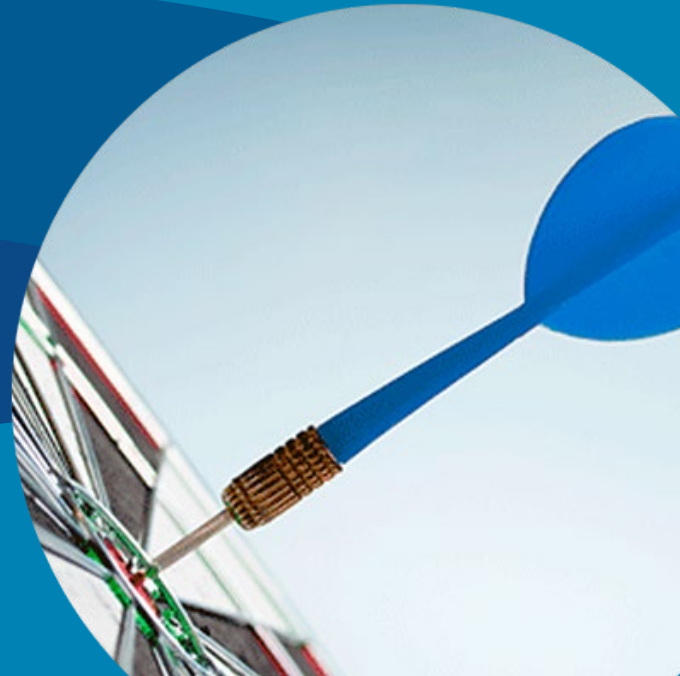




# Wisconsin Retirement System

41<sup>st</sup> Annual Actuarial Valuation of  
Retired Lives  
December 31, 2023



# Operation of the System (Simplified Description)

	Core Annuities	Variable Annuities
Investment Return Hurdle to Trigger Annuity Adjustment	Returns over/under 5%	Returns over/under 5%
Ratio of Assets to Liabilities	If > 0.5%, dividend may be granted If < -0.5%, prior dividends reduced	If > 2%, variable annuity increased If < -2%, variable annuity decreased
Increase/Decrease Rounding Conventions	Rounded to nearest 0.1%	Truncated, carried to next year
Adjustment Effective Date	April following 12/31 valuation	April following 12/31 valuation

# Smoothing Mechanisms

---

## Core

- Undesirable for retirees to experience wide swings in monthly benefits from year to year (especially downward swings)
- Mitigated in Core division by asset smoothing process and portfolio mix
- Asset smoothing has worked well historically, but could not prevent negative dividends in 2009-2013

# Smoothing Mechanisms

---

## Variable

- Variable fund is marked to market each year and subject to wide swings
- Dropping fractions of a percent from the adjustment is a form of smoothing
- Usually has very little effect due to the magnitude of the gains and losses

# Summary of Results – December 31, 2023

**\$ Millions**

	<b>Core</b>	<b>Variable</b>
Number of Annuitants	238,111	43,560
Annual Amount of Annuities Paid	\$ 6,639.1	\$ 457.8
Fund Balance	75,583.6	5,089.2
Actuarial Reserve	72,951.6	4,404.8
<b>Ratio</b>	<b>1.036</b>	<b>1.155</b>

Core effective earnings rate = 9.1%, dividend adjustment = 3.6%.  
Variable effective earnings rate = 22.0%, and the variable adjustment = 15.0%.

(Report- Cover Letter & Pages 6 and 16)



# Summary of Results – Annuity Adjustments

---

- \* 3.6% Core Dividend > 3.4% CPI Increase
- \* 15.0% Variable Adjustment follows -21%/15% Adjustments in previous two years

- Positive core dividend despite volatile investment markets
  - Provides inflationary protection
  - This is a byproduct of the dividend process and not a primary objective
- Positive variable adjustment
  - Previous three of four years had double digit positive variable adjustments
  - Similar to previous periods with double digit negative variable adjustments; increased variable adjustment reflects stronger subsequent market returns

# Summary of Results – Core Assets

---

Due to smoothing via Market Recognition Account, as of December 31, 2023 there are approximately \$4.7 billion in unrecognized losses in the Core fund

- Last year was \$7.0 billion in unrecognized losses
- Will be recognized over the next four years
- Roughly ½ of gain applies to the annuitant reserve, the other half shared by active members and employers
- May decrease probability of future positive annuity adjustments

# Operation of Market Recognition Account (MRA)

## – \$ Millions **2022 Valuation**

	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>
Actual Investment Earnings	\$ (17,445)				
Assumed Investment Earnings	7,894				
Gain/(Loss) to be phased-in	(25,339)				
Phased-in recognition					
• Current year	\$ (5,068)	?	?	?	?
• First prior year	2,495	\$ (5,068)	?	?	?
• Second prior year	1,774	2,495	\$(5,068)	?	?
• Third prior year	2,204	1,774	2,495	\$ (5,068)	?
• Fourth prior year	<u>(2,049)</u>	<u>2,204</u>	<u>1,774</u>	<u>2,495</u>	<u>\$ (5,068)</u>
Total recognized gain (loss)	\$ (644)	\$ 1,405	\$ (799)	\$ (2,573)	\$ (5,068)

**2023-2026: Expect \$7.0 billion in deferred asset LOSSES**  
**-- Shared by annuitants, actives and employers**



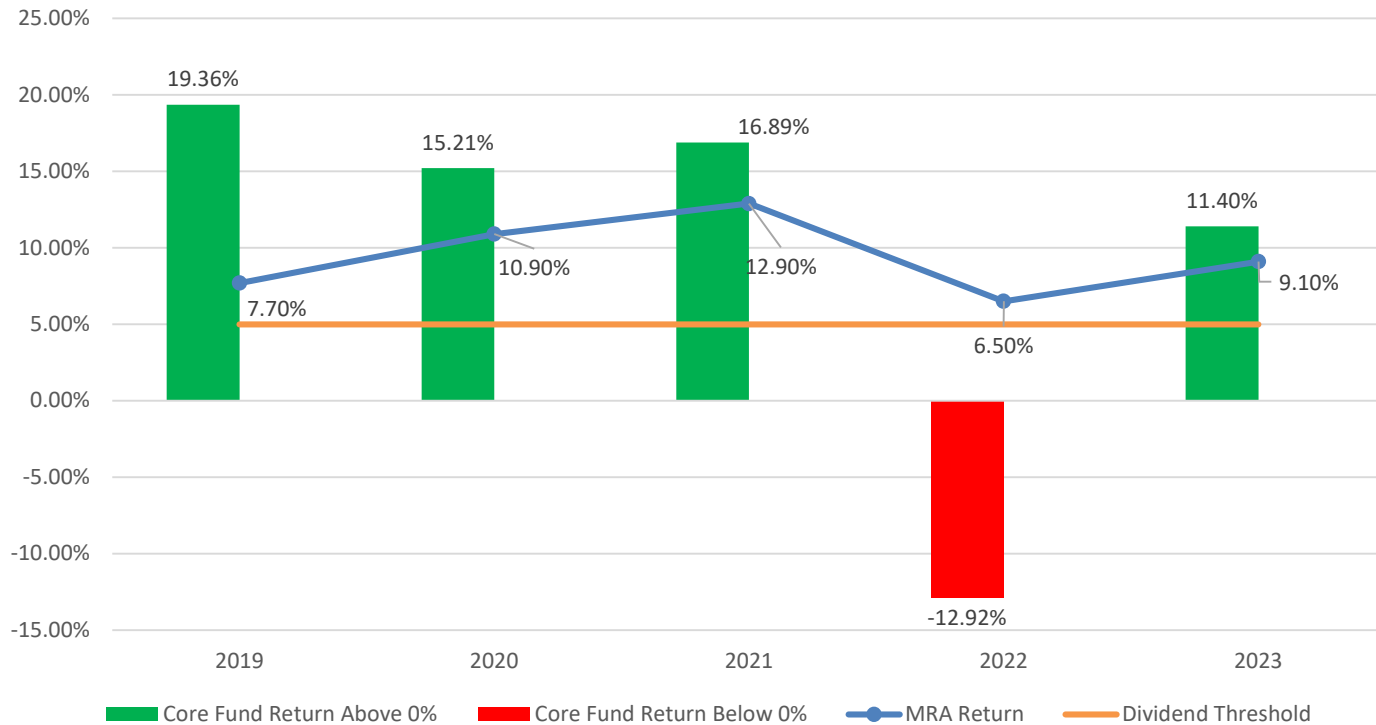
# Operation of Market Recognition Account (MRA)

