UPCOMING EXPERIENCE STUDY

OREGON PUBLIC EMPLOYEES RETIREMENT SYSTEM

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April 3, 2023

Four-Meeting Process – Assumptions & Methods

- April 3: Summary of process, background, and areas of focus

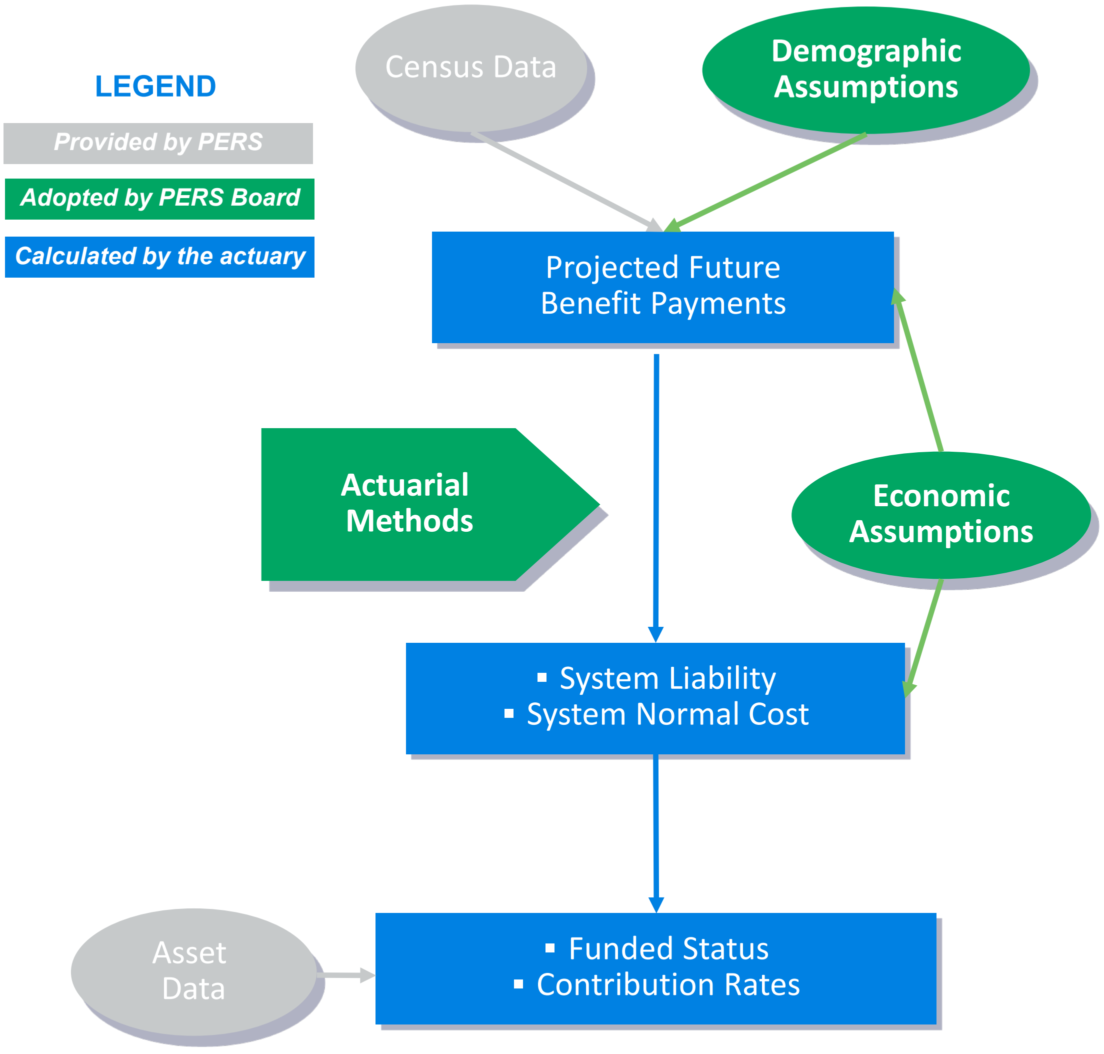
- May 31: Joint meeting with Oregon Investment Council (OIC)
  - Assumed rate – outlooks from OIC's consultants, Milliman

- June 2: Economic assumptions, system funding methods
  - Inflation and system payroll growth
  - Actuarial methods, including amortization and rate collaring policy

- July 28: Demographic assumptions, Board direction to actuary
  - Member-specific assumptions based on study of recent PERS experience
  - Assumptions and methods adopted for use in:
    - 12/31/2022 actuarial valuation with advisory 2025-2027 contribution rates
    - 12/31/2023 actuarial valuation with proposed final 2025-2027 contribution rates

Two-Year Rate-Setting Cycle

- **July 2023: Assumptions & methods adopted by Board in consultation with the actuary**
- September 2023: System-wide 12/31/22 actuarial valuation results
- December 2023: Advisory 2025-2027 employer-specific contribution rates
- July 2024: System-wide 12/31/23 actuarial valuation results
- September 2024: Disclosure & adoption of employer-specific **2025-2027 contribution rates**



Valuation Process and Timeline

- Actuarial valuations are conducted annually
  - Alternate between “rate-setting” and “advisory” valuations
  - This valuation as of 12/31/2022 is advisory
- Board adopts contribution rates developed in rate-setting valuations, and those rates go into effect 18 months after the valuation date

Valuation Date	Employer Contribution Rates
12/31/2019 →	July 2021 – June 2023
12/31/2021 →	July 2023 – June 2025
12/31/2023 →	July 2025 – June 2027

Summary of Assumptions and Methods to Review

Economic Assumptions

- Inflation
- Real wage growth
- System payroll growth
- **Long-term investment return**
- Healthcare cost trend

Actuarial Methods

- Actuarial cost method
- Amortization policy
  - UAL (shortfall) amortization
  - **Side account / PreSLGRP rate adjustments**
- Rate collar
- Contribution lag adjustment

Demographic Assumptions

- Mortality
- Retirement
- Pre-retirement termination
- Disability
- Individual salary increases
- Final average salary adjustments
- Member redirect offsets
- RHIA & RHIPA assumptions

*Background information for **bold** topics discussed on following slides*

Long-Term Investment Return ("The Assumed Rate")

The Assumed Rate: What Is It?

