>1</sup>	13.84%	13.50%	(0.34%)		
Sharpe Ratio	0.38	0.38	--		
<b>Probability of Meeting/Exceeding 6.00%</b>	<b>81%</b>	<b>80%</b>	<b>(1.0%)</b>		
<b>1-Year Downside Return (2 Standard Deviations)</b>	<b>-18.6%</b>	<b>-18.1%</b>	<b>+0.5%</b>		
<b>Illiquid Assets</b>	<b>47.1%</b>	<b>44.6%</b>	<b>(2.5%)</b>		

### Key Takeaways:

- Modest reduction in forecasted return; more meaningful reduction in forecasted volatility
  - Similar Sharpe Ratio
  - Better one-year downside return
- Over a 30-year timeframe, the alternative policy would be assumed to surpass its return hurdle 80% of the time
- Increase in plan liquidity in response to forecasted cash flow needs as well as adding tactical flexibility
- Compared to peers, Michigan is at the lower end of fixed income allocations

<sup>1</sup> Expected returns based on Aon Investments Q3 2022 30-year Capital Market Assumptions assuming the detailed portfolios found in the Appendix. All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees. Expected returns presented are models and do not represent the returns of an actual client account. Not a guarantee of future results. See Appendix for the Capital Market Assumptions.



# 2

## Analysis

- Current State Asset-Liability Profile
- Portfolio Analysis
- Asset-Liability Projection Analysis
- Aggregate Net Cash Flow Analysis



# Current State Asset-Liability Profile

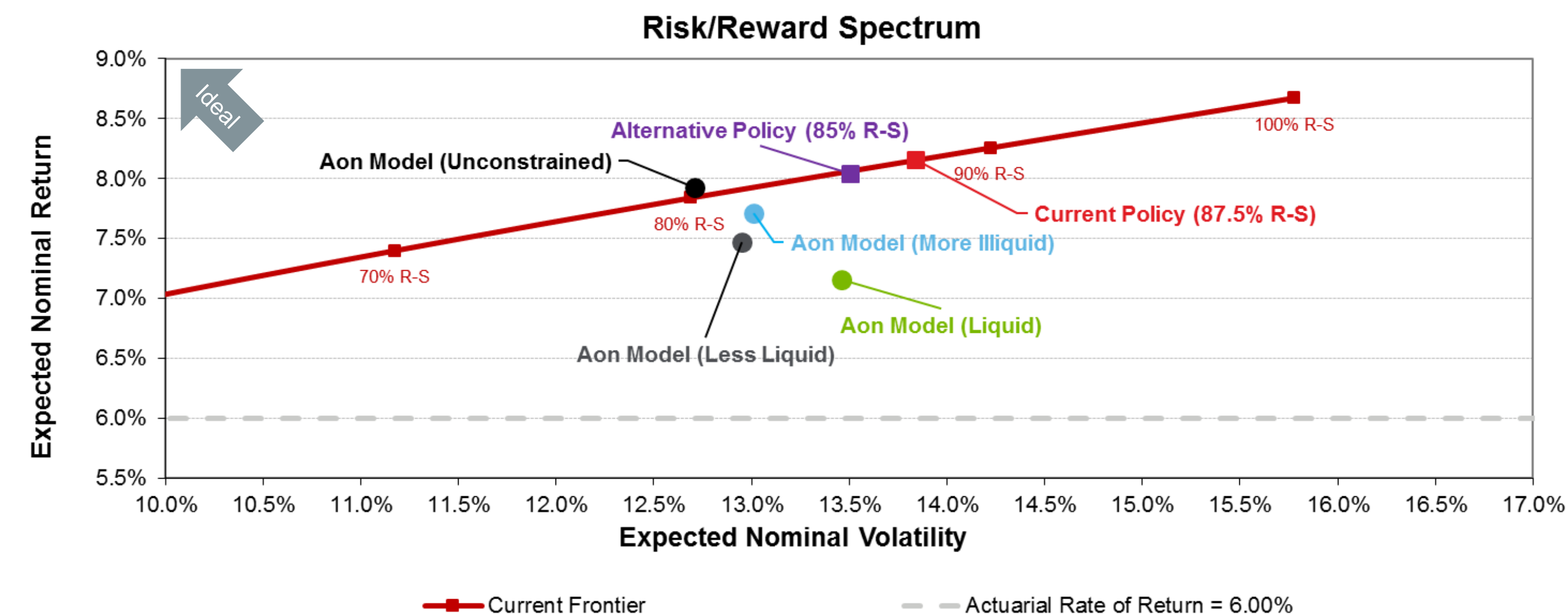
As of September 30, 2021

As of the most recent actuarial valuation reports (September 30, 2021), below is a high level comparison of the State of Michigan's pension / OPEB plans:

(In \$ millions)						
Pension	Discount Rate	Market Value of Assets	Actuarial Liability	Funded Ratio	Liability Growth Rate	Asset Hurdle Rate
-Michigan Public Schools Employees' Retirement System	6.00%	\$63,332.2	\$95,903.4	66.04%	7.12%	10.78%
-Michigan State Employees' Retirement System	6.00%	\$14,481.6	\$19,799.4	73.14%	6.19%	8.46%
-Michigan State Police Retirement System	6.15%	\$1,842.5	\$2,609.3	70.61%	7.25%	10.27%
-Michigan Judges' Retirement System	6.00%	\$299.9	\$266.4	112.61%	6.70%	5.95%
-Military Retirement Provisions	6.00%	\$67.6	\$63.9	105.86%	7.97%	7.53%
-Total Pension		\$80,023.8	\$118,642.3	67.45%	6.97%	10.33%
<b>OPEB</b>						
-Michigan Public Schools Employees' Retiree Health Benefits	6.00%	\$10,742.2	\$12,376.9	86.79%	6.61%	7.61%
-Michigan State Employees' Retiree Health Benefits	6.20%	\$5,082.3	\$8,814.6	57.66%	7.26%	12.58%
-Michigan State Police Retiree Health Benefits	6.25%	\$372.9	\$780.1	47.80%	7.46%	15.61%
-Michigan Judges' Retiree Health Benefits	6.00%	\$11.8	\$8.1	145.98%	8.99%	6.16%
-Total OPEB		\$16,209.1	\$21,979.8	73.75%	6.90%	9.35%

# Portfolio Analysis

## Risk/Reward Spectrum



### Notes:

- **Red** Square: “Current Policy” = Michigan’s current mix of Risk-Reducing assets (12.5%) and Return-Seeking assets (87.5%)
  - **Red** Line “Current Frontier” = Michigan’s Current Policy, scaled to different risk levels (Risk-Reducing assets [FI and cash] and Return-Seeking assets [all other assets] scaled up and down proportionally)
- **Purple** Square: “Alternative Policy” = Michigan’s Current Policy with a 2.5% adjustment from Real Return / Opportunistic to Long Term Fixed Income
- Circles (**Green**, **Blue**, **Gray**, **Black**) = “Aon Model Portfolios” – i.e., Aon’s starting point for Asset Allocation discussions with clients
  - “Liquid” is designed for clients with a low level of resources / low tolerance for portfolio complexity;
  - “Unconstrained” is for clients at the other end of the resource / complexity spectrum

### Key Takeaways:

- Current & Alternative Policies have a higher long-term return forecast than any Aon Model Portfolio
- Current Frontier is more efficient than three of the four Aon Model Portfolios
- Current & Alternative Policies model as more volatile (i.e., has a higher standard deviation of forecasted investment returns) than the Aon Model portfolios