## – \$ Millions **2023 Valuation**

	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>
Actual Investment Earnings	\$ 12,721				
Assumed Investment Earnings	8,082				
Gain/(Loss) to be phased-in	4,639				
Phased-in recognition					
• Current year	\$ 928	?	?	?	?
• First prior year	(5,068)	\$ 928	?	?	?
• Second prior year	2,495	(5,068)	\$ 928	?	?
• Third prior year	1,773	2,495	(5,068)	\$ 928	?
• Fourth prior year	2,204	1,773	2,495	(5,068)	\$ 928
Total recognized gain (loss)	\$ 2,332	\$ 128	\$ (1,645)	\$ (4,140)	\$ 928

**2024-2027: Expect \$4.7 billion in deferred asset Losses**  
**-- Shared by annuitants, actives and employers**

# Core Fund Returns – Market Value vs. Market Recognition Account



# Asset Rate of Return Calculation

$$\text{Rate of Return} = \text{Investment Earnings} / \text{Asset Value}$$

- Rate of Return will vary based on calculation inputs:
  - Asset value could be smoothed or unsmoothed
  - Asset value could be beginning, middle or end of year
  - Timing of Contributions and Benefit Payments will vary
- Result is different Rate of Return calculated by:
  - SWIB (investment manager)
  - ETF (calculations governed by statute)
  - GRS (actuaries)

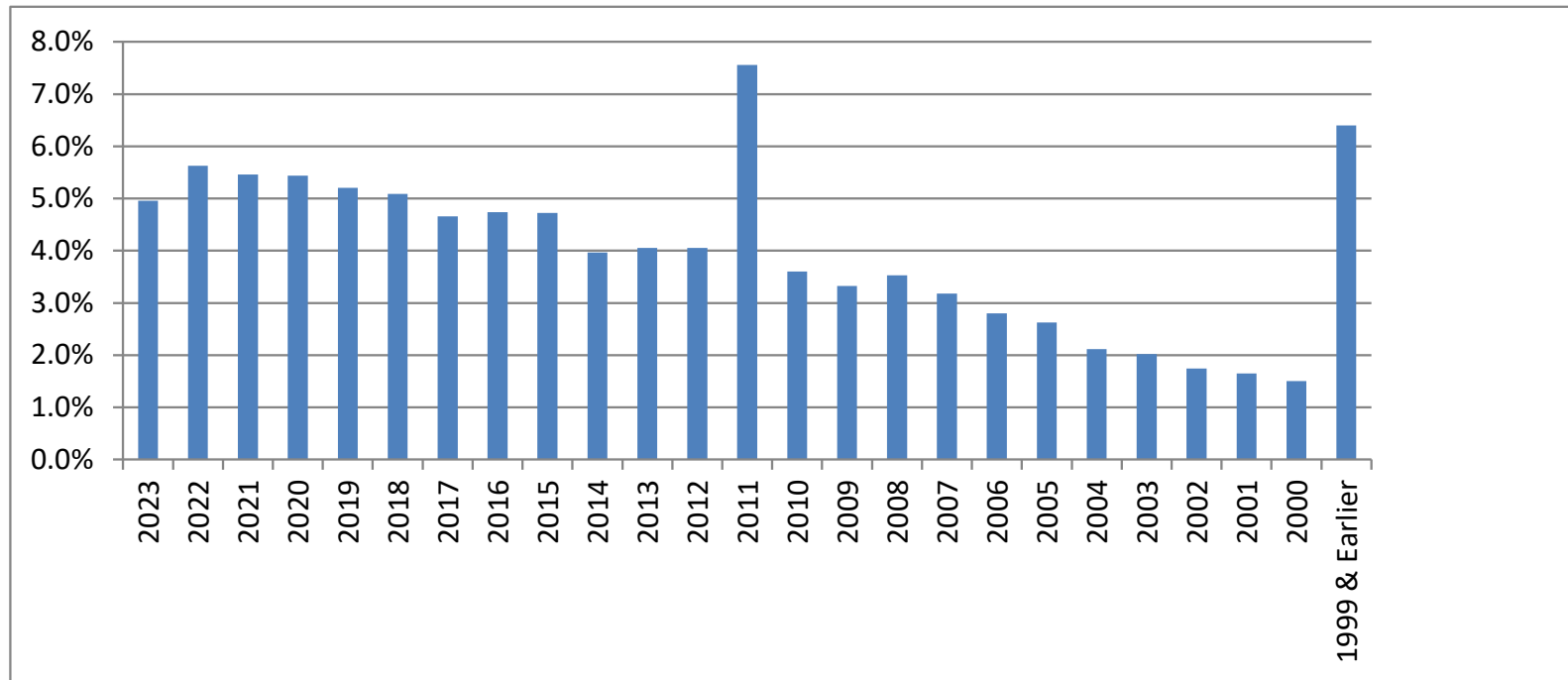
# Primary Sources of Core Dividend

	<u>% of APV<sup>(1)</sup></u>
1. SWIB net of fee investment return	11.40%
2. MRA adjustment	(2.30)%
3. Published effective earnings rate	9.10%
4. Adjustment to relate earnings to average core annuity fund balance	<u>(0.42)%</u>
5. Earnings rate based on average balance	8.68%
6. Expected dividend before adjustments: 1.0868/1.05-1	3.50%
7. Adjustment to relate average asset to ending liability	0.07%
8. Carryover from last year due to timing of dividend, accounting adjustments and rounding	0.05%
9. Experience study adjustment	0.00%
10. Experience and other effects	(0.01)%
11. Statutory adjustment to round to nearest one-tenth percent	<u>(0.01)%</u>
12. <b>Computed average dividend rate: (6)+(7)+(8)+(9)+(10)+(11)</b>	<b>3.6%</b>
13. Adjustment for members at or near the statutory floor	0.0%
14. <b>Final computed dividend rate: (12)+(13), if greater than 0.5% (or less than -0.5%) of core annuities, otherwise 0%</b>	<b>3.6%</b>