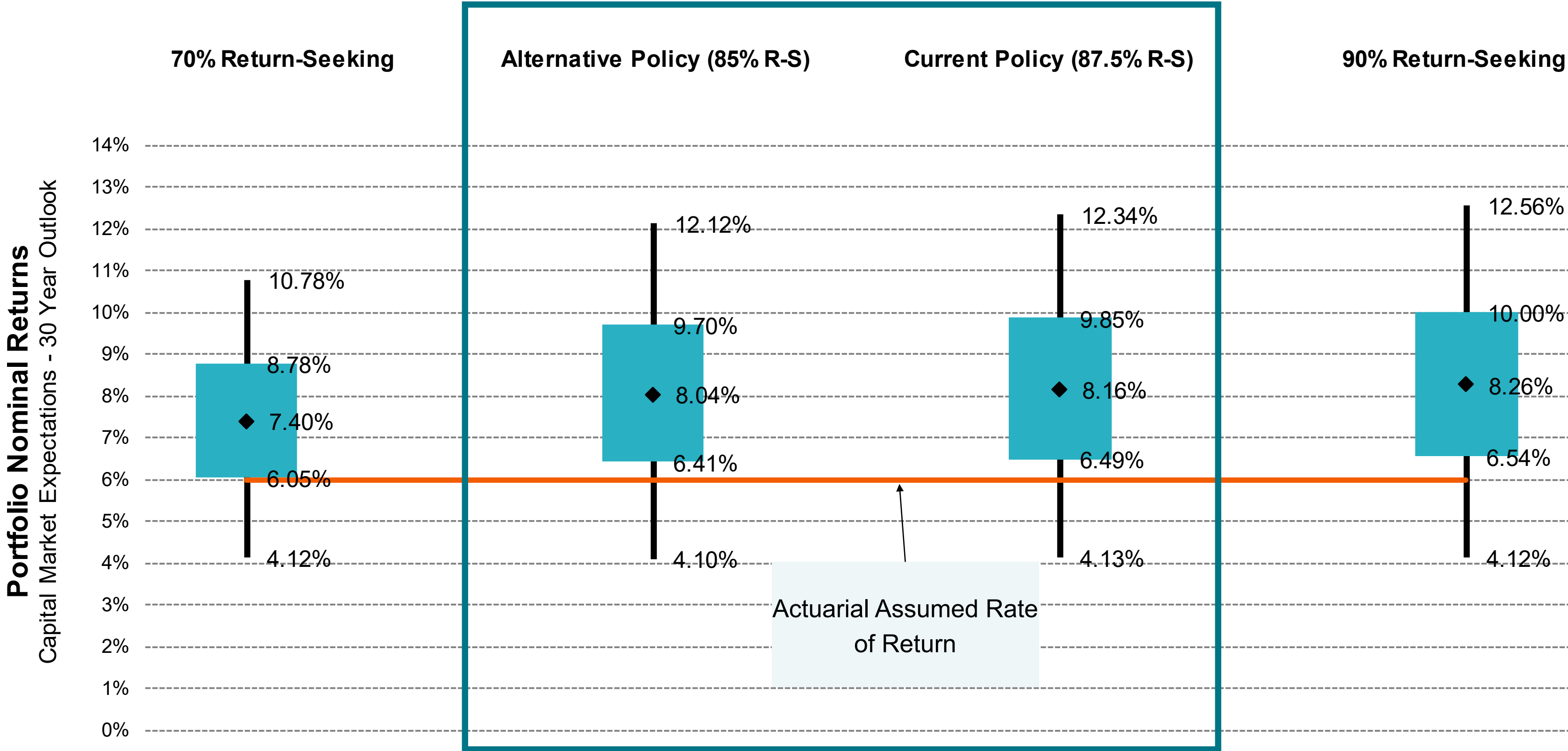
	Expected Nominal Return <sup>1</sup>	Expected Nominal Volatility	Sharpe Ratio
Current Policy (87.5% R-S)	8.16%	13.84%	0.38
Alternative Policy (85% R-S)	8.04%	13.50%	0.38
Aon Model (Liquid)	7.16%	13.46%	0.32
Aon Model (Less Liquid)	7.47%	12.95%	0.35
Aon Model (More Illiquid)	7.71%	13.01%	0.37
Aon Model (Unconstrained)	7.92%	12.71%	0.40

<sup>1</sup> Expected returns based on Aon Investments Q3 2022 30-year Capital Market Assumptions assuming the detailed portfolios found in the Appendix. All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees. Expected returns presented are models and do not represent the returns of an actual client account. Not a guarantee of future results. See Appendix for the Capital Market Assumptions.



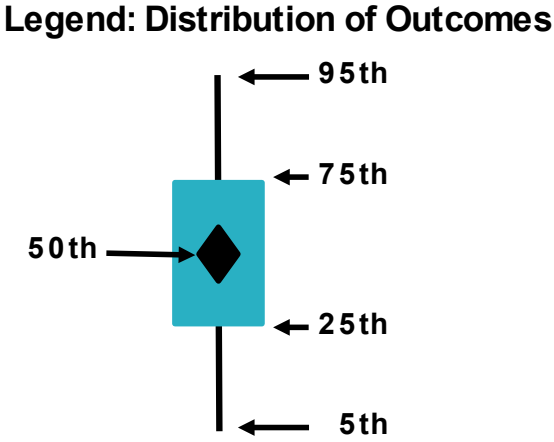
# Portfolio Analysis

## Range of Nominal Returns



### Key Takeaways:

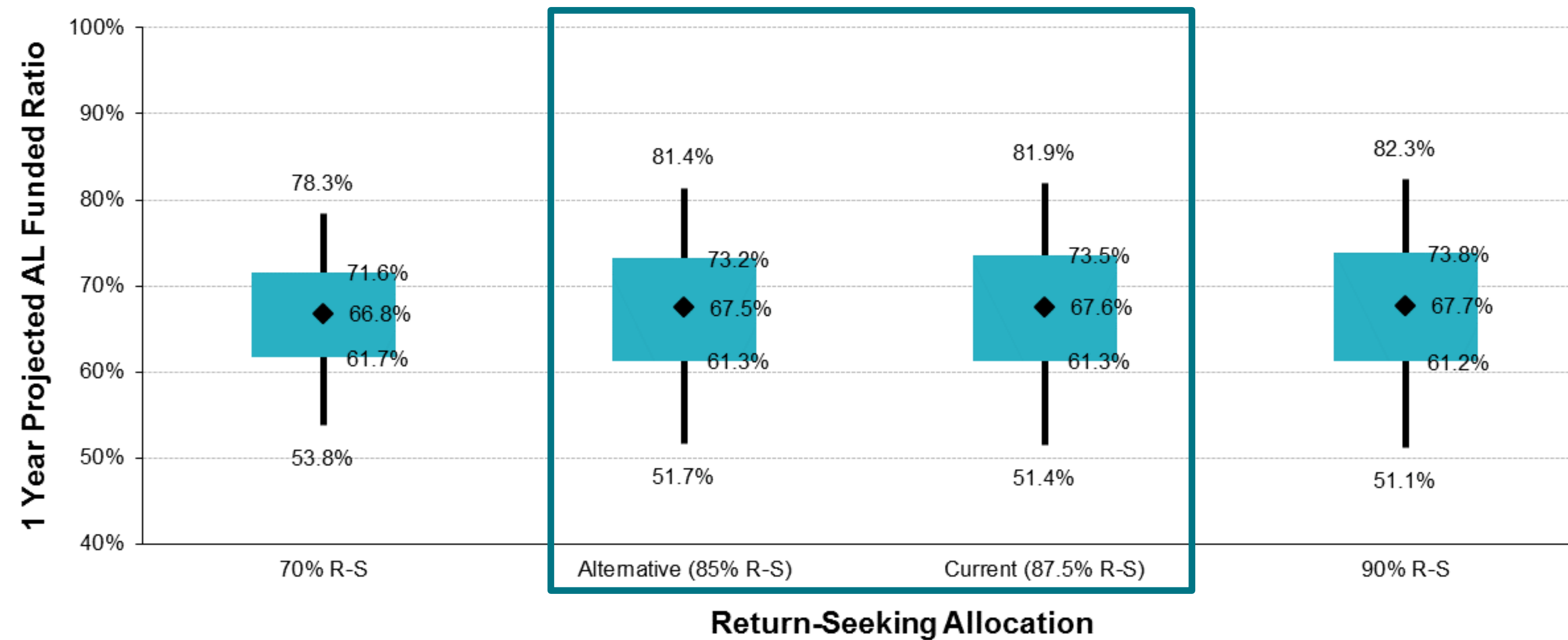
- Median expected returns for policies greater than 50% return-seeking assets are projected to exceed the actuarial assumed rate of return (6.00%)
- Current Policy has an 81% likelihood of surpassing the 6.00% actuarial assumed rate of return



<sup>1</sup> Expected returns based on Aon Investments Q3 2022 30-year Capital Market Assumptions assuming the detailed portfolios found in the Appendix. All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees. Expected returns presented are models and do not represent the returns of an actual client account. Not a guarantee of future results. See Appendix for the Capital Market Assumptions.

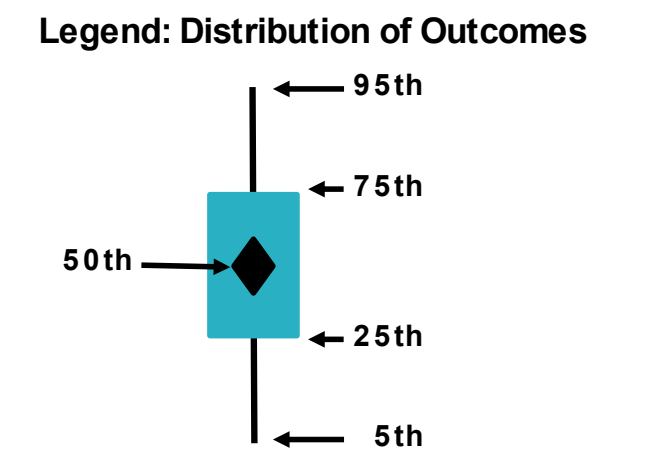
# Asset-Liability Projection Analysis

Short-Term Funded Ratio (1 Year) | Market Value of Assets / Actuarial Liability



## Key Takeaways:

- Higher risk portfolios are projected to have both more upside and downside potential over a short time horizon (1 year in this exhibit)
- Similarly, lower risk portfolios will have a narrower range of potential outcomes

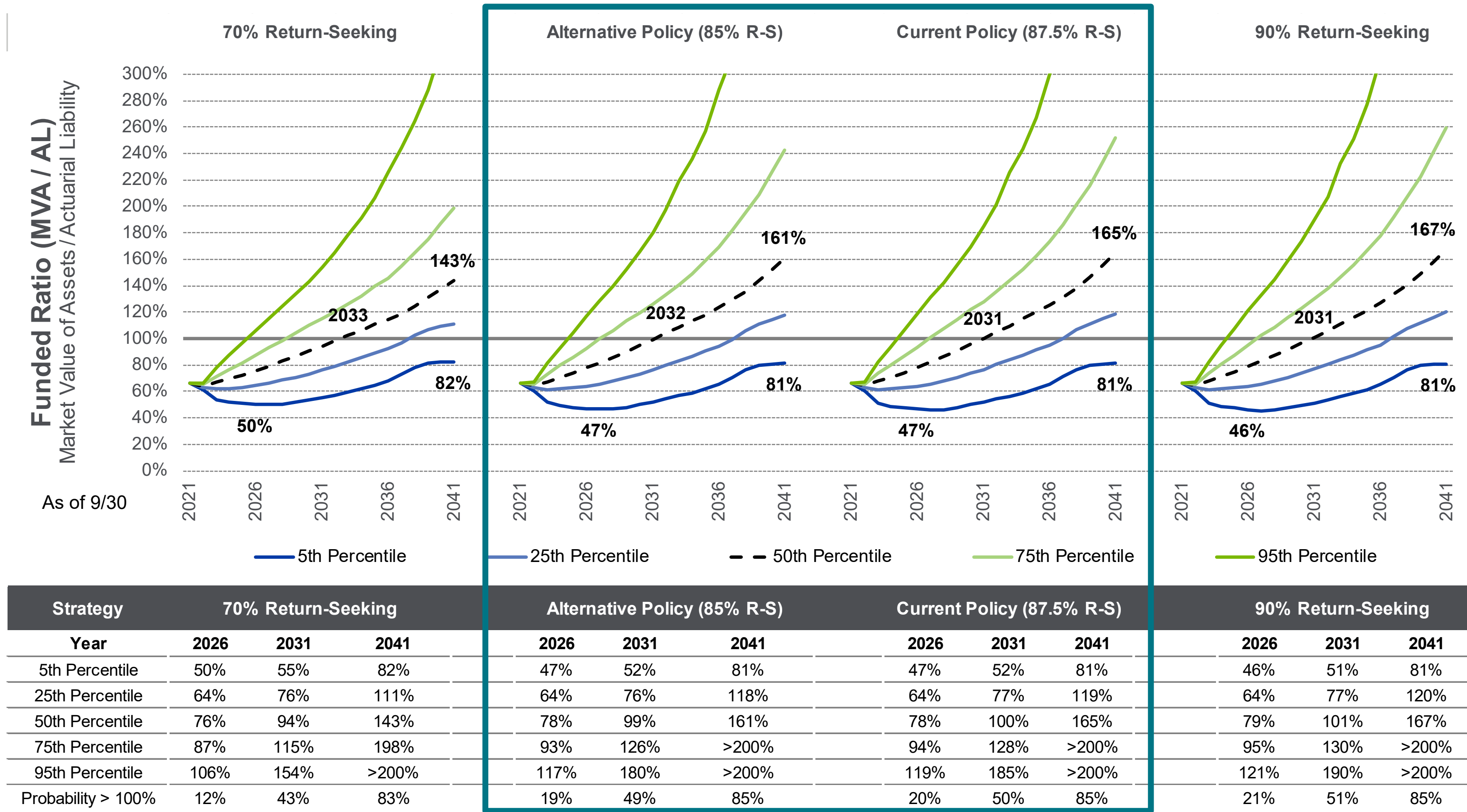


\* Projections assume constant 6.00% discount rate for pension liabilities for all investment policies studied



# Asset-Liability Projection Analysis

## Long-Term Funded Ratio (20 Years) | Market Value of Assets / Actuarial Liability



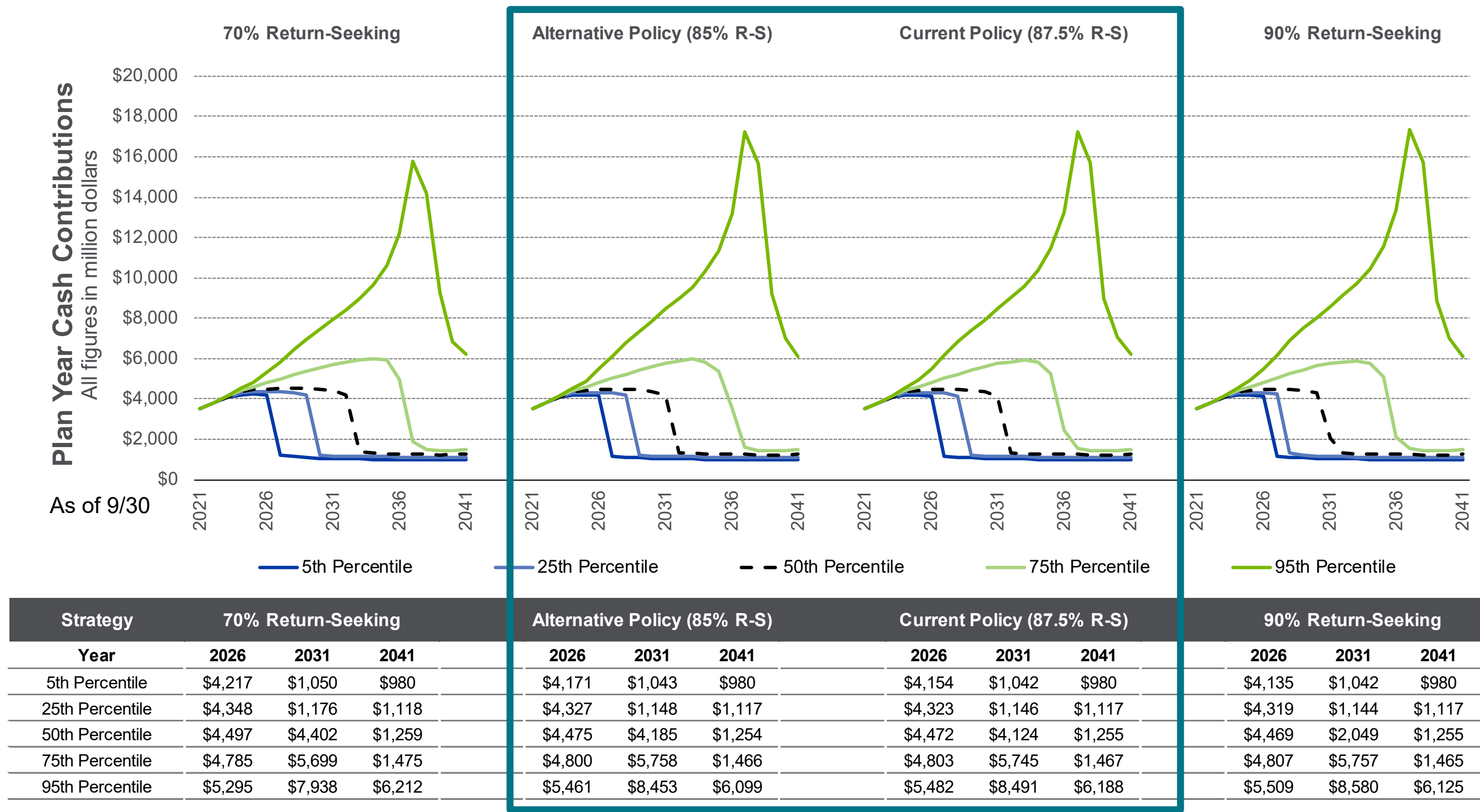
\* Projections assume constant 6.00% discount rate for pension liabilities for all investment policies studied

### Key Takeaways:

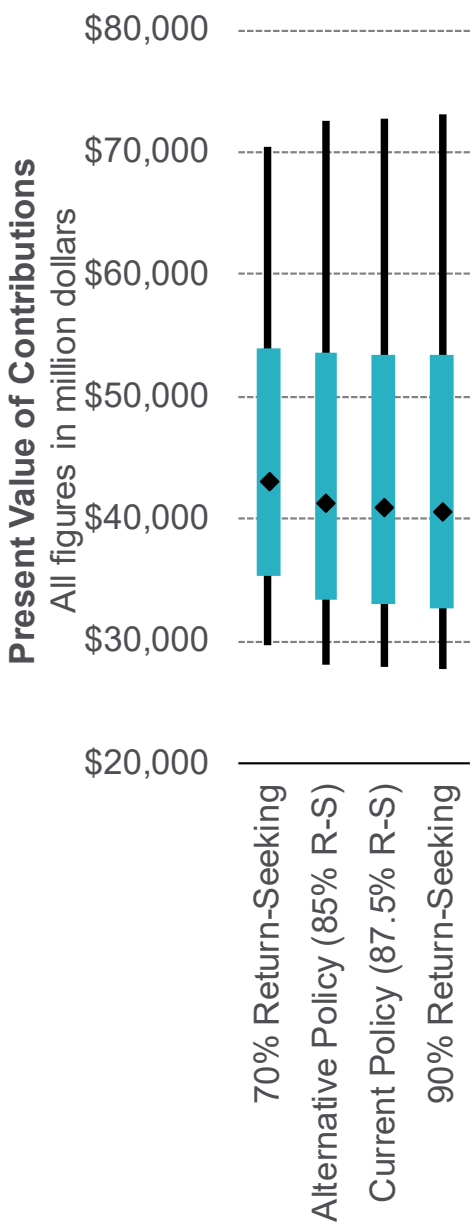
- Under the Current Policy (87.5% R-S), the funded ratio is expected to move towards full funding by FYE 2031 in the central expectation (50th percentile outcome)
- Contribution policy is projected to close the funding shortfall across investment strategies modeled
- Higher return-seeking allocations will increase the central trendline of funded ratio faster, albeit with more volatility