<sup>(1)</sup> Actuarial Present Value

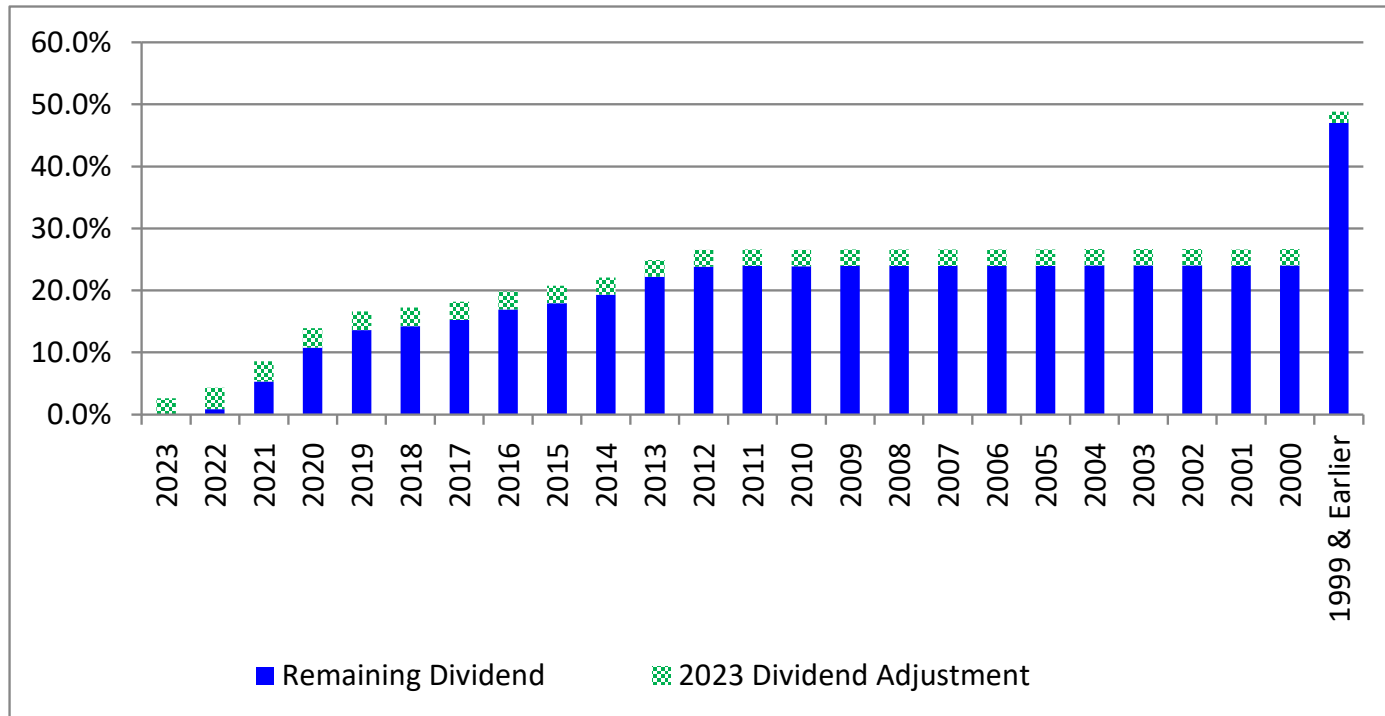


# Liabilities (as a Percentage of Total) by Year of Retirement



(Report-7)

# Dividend Remaining (as a Percentage of Total Benefit) by Year of Retirement



(Report-7)



# Liability Attributable to Dividends – “Dividend Liability”

<b>Valuation</b>	<b>Liability for Dividend Remaining (billions)</b>	<b>Liability for Dividend Adjustment (billions)</b>	<b>Liability after Dividend Adjustment (billions)</b>
12/31/2014	\$4.6	\$1.3	\$5.9
12/31/2015	5.5	0.2	5.7
12/31/2016	5.4	1.0	6.4
12/31/2017	6.1	1.3	7.4
12/31/2018	6.9	0.0	6.9
12/31/2019	6.5	1.0	7.5
12/31/2020	7.0	3.1	10.1
12/31/2021	9.4	4.8	14.2
12/31/2022	13.4	1.1	14.5
12/31/2023	13.7	2.7	16.4

- “Liability for dividend remaining” = value of all previously granted dividends
  - (\$9.2 Billion at 12/31/2008 decreasing to \$3.0 Billion at 12/31/2013)
- 2024 “liability for dividend remaining” is >2008, BUT as a percentage of total liabilities, it is smaller
- Substantial asset losses could decrease the “liability for dividend remaining” to low levels

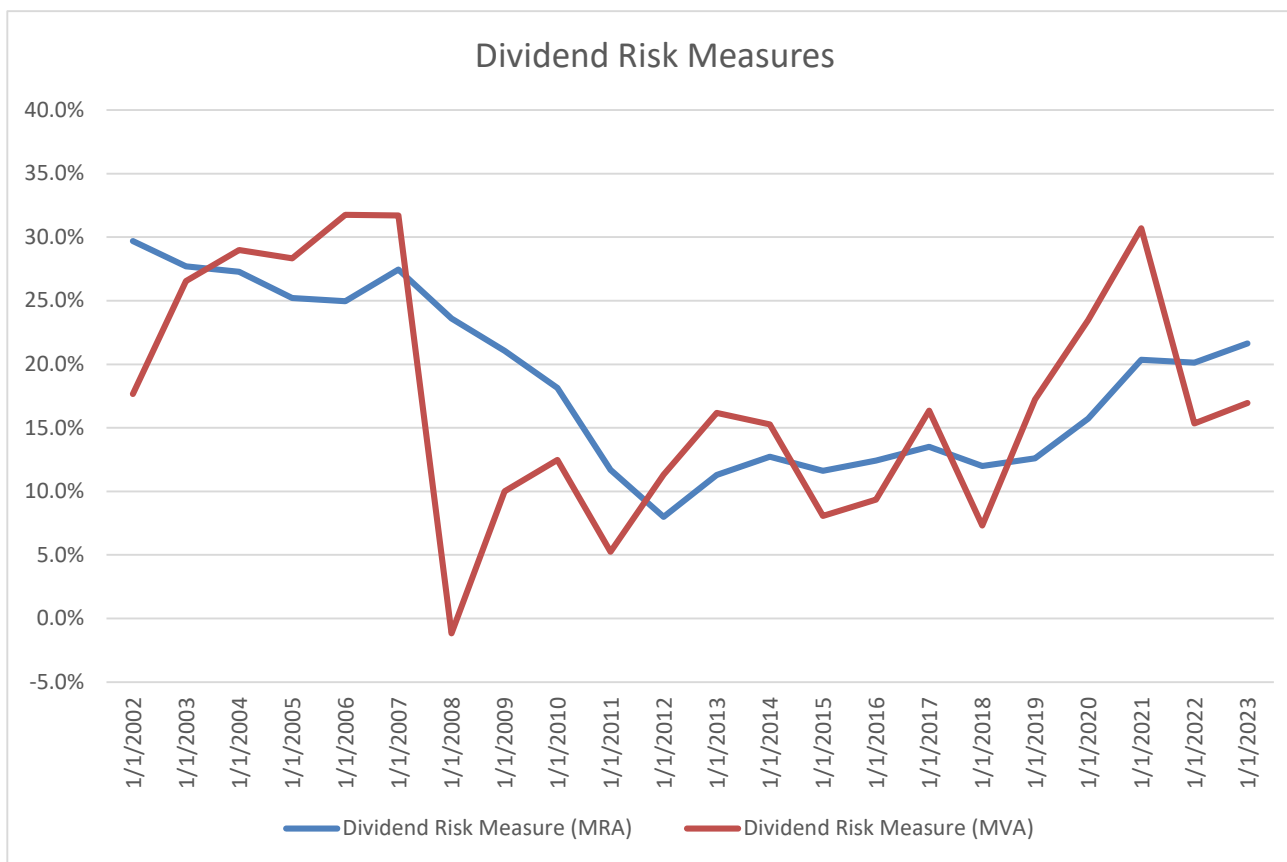
# Dividend Risk Measure (MRA)

---

- Dividend Liability (after Dividend adjustment in April) / Total Core Retiree Assets
- Example (2023)
  - Dividend Liability = \$16.4 billion
  - Total Retiree Assets (Core) = \$75.6 billion
  - Dividend Risk Measure =  $16.4/75.6 = 21.6\%$
- In other words, Retiree Assets (after MRA smoothing) would need to decrease by 21.6% to deplete the existing Dividend Liability by year end
- Dividend Risk Measure was 20.1% last year