# Asset-Liability Projection Analysis

## Total Contributions Amounts (Employer + Employee)

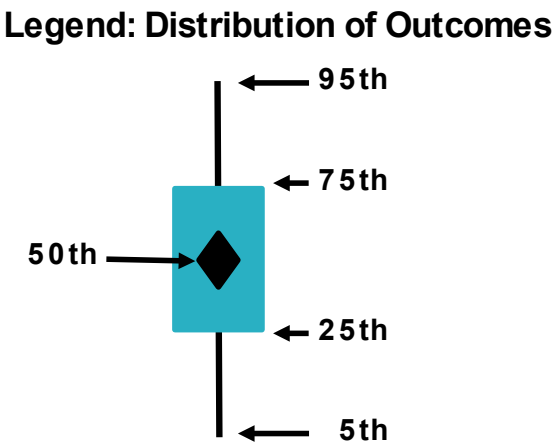


\* Projections assume constant 6.00% discount rate for pension liabilities for all investment policies studied



### Key Takeaways:

- The higher the allocation to return-seeking assets, the lower the present value of future contributions will be on average but the greater the variability in contributions
- Current & Alternative Policies have similar contribution projections





# Asset-Liability Projection Analysis

## Summary of Results

R-S%	30Y Expected Return <sup>1</sup>	30Y Nominal Volatility	Sharpe Ratio	1Y Return (2 STD Down)	20-year Economic Cost (in \$ Billions)		20-year Present Value of Contributions (in \$ Billions)		20-year Ending Funded Ratio (MVA / AL)	
					Expected <sup>2</sup>	Downside <sup>3</sup>	Expected <sup>2</sup>	Downside <sup>3</sup>	Expected <sup>2</sup>	Downside <sup>4</sup>
Current Policy (87.5% R-S)	8.16%	13.84%	0.38	-18.6%	\$28.9	\$69.7	\$40.9	\$72.8	165%	81%
Alternative Policy (85% R-S)	8.04%	13.50%	0.38	-18.1%	\$29.6	\$69.7	\$41.2	\$72.6	161%	81%
Current Frontier of Results										
70.0%	7.40%	11.17%	0.40	-14.4%	\$34.1	\$67.9	\$43.0	\$70.5	143%	82%
72.5%	7.51%	11.55%	0.40	-15.0%	\$33.3	\$67.9	\$42.5	\$70.8	147%	82%
75.0%	7.62%	11.93%	0.40	-15.6%	\$32.5	\$68.2	\$42.3	\$71.0	149%	82%
77.5%	7.73%	12.31%	0.39	-16.2%	\$31.8	\$68.6	\$42.0	\$71.4	152%	82%
80.0%	7.84%	12.69%	0.39	-16.8%	\$31.0	\$68.8	\$41.7	\$71.7	155%	82%
82.5%	7.95%	13.07%	0.39	-17.4%	\$30.3	\$69.1	\$41.5	\$72.1	158%	82%
85.0%	8.05%	13.45%	0.38	-18.0%	\$29.5	\$69.3	\$41.2	\$72.4	161%	82%
87.5%	8.16%	13.84%	0.38	-18.6%	\$28.9	\$69.7	\$40.9	\$72.8	165%	81%
90.0%	8.26%	14.22%	0.38	-19.3%	\$28.1	\$70.0	\$40.7	\$73.2	167%	81%

<sup>1</sup> Expected returns based on Aon Investments Q3 2022 30-year Capital Market Assumptions assuming the detailed portfolios found in the Appendix. All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees. Expected returns presented are models and do not represent the returns of an actual client account. Not a guarantee of future results. See Appendix for the Capital Market Assumptions.

<sup>2</sup> Expected = 50th percentile outcome or central expectation across all 5,000 simulations

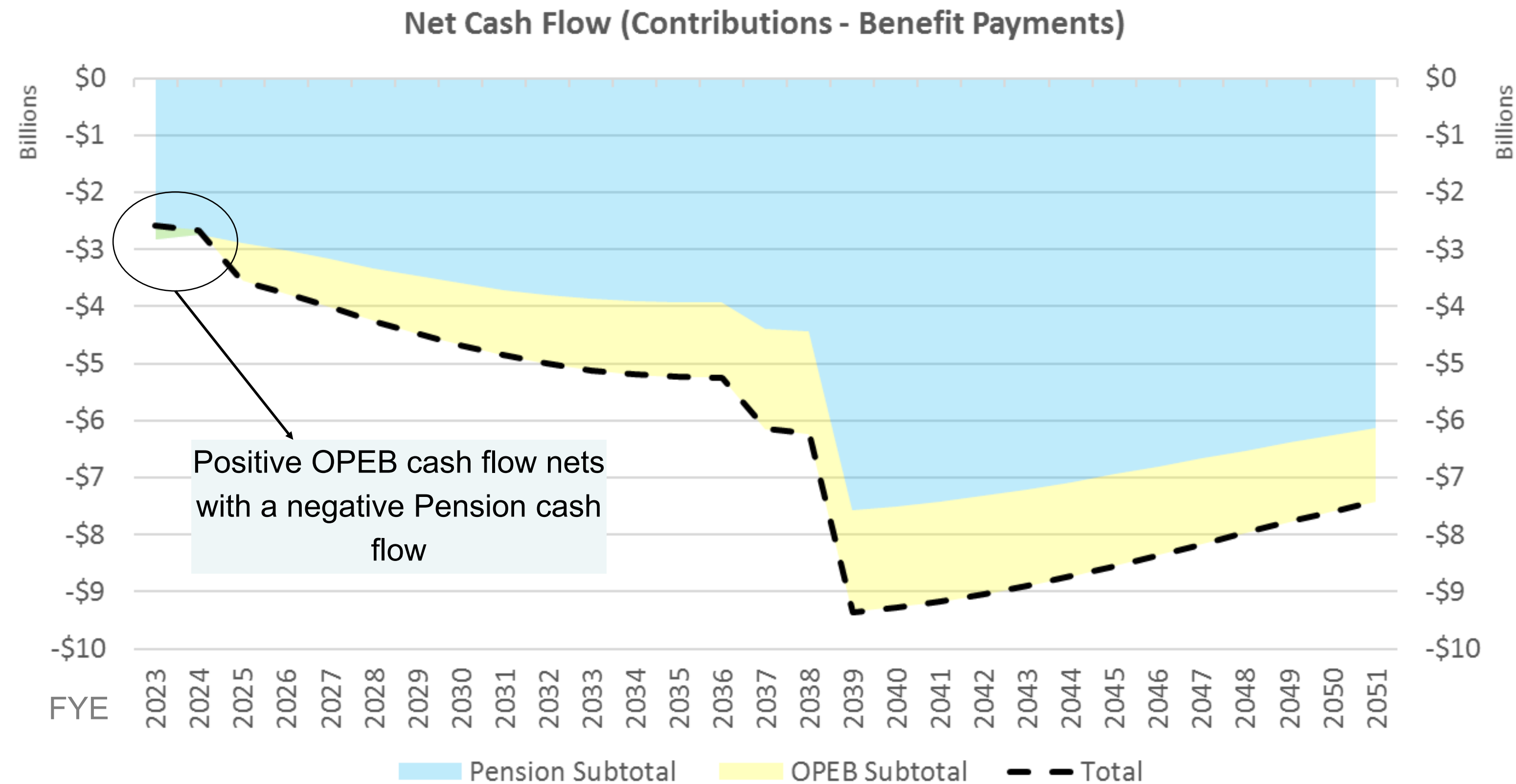
<sup>3</sup> Downside = 95th percentile outcome across all 5,000 simulations

<sup>4</sup> Downside = 5th percentile outcome across all 5,000 simulations

- Key Takeaways:**
- All else equal, we believe MPERS would benefit from reducing its investment risk posture, at least at the margin
  - The alternative policy is projected to result in:
    - Lower expected returns, nominal volatility, downside (95th percentile) contribution amounts, and more favorable one year downside return.
    - Similar Sharpe Ratio (i.e., same efficiency) and expected attainment of full funding
    - Slightly higher expected (50<sup>th</sup> percentile) contribution amounts

# Aggregate Net Cash Flow Analysis

Michigan Is Projected to Have a Total Net Cash Outflow, Driven By the Pension Plans



## Key Observations

- Baseline actuarial data provided by GRS
- Aggregate pension plans are shown in blue; aggregate OPEB plans in yellow
- Michigan is projected to have an aggregate baseline of negative cash flow with more going out in benefit payments than coming in via contributions
- Closed amortization policy drives the sharp change mid-projection period
- Both the aggregate pension and aggregate OPEB plans are assumed to increasingly become more cash flow negative with each passing decade



# 3

## Summary and Conclusions





# Summary and Conclusions

## Mix of Return-Seeking vs. Risk-Reducing Assets

- Plan is currently underfunded, expected to become fully funded by 2031
- Current portfolio is well-constructed with a high likelihood of meeting/exceeding the actuarial assumed rate of return
- Consider lower risk portfolios given funded status trajectory

## Liquidity

- Net outflow is projected to increase over the next few decades
- Consider a slight increase to liquid assets

## Funding Interaction

- Funding policy and expected returns provide buffers that mitigate contribution volatility



# 4

## Appendix

- Portfolio Analysis
- Peer Benchmarking
- Aggregate Liability Analysis
- Asset-Liability Projection Analysis
- Contribution Policy Impact on Asset-Liability Study
- Capital Market Assumptions