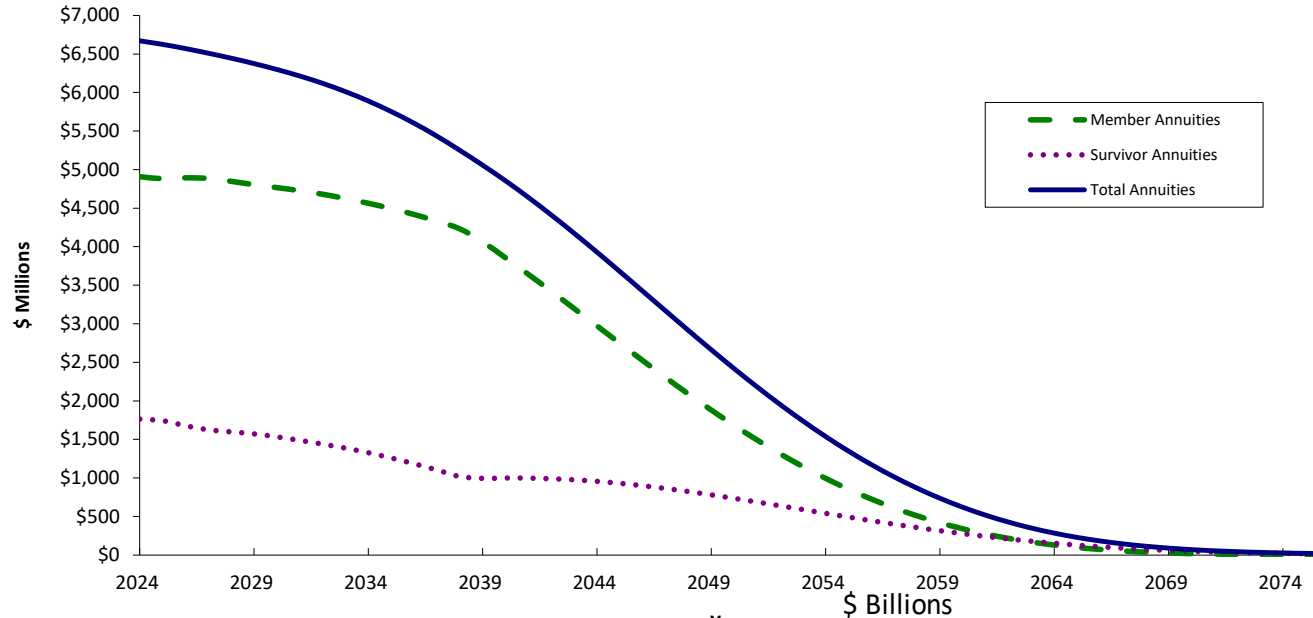


# Dividend Risk Measures History\*



\*Higher values are desirable.

# Projected Future Core Annuities



	Year	\$ Billions
	<u>With Expected Dividends</u>	<u>Without Expected Dividends</u>
Total Future Benefit Payments	\$153.0	\$121.7
Present Assets	75.6	75.6
Future Investment Return Needed	77.4	46.1

Based upon the assumptions used in the valuation, future dividends are expected to be approximately 1.7% per year. Of course actual dividends will be based upon actual future investment return and the operation of the Market Recognition Account.

(Report-13)



# Primary Sources of Variable Adjustment

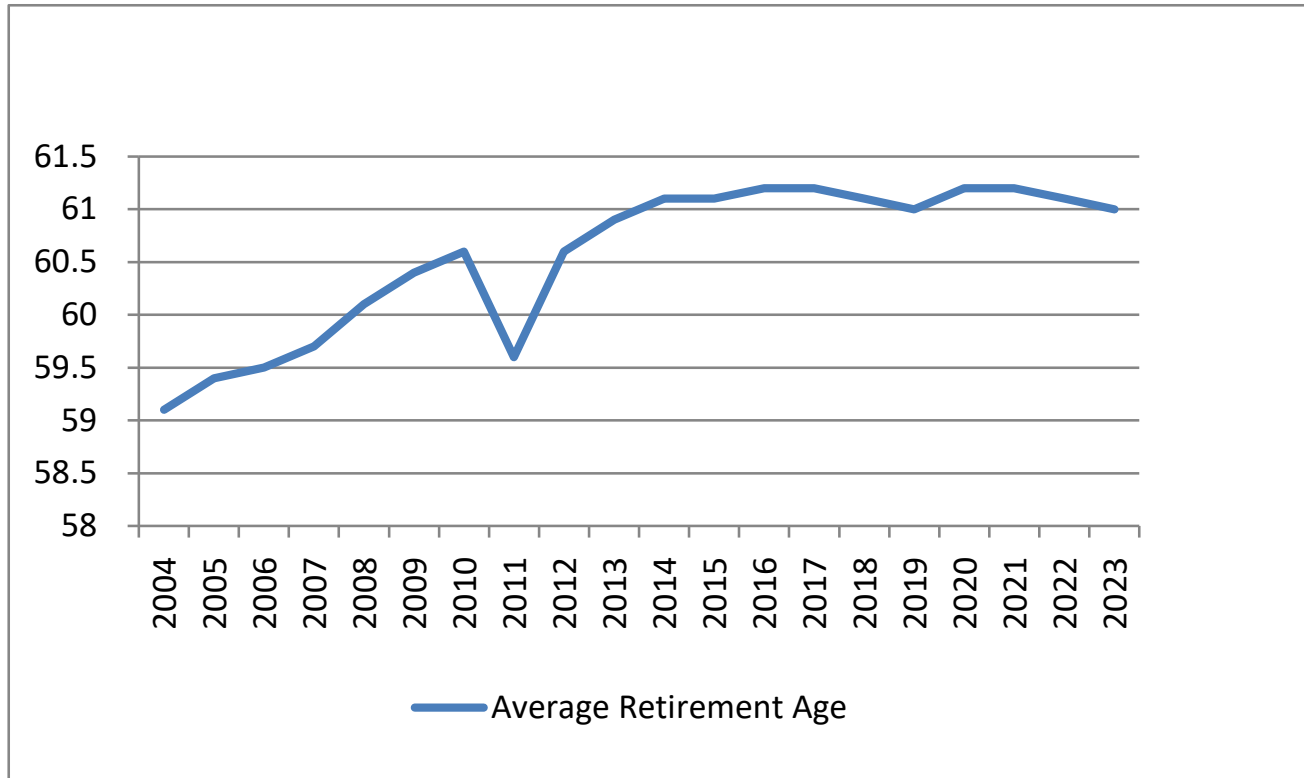
	<u>% of APV<sup>(1)</sup></u>
1. SWIB net of fee investment return	22.2%
2. Adjustment to published effective rate	<u>(0.2)%</u>
3. Published effective earnings rate	22.0%
4. Adjustment to relate earnings to average variable annuity fund balance	<u>(0.5)%</u>
5. Earnings rate based on average balance	21.5%
6. Expected change before adjustments: $1.215/1.05-1$	15.7%
7. Adjustment to relate average asset to ending liability	0.3%
8. Carryover from last year due to timing of distribution, accounting adjustments and truncation	(0.7)%
9. Experience study adjustment	0.0%
10. Experience and other effects	0.2%
11. Statutory adjustment: (truncate to whole percent)	<u>(0.5)%</u>
<b>12. Variable annuity change: (6)+(7)+(8)+(9)+(10)+(11)</b>	<b>15.0%</b>

<sup>(1)</sup> Actuarial Present Value



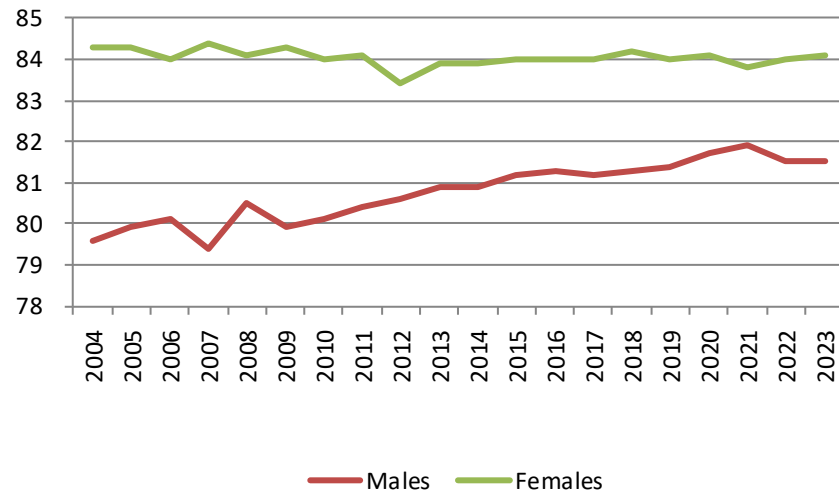
# Average Retirement Age

---



# Average Age at Death

Average age at death, while an interesting statistic, is not a proper measure of life expectancy, because it does not include people who have not yet died. The expected age at death for a healthy 65-year-old retiree is 87.0 for males and 89.0 for females.