# Portfolio Analysis | Spectrum of Our Model Portfolios

Reflects Our Best Ideas for a Typical Pension Plan

Aon’s Model Portfolios reflect Aon’s best ideas for a typical total return defined benefit plan across a range of circumstances noted below

- Intended as a *starting point* for asset allocation analysis and decision-making and to be customized based on client-specific needs and circumstances

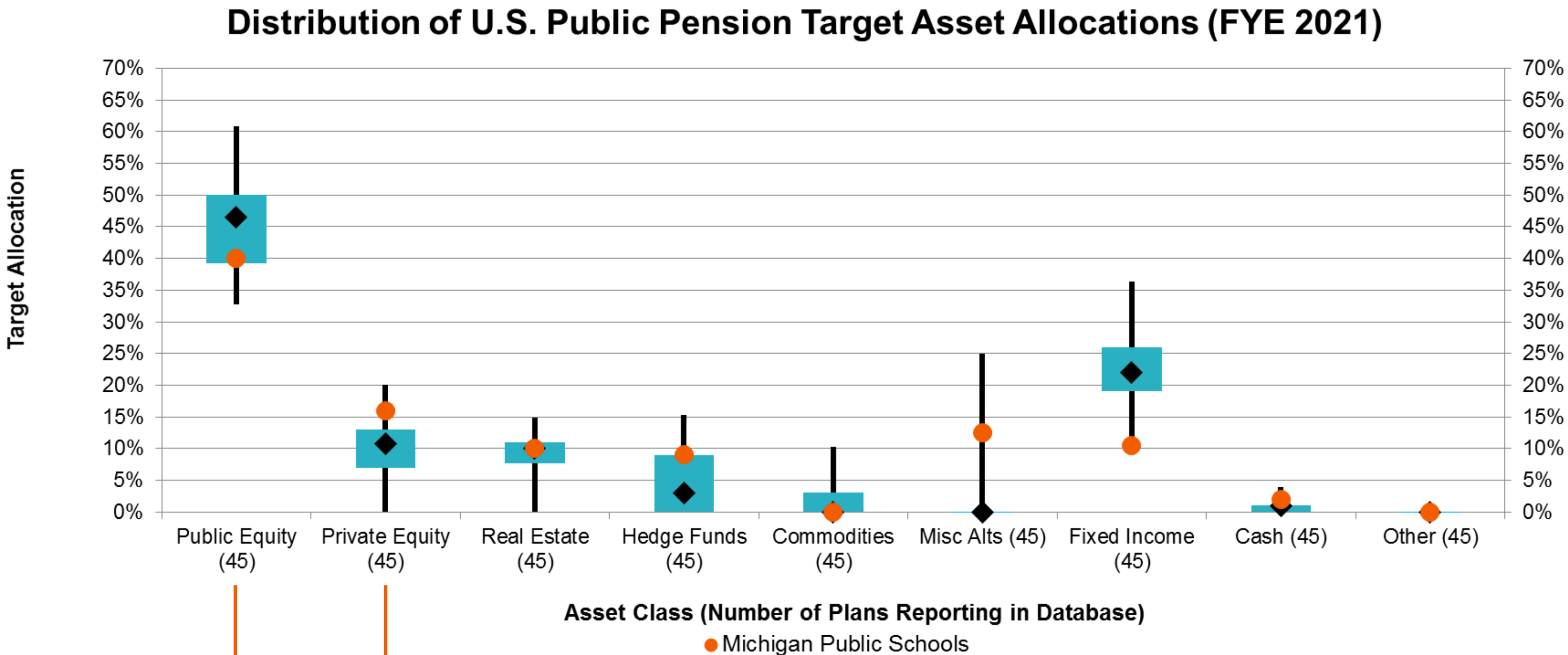
	Liquid	Less Liquid	More Illiquid	Unconstrained
Complexity	Simple			Complex
Costs	Low Cost			Higher Cost
Resources	Light Resources			Deep Resources
Governance	Modest Governance			Strong Governance
Liquidity	More Liquid			Less Liquid

- As a general statement, moving from left-to-right on the above spectrum increases both investment portfolio return potential and risk-adjusted return potential, based on our capital markets modelling
  - It also increases the reliance on “alpha” (manager skill) and reduces the emphasis on market “beta” (market risk premiums); alpha is not guaranteed



# Peer Benchmarking

## Distribution of U.S. Public Pension Target Asset Allocations (Assets > \$25B)<sup>1</sup>

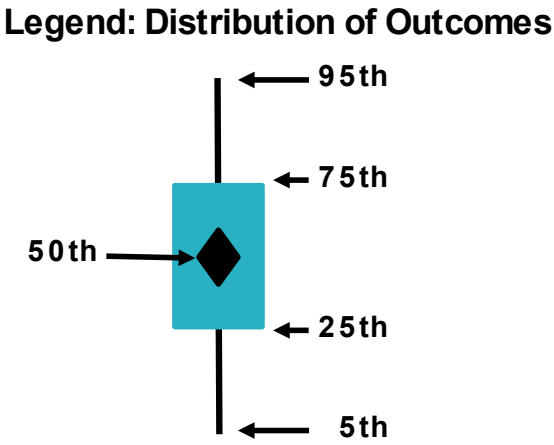


	Public Equity	Private Equity	Total Equity
MPSERS	40%	16%	56%
Public Peers	46%	11%	57%
Difference	(6%)	+5%	(1%)

Source: Public Plans Data (publicplansdata.org) as of July 2022  
<sup>1</sup> Peers defined as public funds published within publicplansdata.org as of July 2022; Number of plans per year are shown in parentheses

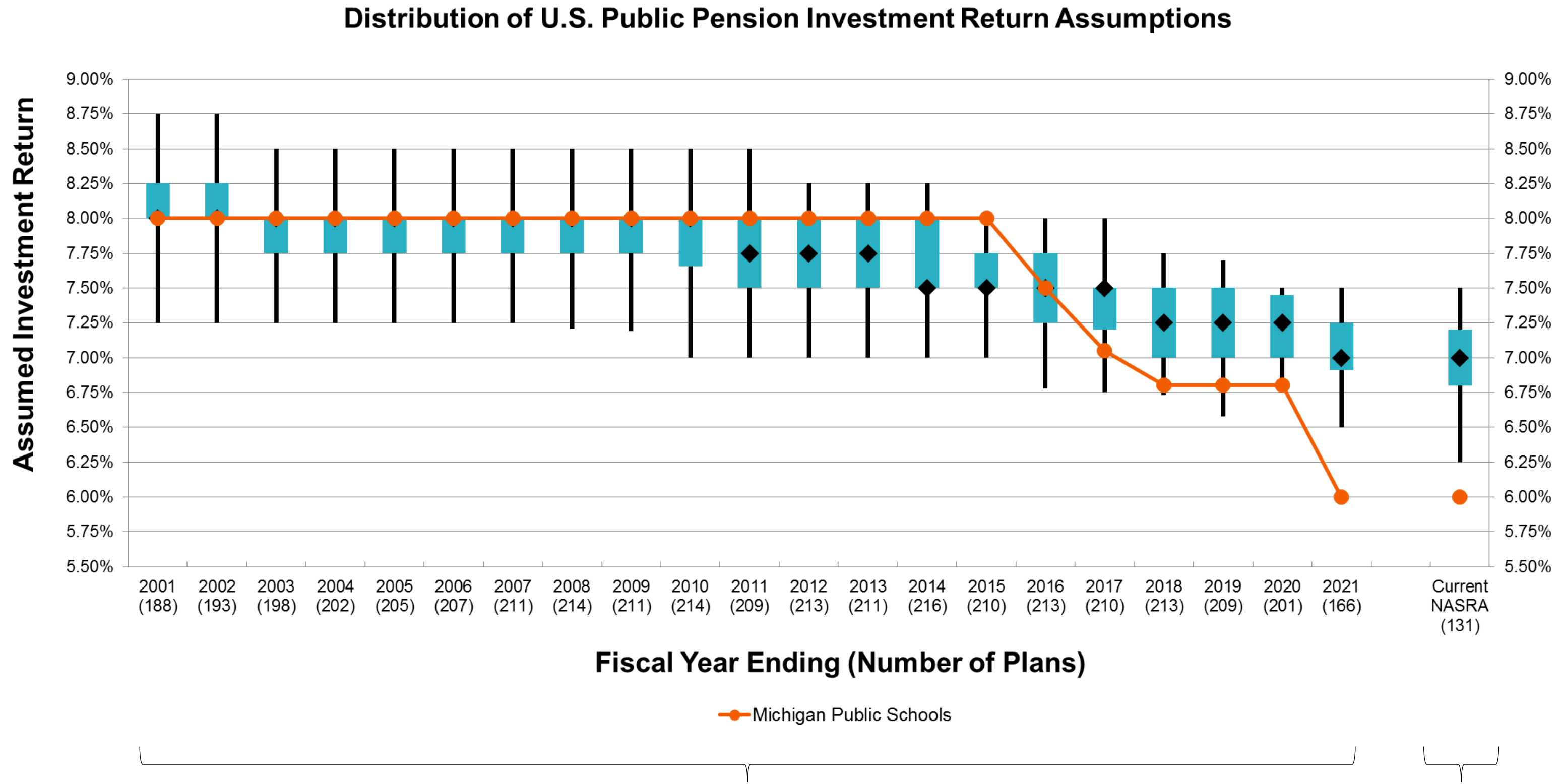
### Observations

- Michigan's total equity allocation (public + private) is similar to public plans with greater than \$25 billion in assets
- Michigan's fixed income allocation is at the 5<sup>th</sup> percentile relative to peers with \$25 billion in assets