# Comparative Statement – Core

Valuation Date	Number	\$ Millions				Change in		
		Annual Annuities	Fund Balance	Actuarial Reserve	Ratio	Annuities		CPI*
						Average	Maximum	
2014	185,605	\$ 4,102.3	\$ 47,135.7	\$ 45,790.7	1.029	2.9 %		0.8 %
2015	191,795	4,364.9	49,147.0	48,897.5	1.005	0.5 %		0.7 %
2016	197,647	4,523.1	51,972.0	50,941.4	1.020	2.0 %		2.1 %
2017	203,202	4,747.0	54,900.0	53,590.0	1.024	2.4 %		2.1 %
2018	211,126	5,040.9	56,493.8	56,629.3	0.998	0.0 %		1.9 %
2019	216,944	5,183.7	59,138.4	58,157.0	1.017	1.7 %		2.3 %
2020	222,723	5,423.2	63,805.8	60,691.1	1.051	5.1 %		1.4 %
2021	228,161	5,842.6	69,910.7	65,085.4	1.074	7.4 %		7.0 %
2022	233,804	6,409.7	72,108.4	70,987.2	1.016	1.6%		6.5 %
2023	238,111	6,639.1	75,583.6	72,951.6	1.036	3.6%		3.4 %
<b>35-Year Average</b>						<b>3.4 %</b>		<b>2.7 %</b>
<b>20-Year Average</b>						<b>1.6 %</b>		<b>2.6 %</b>
<b>10-Year Average</b>						<b>2.7 %</b>		<b>2.8 %</b>
<b>5-Year Average</b>						<b>3.9 %</b>		<b>4.1 %</b>

*\*Based on December CPI-U67 index.*

**(Report-21)**

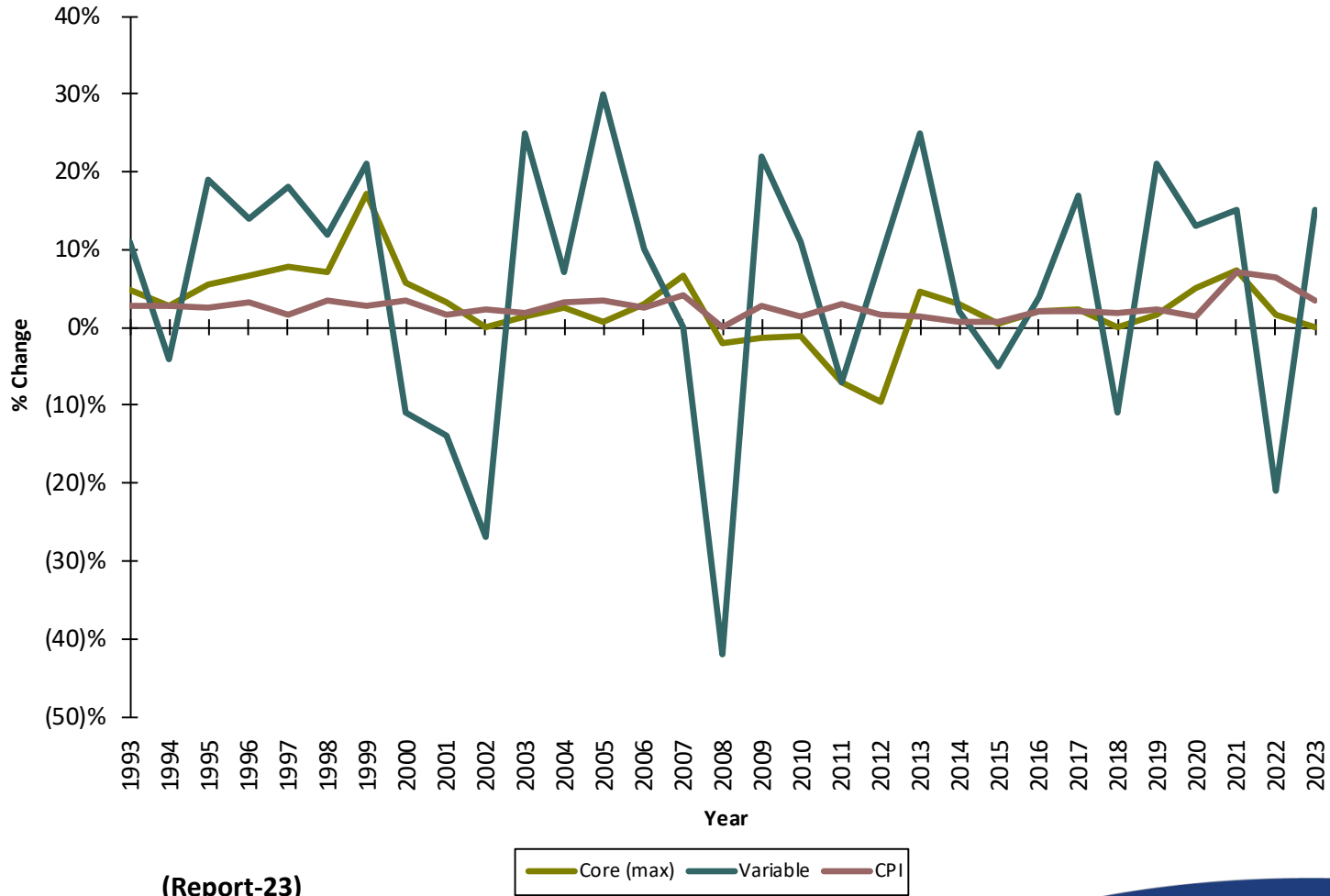
# Comparative Statement – Variable

Valuation Date	Number	\$ Millions				Change in	
		Annual Annuities	Fund Balance	Actuarial Reserve	Ratio	Annuities	CPI*
2014	39,420	\$ 386.5	\$ 3,995.4	\$ 3,917.1	1.020	2.0 %	0.8 %
2015	40,152	387.8	3,704.8	3,910.1	0.947	(5.0)%	0.7 %
2016	40,647	363.6	3,792.0	3,645.1	1.040	4.0 %	2.1 %
2017	40,877	369.9	4,324.9	3,682.1	1.175	17.0 %	2.1 %
2018	41,187	425.8	3,738.6	4,207.6	0.891	(10.0)%	1.9 %
2019	41,777	379.7	4,519.4	3,728.6	1.212	21.0 %	2.3 %
2020	41,753	449.7	4,954.0	4,383.0	1.130	13.0 %	1.4 %
2021	42,251	502.6	5,618.0	4,866.0	1.155	15.0 %	7.0 %
2022	43,007	578.5	4,403.0	5,586.5	0.788	(21.0)%	6.5 %
2023	43,560	457.8	5,089.2	4,404.8	1.155	15.0 %	3.4 %
<b>35-Year Average</b>						<b>3.8 %</b>	<b>2.7 %</b>
<b>20-Year Average</b>						<b>3.1 %</b>	<b>2.6 %</b>
<b>10-Year Average</b>						<b>4.2 %</b>	<b>2.8 %</b>
<b>5-Year Average</b>						<b>7.4 %</b>	<b>4.1 %</b>

\*Based on December CPI-U67 index.