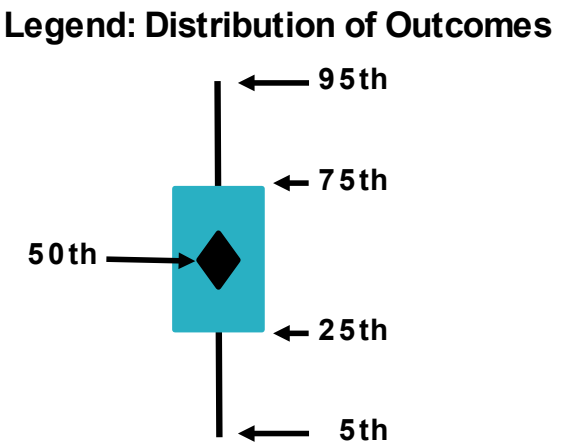
# Peer Benchmarking

## Expected Return Assumption versus Peers<sup>1</sup>



### Key Takeaways:

- The historical actuarial assumption trend for investment returns has declined from an 8.00% median in FYE 2001-2010 to 7.00% as of FYE 2020-2021, per Public Plans Data<sup>1</sup>
- Current actuarial assumptions, as tracked by NASRA as of July 2022, have a median actuarial assumption of 7.00%

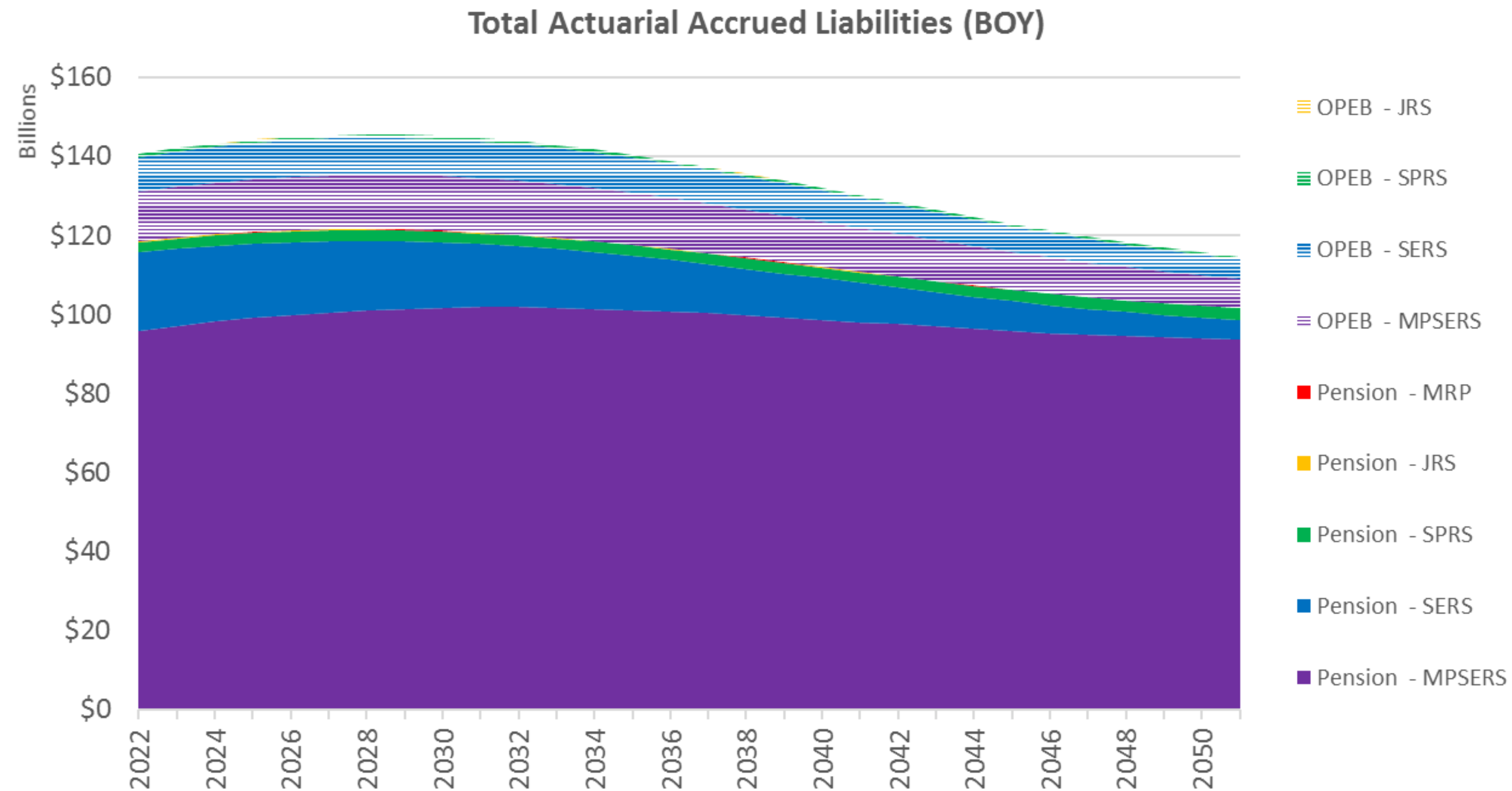


Sources: Public Plans Data (publicplansdata.org) as of July 2022; NASRA downloadable investment return assumptions as of July 2022  
<sup>1</sup> Peers defined as public funds published within publicplansdata.org as of July 2022; Number of plans per year are shown in parentheses



# Aggregate Liability Analysis

Based on GRS' Baseline Projections | Aggregate Liability Peaks in Fiscal Year Ending 2028

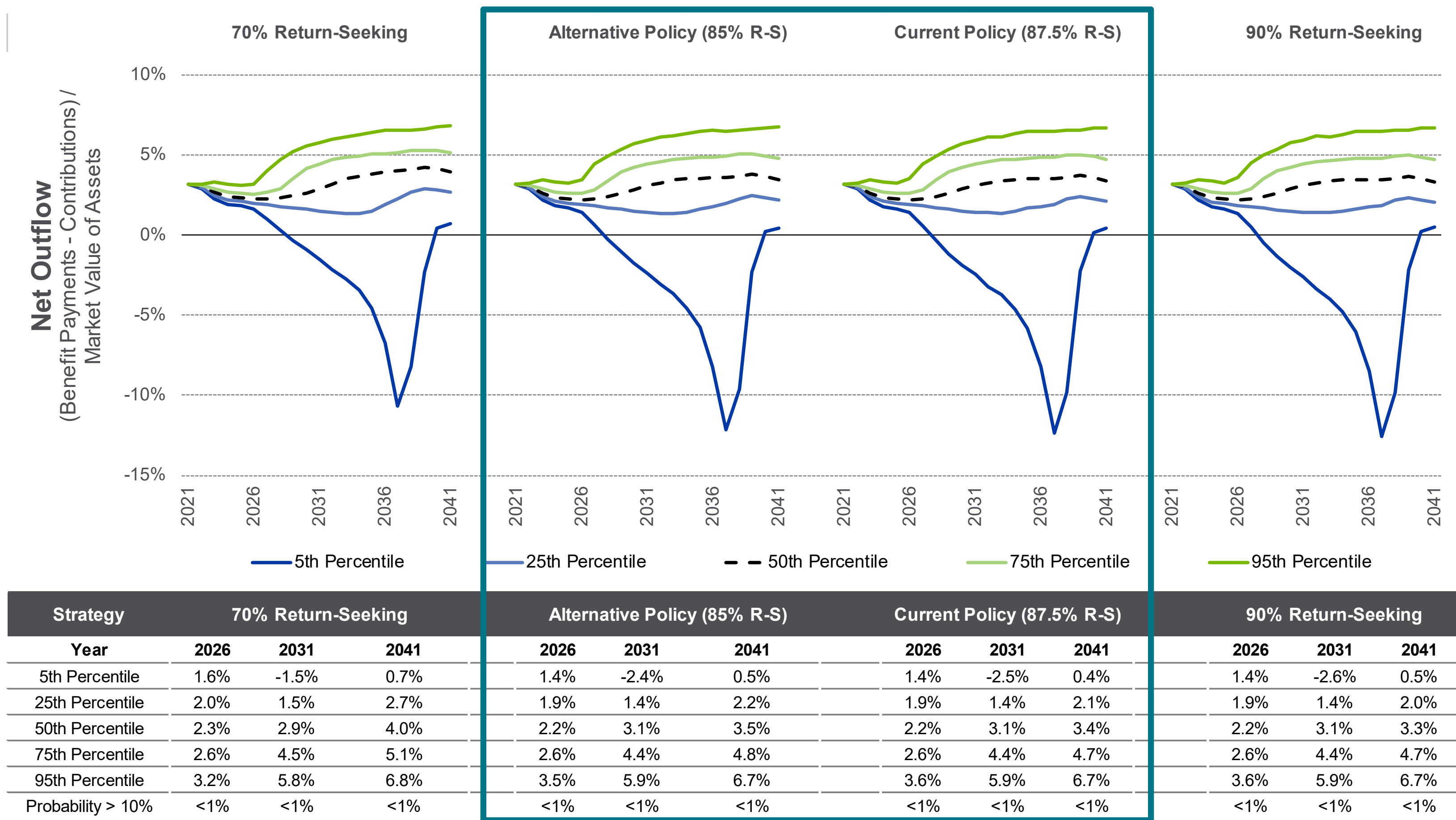


## Key Observations

- Individual systems are color-coded; pension plans are shown in solid colors with OPEB plans in stripes
- Based on GRS' projections, the aggregate liability reaches its peak in Fiscal Year Ending 2028

# Asset-Liability Projection Analysis

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



\* Projections assume constant 6.00% discount rate for pension liabilities for all investment policies studied

## Key Takeaways:

- The Plan is assumed to have net outflows increase over the projection period
- Net outflows are expected to remain in the 2-4% range over the projection period
- Net outflows of 10%+ can put stress on fund liquidity over time; however, it is not likely over the projection period



# Contribution Policy Impact on Asset-Liability Study

## Overview

- Michigan's asset-liability study results are heavily influenced by its contribution policy, specifically how the following pieces interact:
  - Floor provision
  - Investment strategy expecting a return greater than the actuarial assumptions
  - Closed amortization
- In their individual silo, each provision is also used to some degree by other public pension plans; however, in our experience, their combination is unique to Michigan

# Contribution Policy Impact on Asset-Liability Study

## Floor Provision

- The following plans have a floor provision on their contribution policy, related to either the normal cost or amortization component of the calculations:
  - MPERS, SPRS
- The floor provisions serve to advance funding in good scenarios, building a buffer to be used to offset future increases
  - In good times, the contributions will not decrease until full funding
  - In bad times, the contributions will increase and re-set the floor for future years
- A floor provision is utilized in other public pension plans:
  - Nebraska Public Employees Retirement System; San Diego City Employees' Retirement System



# Contribution Policy Impact on Asset-Liability Study

## Banking Excess Returns

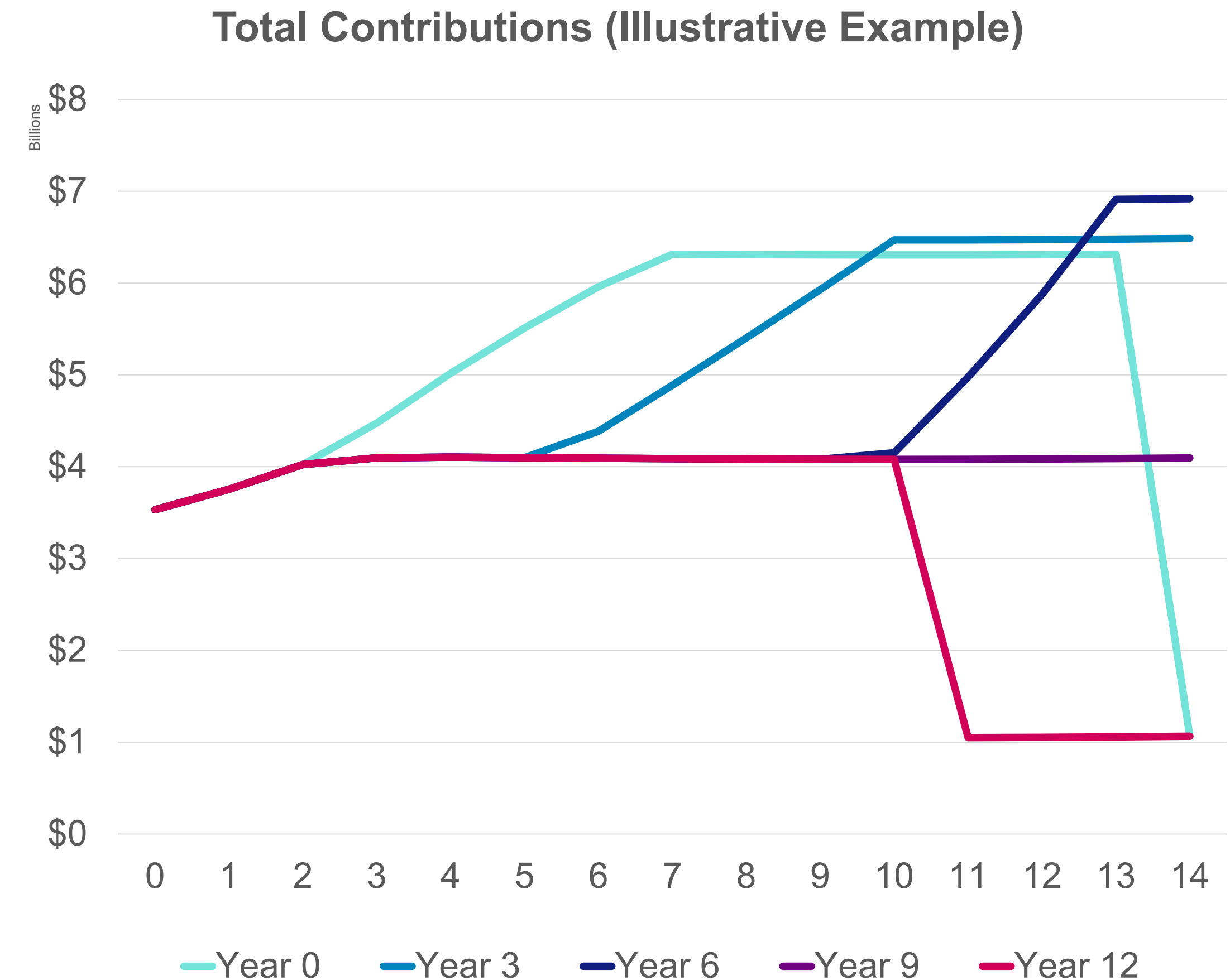
- Based on results from Aon’s 6/30/2022 capital market assumptions, the Michigan portfolio has a 30-year expected return assumption of 8.16%
- Over a 30-year timeframe, Michigan would be assumed to surpass its actuarial assumed rate of return (6.00%) in ~81% of scenarios
- Similar to the floor provision, excess returns over the actuarial rate will build a buffer to be used to offset future increases

Percentile	Current Policy (87.5% R-S)
5 <sup>th</sup>	4.13%
25 <sup>th</sup>	6.49%
50 <sup>th</sup>	8.16%
75 <sup>th</sup>	9.85%
95 <sup>th</sup>	12.34%

# Contribution Policy Impact on Asset-Liability Study

## Closed Amortization

- The closed amortization policy forces full funding by a specific date; by itself, volatility will increase in the future as that period moves to immediate recognition
- Along the way, volatility is subdued based on the buffer (from the contribution floor and excess asset returns) that has accumulated under each specific path
- The example to the right assumes a 15 year geometric return of 6.00% (the actuarial assumption) with -20% negative shock applied at various points in time (resulting in returns of 8.15% in the other 14 years):
  - The earlier the shock occurs, the more contributions will increase (see shocks in Years 0, 3, and 6)
  - The later the shock occurs, the more likely the Plan has a large enough buffer than contributions will not correspondingly increase (see shocked in Years 9 and 12)





# Contribution Policy Impact on Asset-Liability Study

## Key Findings

- The combination of the floor provision and asset returns expected to be greater than the actuarial assumption is expected to...
  - Keep contributions steady until full funding, advancing contributions rather than realizing any near-term savings
  - Build up a buffer or reserve which can be tapped into in adverse markets
- The closed amortization policy will add volatility to the plan contributions as the time to immediate recognition comes closer
  - That volatility could be dampened depending on the path taken and how much of a buffer has accumulated leading up to adverse market conditions
- **Advancing contributions and creating buffers to insulate negative events are some reasons why a riskier portfolio in our asset-liability modeling may not appear noticeably riskier in the lead-up to full funding**

# Portfolio Analysis

## Aon Model Portfolios vs. Current MPSERS Policy

Asset Class	Current Policy (87.5% R-S)	Aon Model (Liquid)	Aon Model (Less Liquid)	Aon Model (More Illiquid)	Aon Model (Unconstrained )
<b>Equity</b>					
- Public Equity	40.0%	65.6%	54.7%	49.2%	38.3%
- Private Equity	22.3% <sup>2</sup>	0.0%	5.5%	10.9%	16.4%
- Subtotal	62.3%	65.6%	60.2%	60.2%	54.7%
<b>Liquid Alternatives</b>					
- Subtotal	5.9%	0.0%	5.5%	8.2%	8.2%
<b>Return-Seeking Fixed Income</b>					
- Multi-Asset Credit	6.3%	8.2%	8.2%	5.5%	5.5%
- Private Debt	3.2%	0.0%	0.0%	2.7%	5.5%
- Subtotal	9.4%	8.2%	8.2%	8.2%	10.9%
<b>Real Assets</b>					
- Real Estate (Core)	1.3%	13.7%	8.2%	5.5%	5.5%
- Real Estate (Non-Core)	6.8%	0.0%	2.7%	2.7%	4.1%
- REITs	0.4%	0.0%	0.0%	0.0%	0.0%
- Infrastructure	1.5%	0.0%	2.7%	2.7%	4.1%
- Subtotal	10.0%	13.7%	13.7%	10.9%	13.7%
<b>Risk-Reducing</b>					
- Cash	2.0%	2.0%	2.0%	2.0%	2.0%
- Core / Core Plus Fixed Income	10.5%	10.5%	10.5%	10.5%	10.5%
- Subtotal	12.5%	12.5%	12.5%	12.5%	12.5%
<b>Expected Return<sup>1</sup></b>	<b>8.16%</b>	<b>7.16%</b>	<b>7.47%</b>	<b>7.71%</b>	<b>7.92%</b>
Expected Risk <sup>1</sup>	13.84%	13.46%	12.95%	13.01%	12.71%
Sharpe Ratio	0.38	0.32	0.35	0.37	0.40
<b>1-Year Downside Return (2 Standard Deviations)</b>	<b>-18.6%</b>	<b>-18.9%</b>	<b>-17.7%</b>	<b>-17.5%</b>	<b>-16.8%</b>
<b>Illiquid Assets</b>	<b>47.1%</b>	<b>13.7%</b>	<b>24.6%</b>	<b>32.8%</b>	<b>43.8%</b>

### Key Takeaways:

- Current MPSERS Policy generally compares favorably to the Aon Model Portfolios
- Current MPSERS Policy's total equity exposure appears on the higher end of the Aon Model Portfolios
- Current MPSERS Policy's higher exposure to equity risk results in higher forecasted total portfolio volatility
  - Also explains Current Policy's Sharpe Ratio being less than the Unconstrained Model

<sup>1</sup> Expected returns based on Aon Investments Q3 2022 30-year Capital Market Assumptions assuming the detailed portfolios found in the Appendix. All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees. Expected returns presented are models and do not represent the returns of an actual client account. Not a guarantee of future results. See Appendix for the Capital Market Assumptions.