(Report-22)

# History of % Dividend Adjustments





# Looking Ahead

---

- As of the December 31, 2023 valuation, there are about \$4.7 billion in unrecognized asset losses in the Core fund
  - About half of this will be applied to annuitant reserve
  - Will be recognized over the next four years
  - May decrease probability of future positive annuity adjustments
- We will continue monitoring various plan risks, including dividend liability risk

# WRS STRESS TESTING

This is a brief summary of the material presented to the SWIB Board in 4<sup>th</sup> quarter, 2023

# Objectives of this Presentation

---

- Provide an overview of the WRS
  - Relationship of Investment Return to Success Measures
  - Effects of bad outcomes
- Evaluate several points along the asset allocation spectrum against the measures of success
  - Deterministic stress tests
  - Stochastic simulations
- Find the “Sweet Spot” if it exists



# Monte Carlo Simulations

- Based on 10,000 random trials (normal distribution)
- Valuation Assumptions held constant
- Assumes nine sets of expected return/standard deviations (provided by NEPC)

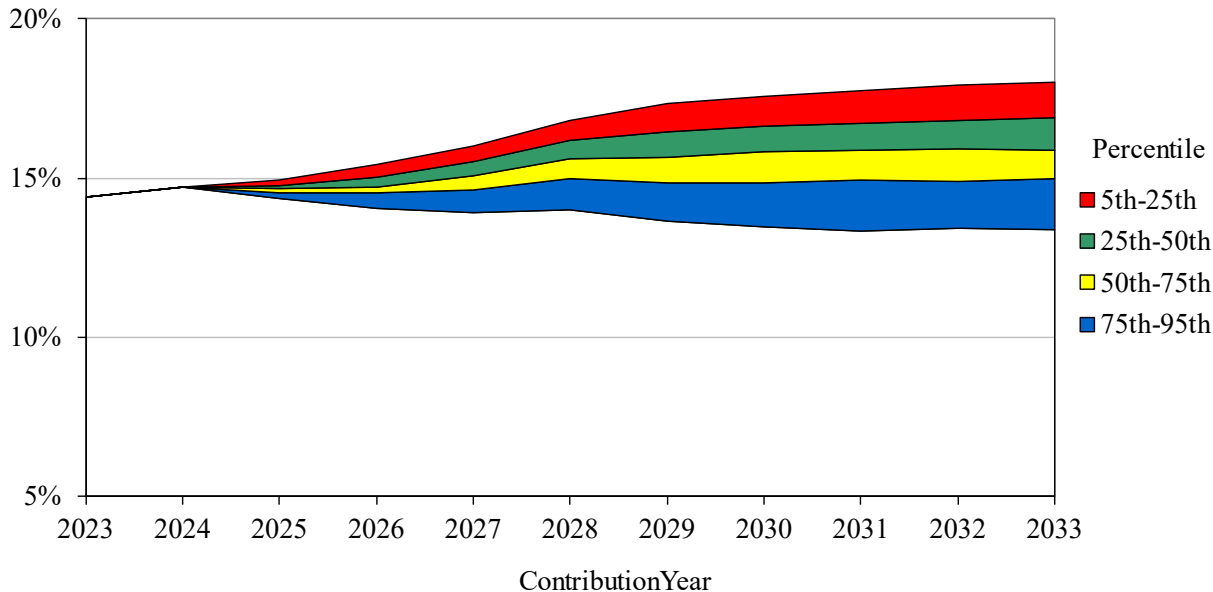
Actuarial  
Rate 6.8%



	Expected Return		Standard Deviation	
	Geometric	Arithmetic	2023	2021
Scenario 1	4.0%	4.1%	3.8%	6.9%
Scenario 2	5.0%	5.1%	4.6%	11.3%
Scenario 3	5.5%	5.6%	5.5%	N/A
Scenario 4	6.0%	6.4%	9.4%	15.5%
Scenario 5	6.5%	7.2%	12.9%	N/A
Scenario 6	7.0%	7.8%	13.6%	20.4%
Scenario 7	7.5%	8.7%	17.1%	N/A
Scenario 8	8.0%	10.0%	22.4%	26.3%
Scenario 9	9.0%	12.1%	28.1%	33.7%

# Contribution as a % of Payroll

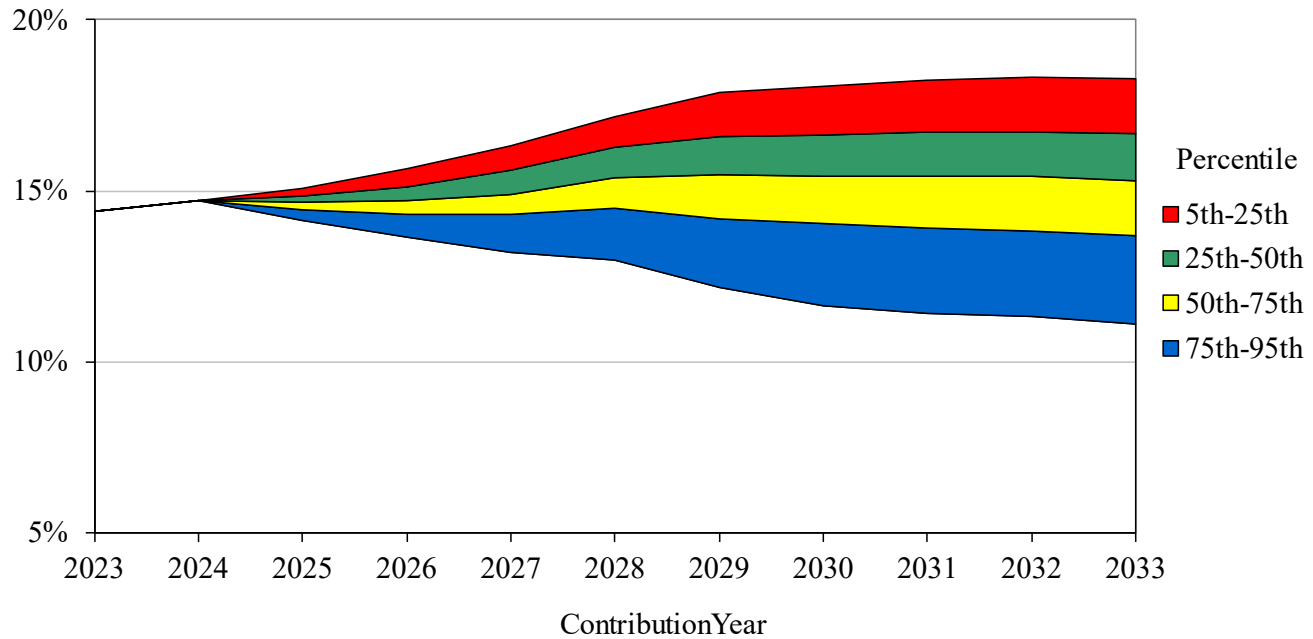
## Scenario 4 – 6.0% Return, 9.4% Volatility



<b>5th Percentile</b>	14.4%	14.7%	15.0%	15.4%	16.0%	16.8%	17.4%	17.5%	17.7%	17.9%	18.0%
<b>25th Percentile</b>	14.4%	14.7%	14.8%	15.0%	15.5%	16.2%	16.5%	16.6%	16.7%	16.8%	16.9%
<b>Median</b>	14.4%	14.7%	14.7%	14.7%	15.1%	15.6%	15.7%	15.8%	15.9%	15.9%	15.9%
<b>75th Percentile</b>	14.4%	14.7%	14.6%	14.5%	14.6%	15.0%	14.9%	14.8%	14.9%	14.9%	15.0%
<b>95th Percentile</b>	14.4%	14.7%	14.4%	14.0%	13.9%	14.0%	13.7%	13.4%	13.3%	13.4%	13.4%

# Contribution as a % of Payroll

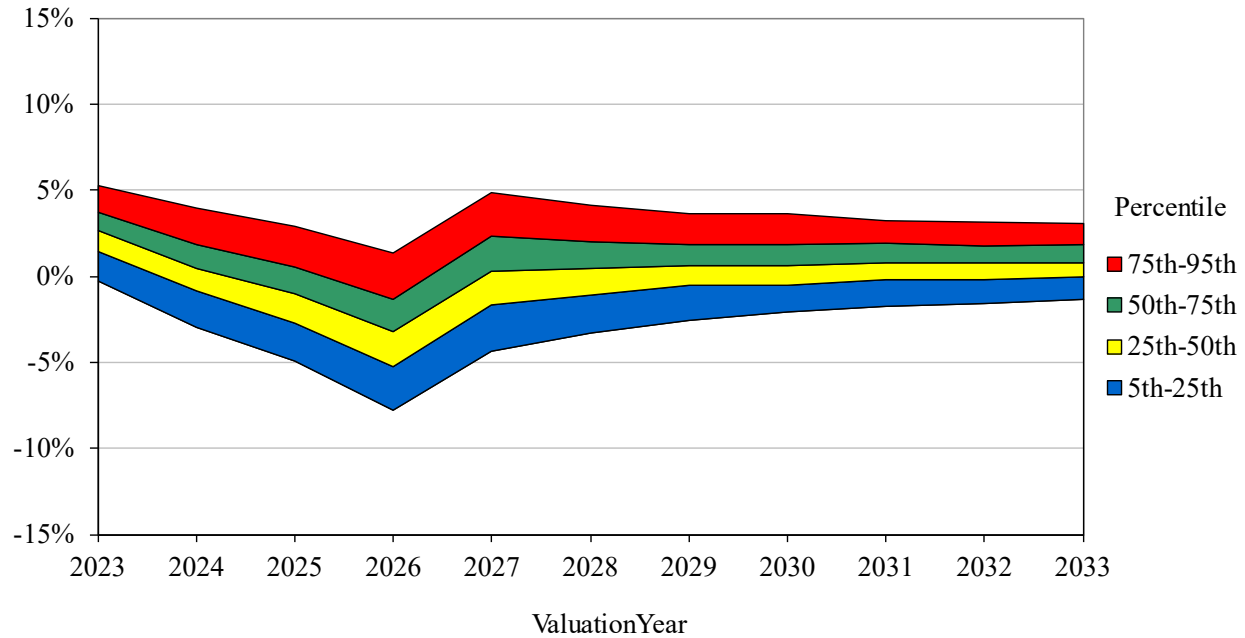
## Scenario 6 – 7.0% Return, 13.6% Volatility



<b>5th Percentile</b>	14.4%	14.7%	15.1%	15.6%	16.3%	17.2%	17.9%	18.0%	18.2%	18.3%	18.3%
<b>25th Percentile</b>	14.4%	14.7%	14.9%	15.1%	15.6%	16.3%	16.6%	16.6%	16.7%	16.7%	16.7%
<b>Median</b>	14.4%	14.7%	14.7%	14.7%	14.9%	15.4%	15.5%	15.4%	15.4%	15.4%	15.3%
<b>75th Percentile</b>	14.4%	14.7%	14.5%	14.3%	14.3%	14.5%	14.2%	14.0%	13.9%	13.8%	13.7%
<b>95th Percentile</b>	14.4%	14.7%	14.2%	13.6%	13.2%	13.0%	12.2%	11.6%	11.4%	11.3%	11.1%

# Dividend Rates

## Scenario 4 – 6.0% Return, 9.4% Volatility

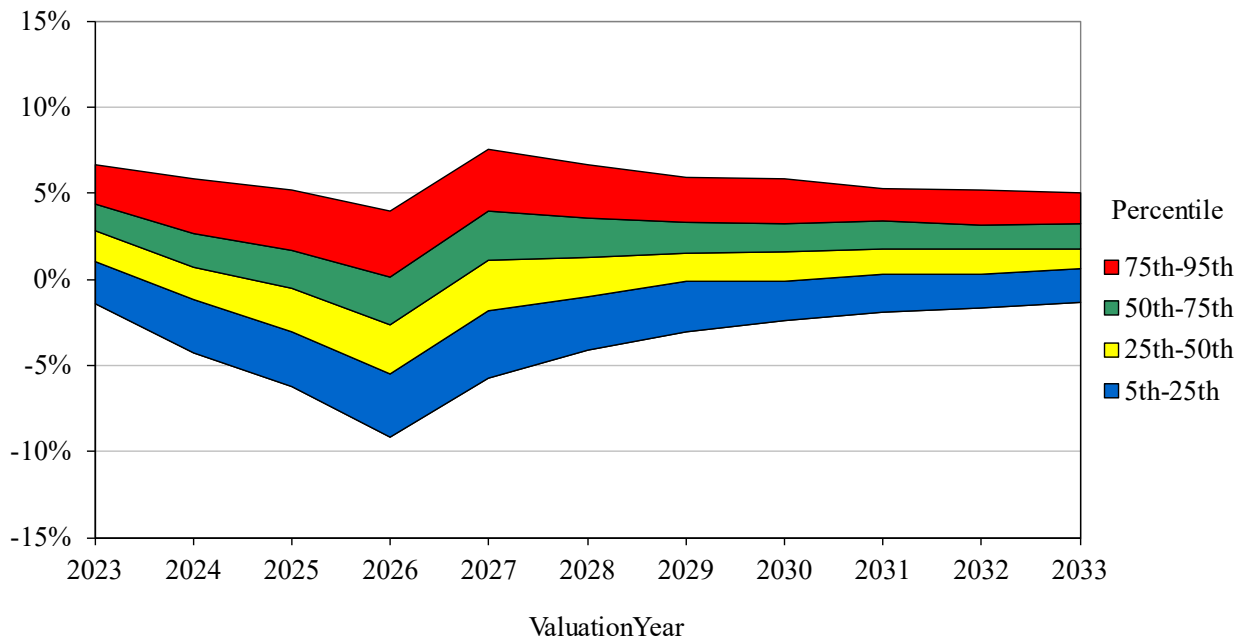


<b>5th Percentile</b>	-0.3%	-3.0%	-4.9%	-7.7%	-4.3%	-3.3%	-2.5%	-2.1%	-1.7%	-1.6%	-1.3%
<b>25th Percentile</b>	1.4%	-0.9%	-2.8%	-5.2%	-1.7%	-1.1%	-0.5%	-0.5%	-0.2%	-0.2%	0.0%
<b>Median</b>	2.6%	0.5%	-1.0%	-3.2%	0.3%	0.5%	0.6%	0.7%	0.8%	0.8%	0.8%
<b>75th Percentile</b>	3.7%	1.8%	0.5%	-1.3%	2.3%	2.0%	1.8%	1.8%	1.9%	1.8%	1.8%
<b>95th Percentile</b>	5.3%	4.0%	2.9%	1.3%	4.9%	4.2%	3.7%	3.7%	3.3%	3.2%	3.1%



# Dividend Rates

## Scenario 6 – 7.0% Return, 13.6% Volatility



<b>5th Percentile</b>	-1.4%	-4.3%	-6.2%	-9.2%	-5.7%	-4.1%	-3.0%	-2.4%	-1.9%	-1.7%	-1.4%
<b>25th Percentile</b>	1.1%	-1.2%	-3.1%	-5.5%	-1.8%	-1.0%	-0.1%	-0.1%	0.3%	0.3%	0.6%
<b>Median</b>	2.8%	0.7%	-0.5%	-2.6%	1.1%	1.3%	1.5%	1.6%	1.8%	1.8%	1.8%
<b>75th Percentile</b>	4.4%	2.7%	1.7%	0.2%	4.0%	3.6%	3.3%	3.3%	3.4%	3.2%	3.2%
<b>95th Percentile</b>	6.7%	5.9%	5.2%	4.0%	7.6%	6.6%	5.9%	5.9%	5.2%	5.2%	5.0%



# Stress Testing Dividend Depletion and Retiree Funded Status

---

- Definitions
  - Dividend Liability = Total Retiree Liability (w/div.)  
less Base Benefit Liability (w/o div.)
  - Retiree Funded Status =  
Total Retiree Liability (w/div.) / Base Benefit Liability  
(w/o div.)
- Dividend Stress Test studied
  - Probability that dividend liability will be depleted
  - Number of paths leading to Dividend Depletion
  - Worst case scenario of Retiree Funded Status
  - Depletion Severity measure