<sup>2</sup> For modeling purposes, Michigan's 12.5% allocation to Real Return & Opportunistic assets is split 50/50 between Private Equity and Multi-Asset Credit

Percentages in table may not sum to 100% due to rounding



# Capital Market Assumptions

## Mapping of Current Target Asset Allocation

The Current Target Asset Allocation is modeled using our capital market assumptions as follows:

Target Asset Allocation as of June 30, 2022		
	Allocation %	Capital Market Assumption Mapping
<b>Return-Seeking</b>		
- U.S. Equity	25.0%	90% U.S. Large Cap / 10% U.S. Small Cap
- Private Equity	16.0%	Private Equity
- International Equity	15.0%	75% International Developed / 25% Emerging Markets
- Real Return / Opportunistic	12.5%	50% Private Equity / 50% Multi-Asset Credit
- Real Estate & Infrastructure	10.0%	68% Non-Core Real Estate / 12.75% Core Real Estate / 4.25% U.S. REITs / 15% Infrastructure
- Absolute Return	9.0%	65% Hedge Funds (Direct -- Median Manager) / 35% Private Debt Direct Lending
- Total	87.5%	
<b>Risk-Reducing</b>		
- Cash & Short Term Fixed Income	2.0%	Cash
- Long Term Fixed Income	10.5%	Core Fixed Income
- Total	12.5%	
<b>Total</b>	<b>100.0%</b>	

# Our Capital Market Assumptions

## As of June 30, 2022 (30 Years)

	Expected Real Return <sup>1</sup>	Expected Nominal Return <sup>1</sup>	Expected Nominal Volatility
<b>Equity</b>			
1 Large Cap U.S. Equity	4.8%	7.3%	17.5%
2 Small Cap U.S. Equity	5.3%	7.8%	23.5%
3 International Equity (Developed)	5.1%	7.6%	21.0%
4 Emerging Markets Equity	5.7%	8.2%	24.5%
<b>Fixed Income</b>			
5 Cash (Gov't)	0.5%	2.9%	2.0%
6 Core Fixed Income	1.3%	3.7%	4.5%
7 Core Plus Fixed Income	1.7%	4.1%	5.0%
8 Multi-Asset Credit <sup>2</sup>	4.4%	6.9%	9.0%
<b>Alternatives</b>			
9 Direct Hedge Funds <sup>2,3</sup>	3.5%	6.0%	9.5%
10 US REITs	3.9%	6.4%	19.0%
11 Core Real Estate	2.6%	5.1%	15.5%
12 Non-Core Real Estate	4.2%	6.7%	25.5%
13 Private Equity	7.6%	10.2%	25.5%
14 Infrastructure	5.2%	7.7%	15.0%
15 Closed-End Real Assets	5.5%	8.0%	16.0%
16 Private Debt	4.6%	7.1%	17.5%
<b>Inflation</b>			
17 Inflation	0.0%	2.4%	2.0%

<sup>1</sup> Expected returns are using Aon Investments Q3 2022 30-Year Capital Market Assumptions. Assumptions do not include fees/expenses. All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees. Expected returns presented are models and do not represent the returns of an actual client account. Not a guarantee of future results.

<sup>2</sup> Alpha incorporated in Expected Nominal Return

<sup>3</sup> Represents diversified portfolio of Direct hedge fund investments.



# Our Capital Market Assumptions

## As of June 30, 2022

	Nominal Correlations	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Large Cap U.S. Equity	1.00	0.93	0.81	0.73	0.07	0.02	0.08	0.61	0.66	0.65	0.34	0.45	0.62	0.34	0.52	0.38	0.07
2	Small Cap U.S. Equity	0.93	1.00	0.75	0.68	0.06	0.02	0.07	0.57	0.62	0.61	0.32	0.43	0.60	0.34	0.50	0.36	0.07
3	International Equity (Developed)	0.81	0.75	1.00	0.76	0.03	0.01	0.07	0.62	0.56	0.54	0.34	0.44	0.56	0.31	0.50	0.38	0.10
4	Emerging Markets Equity	0.73	0.68	0.76	1.00	0.06	0.03	0.08	0.64	0.46	0.50	0.32	0.41	0.53	0.29	0.46	0.40	0.07
5	Cash (Gov't)	0.07	0.06	0.03	0.06	1.00	0.41	0.36	0.04	-0.03	0.07	0.13	0.12	0.07	0.11	0.14	-0.17	0.29
6	Core Fixed Income	0.02	0.02	0.01	0.03	0.41	1.00	0.98	0.25	0.04	0.02	0.05	0.04	0.03	0.05	0.05	0.07	-0.02
7	Core Plus Fixed Income	0.08	0.07	0.07	0.08	0.36	0.98	1.00	0.39	0.18	0.06	0.07	0.07	0.08	0.07	0.09	0.23	-0.02
8	Multi-Asset Credit	0.61	0.57	0.62	0.64	0.04	0.25	0.39	1.00	0.68	0.40	0.22	0.30	0.40	0.22	0.34	0.68	0.09
9	Direct Hedge Funds	0.66	0.62	0.56	0.46	-0.03	0.04	0.18	0.68	1.00	0.42	0.21	0.29	0.41	0.22	0.33	0.56	0.03
10	US REITs	0.65	0.61	0.54	0.50	0.07	0.02	0.06	0.40	0.42	1.00	0.43	0.47	0.43	0.24	0.48	0.25	0.05
11	Core Real Estate	0.34	0.32	0.34	0.32	0.13	0.05	0.07	0.22	0.21	0.43	1.00	0.97	0.32	0.18	0.85	0.15	0.06
12	Non-Core Real Estate	0.45	0.43	0.44	0.41	0.12	0.04	0.07	0.30	0.29	0.47	0.97	1.00	0.37	0.22	0.89	0.19	0.07
13	Private Equity	0.62	0.60	0.56	0.53	0.07	0.03	0.08	0.40	0.41	0.43	0.32	0.37	1.00	0.32	0.45	0.30	0.06
14	Infrastructure	0.34	0.34	0.31	0.29	0.11	0.05	0.07	0.22	0.22	0.24	0.18	0.22	0.32	1.00	0.64	0.15	0.06
15	Closed-End Real Assets	0.52	0.50	0.50	0.46	0.14	0.05	0.09	0.34	0.33	0.48	0.85	0.89	0.45	0.64	1.00	0.22	0.08
16	Private Debt	0.38	0.36	0.38	0.40	-0.17	0.07	0.23	0.68	0.56	0.25	0.15	0.19	0.30	0.15	0.22	1.00	0.01
17	Inflation	0.07	0.07	0.10	0.07	0.29	-0.02	-0.02	0.09	0.03	0.05	0.06	0.07	0.06	0.06	0.08	0.01	1.00

# Legal Disclosures and Disclaimers

Investment advice and consulting services provided by Aon Investments USA Inc. (“Aon Investments”). The information contained herein is given as of the date hereof and does not purport to give information as of any other date. The delivery at any time shall not, under any circumstances, create any implication that there has been a change in the information set forth herein since the date hereof or any obligation to update or provide amendments hereto.

This document is not intended to provide, and shall not be relied upon for, accounting, legal or tax advice. Any accounting, legal, or taxation position described in this presentation is a general statement and shall only be used as a guide. It does not constitute accounting, legal, and tax advice and is based on Aon Investments’ understanding of current laws and interpretation.

Aon Investments disclaims any legal liability to any person or organization for loss or damage caused by or resulting from any reliance placed on that content. Aon Investments reserves all rights to the content of this document. No part of this document may be reproduced, stored, or transmitted by any means without the express written consent of Aon Investments.

Aon Investments USA Inc. is a federally registered investment advisor with the U.S. Securities and Exchange Commission. Aon Investments is also registered with the Commodity Futures Trading Commission as a commodity pool operator and a commodity trading advisor and is a member of the National Futures Association. The Aon Investments ADV Form Part 2A disclosure statement is available upon written request to:

Aon Investments USA Inc.  
200 E. Randolph Street  
Suite 700  
Chicago, IL 60601  
ATTN: Aon Investments Compliance Officer

© Aon plc 2022. All rights reserved.