# Stress Testing Dividend Depletion and Retiree Funded Status

---



Probability {Dividend Depletion in  
Year i}

Represents the number of times the Retiree Funded Status is less than 1 in year  $i$  divided by 10,000 (allows for recovery in future years)

# Dividend Stress Test

**Probability That Dividend Liability Will Be Depleted in Year  
(allows for recovery in future year)**

Actuarial  
Rate 6.8%



	Expected ROR	Standard Deviation	Year				
			1	5	10	20	50
1	4.0%	3.8%	0%	0%	20%	91%	100%
2	5.0%	4.6%	0%	0%	4%	18%	71%
3	5.5%	5.5%	0%	0%	3%	6%	12%
4	6.0%	9.4%	0%	5%	10%	8%	5%
5	6.5%	12.9%	0%	10%	14%	10%	3%
6	7.0%	13.6%	0%	10%	12%	7%	1%
7	7.5%	17.1%	0%	15%	15%	8%	1%
8	8.0%	22.4%	0%	22%	21%	12%	2%
9	9.0%	28.1%	0%	25%	24%	13%	2%

# Stress Testing Dividend Depletion and Retiree Funded Status

---



Percentage of Paths Leading to  
Dividend Depletion on or before  $i$

Counts the number of times on or before year  $i$  the Retiree Funded Status is less than 1 (does not allow for recovery in future years)

# Dividend Stress Test

## Percentage of Paths Leading to Dividend Depletion on or before Year $i$

Actuarial  
Rate 6.8%



	Expected ROR	Standard Deviation	Year				
			1	5	10	20	50
1	4.0%	3.8%	0%	0%	20%	91%	100%
2	5.0%	4.6%	0%	0%	4%	18%	73%
3	5.5%	5.5%	0%	0%	3%	7%	18%
4	6.0%	9.4%	0%	5%	12%	14%	18%
5	6.5%	12.9%	0%	10%	17%	20%	21%
6	7.0%	13.6%	0%	10%	16%	17%	18%
7	7.5%	17.1%	0%	15%	21%	22%	23%
8	8.0%	22.4%	0%	22%	28%	29%	29%
9	9.0%	28.1%	0%	25%	32%	32%	33%

# Stress Testing Dividend Depletion and Retiree Funded Status

---



## Worst Case Scenario of Retiree Funded Status

Finds the 5<sup>th</sup> percentile of retiree funded status for any given year in any given scenario (very unlikely scenario)

# Dividend Stress Test

## Worst Case Scenario of Retiree Funded Status (% of Floor Benefit That Is Funded)

	Expected ROR	Standard Deviation	Year				
			1	5	10	20	50
1	4.0%	3.8%	126%	107%	96%	81%	51%
2	5.0%	4.6%	126%	108%	101%	94%	78%
3	5.5%	5.5%	126%	108%	103%	100%	95%
4	6.0%	9.4%	124%	100%	95%	96%	101%
5	6.5%	12.9%	123%	94%	89%	91%	108%
6	7.0%	13.6%	123%	94%	91%	97%	131%
7	7.5%	17.1%	122%	88%	84%	92%	139%
8	8.0%	22.4%	120%	77%	73%	80%	131%
9	9.0%	28.1%	118%	67%	64%	74%	148%

Actuarial Rate 6.8% →

Worst Case Scenario based on 5<sup>th</sup> percentile (i.e., 5% probability)

# Stress Testing Dividend Depletion and Retiree Funded Status

---



## Depletion Severity Measure

Of the stress test simulations that result in a Retiree Funded Status of less than 1, finds the average Retiree Funded Status (or degree of depletion)



# Dividend Stress Test

## Depletion Severity Measure

### Average Retiree Funded Status for Depletion Scenarios

	Expected ROR	Standard Deviation	Year				
			1	5	10	20	50
1	4.0%	3.8%	N/A	97%	96%	90%	60%
2	5.0%	4.6%	N/A	98%	97%	95%	89%
3	5.5%	5.5%	N/A	96%	96%	95%	93%
4	6.0%	9.4%	N/A	94%	93%	92%	89%
5	6.5%	12.9%	N/A	91%	89%	88%	87%
6	7.0%	13.6%	N/A	91%	89%	89%	91%
7	7.5%	17.1%	N/A	88%	85%	85%	87%
8	8.0%	22.4%	N/A	84%	80%	81%	80%
9	9.0%	28.1%	N/A	79%	75%	76%	77%

Actuarial Rate 6.8% →

# Dividend Stress Test Observations

---

- The low risk scenarios are actually risky in the sense that, for example, 4% and 5% expected return has a much higher chance of dividend depletion in later years than higher risk scenarios
- Must balance short and long term volatility
- Consider probability of dividend depletion
- Consider level of worst case scenario that is acceptable

# Combination of All Scenarios

## 2033 Results by %-tile of Investment Return Outcomes

	ROR	StdDev	Contribution Rates			Dividend Rates			Highest	Worst Retiree
			95th	50th	5th	95th	50th	5th	Div. Dep. PRB	Funded %
1	4.0%	3.8%	16.4%	17.2%	18.0%	-0.2%	-1.1%	-2.0%	100%/Year50	51%/Year50
2	5.0%	4.6%	15.5%	16.6%	17.6%	1.0%	-0.1%	-1.2%	73%/Year50	78%/Year50
3	5.5%	5.5%	14.9%	16.2%	17.5%	1.7%	0.4%	-0.9%	18%/Year50	95%/Year50
4	6.0%	9.4%	13.4%	15.9%	18.0%	3.1%	0.8%	-1.3%	18%/Year50	95%/Year10
5	6.5%	12.9%	11.9%	15.6%	18.4%	4.4%	1.3%	-1.7%	21%/Year50	89%/Year10
6	7.0%	13.6%	11.1%	15.3%	18.3%	5.0%	1.8%	-1.4%	18%/Year50	91%/Year10
7	7.5%	17.1%	9.3%	15.0%	18.7%	6.3%	2.3%	-1.7%	23%/Year50	84%/Year10
8	8.0%	22.4%	6.5%	14.7%	19.4%	8.0%	2.7%	-2.5%	29%/Year50	73%/Year10
9	9.0%	28.1%	2.1%	14.1%	20.0%	10.3%	3.5%	-3.0%	33%/Year50	64%/Year10

Actuarial  
Rate 6.8%

- Portfolios with lower expected return result in higher expected contributions and lower expected dividends
- Higher assumed rates of return are associated with higher standard deviation (i.e., risk) and 5<sup>th</sup> percentile scenario for retiree dividend pool falling below 75% (Worst Retiree Funded %)
- Scenarios 4 through 7 represent potential 'Goldilocks Zone'

# 2023 Observations

---

- Changes from 2021 Study
  - Returns over 2021 and 2022 were 16.9% and (12.9)%
    - MRA returns of 12.9% and 6.5%
    - 2021 – 11B in unrecognized gains, 2023 – 7B in unrecognized losses
  - Much lower Standard Deviation than 2021 Study
  - Changes in assumptions (7.0% to 6.8%, mortality, retirement)
  - Additional return breakpoint scenarios (50 bp increments)

# 2023 Observations

---

- Overall results are similar to 2021 study
  - Probability of depleting dividend liability varies due to factors on previous slide
  - Smaller range of dividend/contribution results due to lower standard deviation
- ‘Goldilocks zone’ has widened to 6.0% to 7.5%
  - Provides for positive return with appropriate downside protection

# Questions

---

# Disclaimers

- This presentation shall not be construed to provide tax advice, legal advice or investment advice.
- This presentation is intended to be used in conjunction with the actuarial valuation report for retired lives issued on February 23, 2024. This presentation should not be relied on for any purpose other than the purpose described in the valuation report.
- Readers are cautioned to examine original source materials and to consult with subject matter experts before making decisions related to the subject matter of this presentation.
- This presentation expresses the views of the authors and does not necessarily express the views of Gabriel, Roeder, Smith & Company.