- Assumed rate: expected average annual **future** investment return

- PERS Board sets the assumed rate every two years
  - This year the rate will be selected at the July 28 meeting

- The assumed rate is used to determine:
  - The contribution cost rate for benefits earned in the future (normal cost rate)
  - The system's current unfunded actuarial liability (UAL)
  - The contribution cost rate to systematically amortize UAL over time (UAL rate)
  - Actuarial equivalence factors (AEFs) for amounts of optional benefit forms
  - AEFs to convert account balances to "money match" annuities for Tiers 1 & 2
  - Account balance interest crediting level for Tier 1 actives

Use of the Assumed Rate

The PERS Funding Equation

At the end of each calendar year, the PERS actuaries calculate the system's funded status using the following basic equation:

B	=	C	+	E
BENEFITS		CONTRIBUTIONS		EARNINGS
Present value of earned benefits		*Employer funds to pay for pension benefits*		*Future returns on investment funds*
Set by: Oregon Legislature		Set by: PERS Board		Managed by: Oregon Investment Council

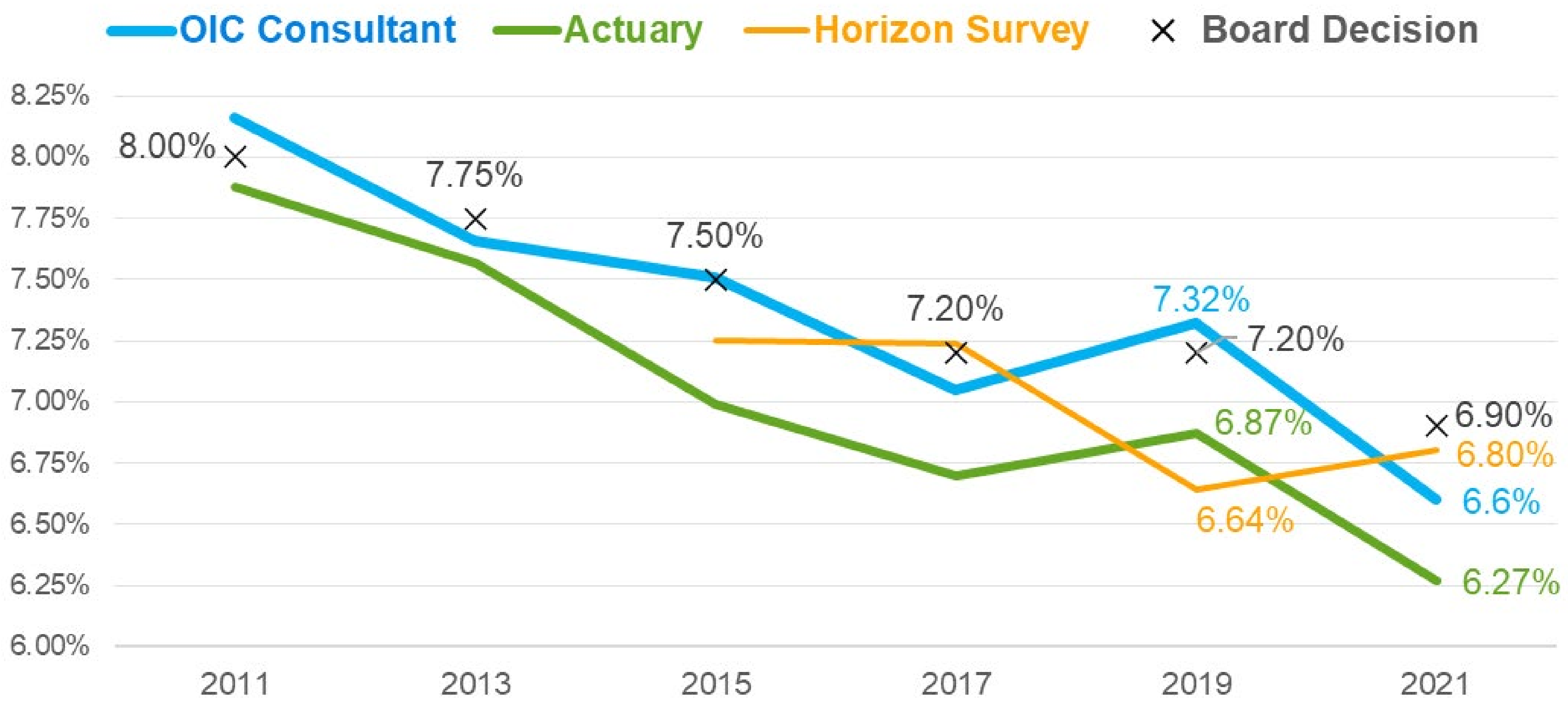
Every two years, the PERS Board adjusts contribution rates so that, over time, contributions will be sufficient to fund the benefits earned, if earnings follow assumptions.

- "B" is predictable with a relatively high degree of certainty
- "E" is the unpredictable **actual** future investment return on PERS assets
- "C" is the balancing item --- it must provide to "B" what "E" fails to cover

- The **assumed rate** is the Board's estimate of "E" to prudently set "C"
- The Board's decision on the estimated "E" does **not** affect actual future earnings

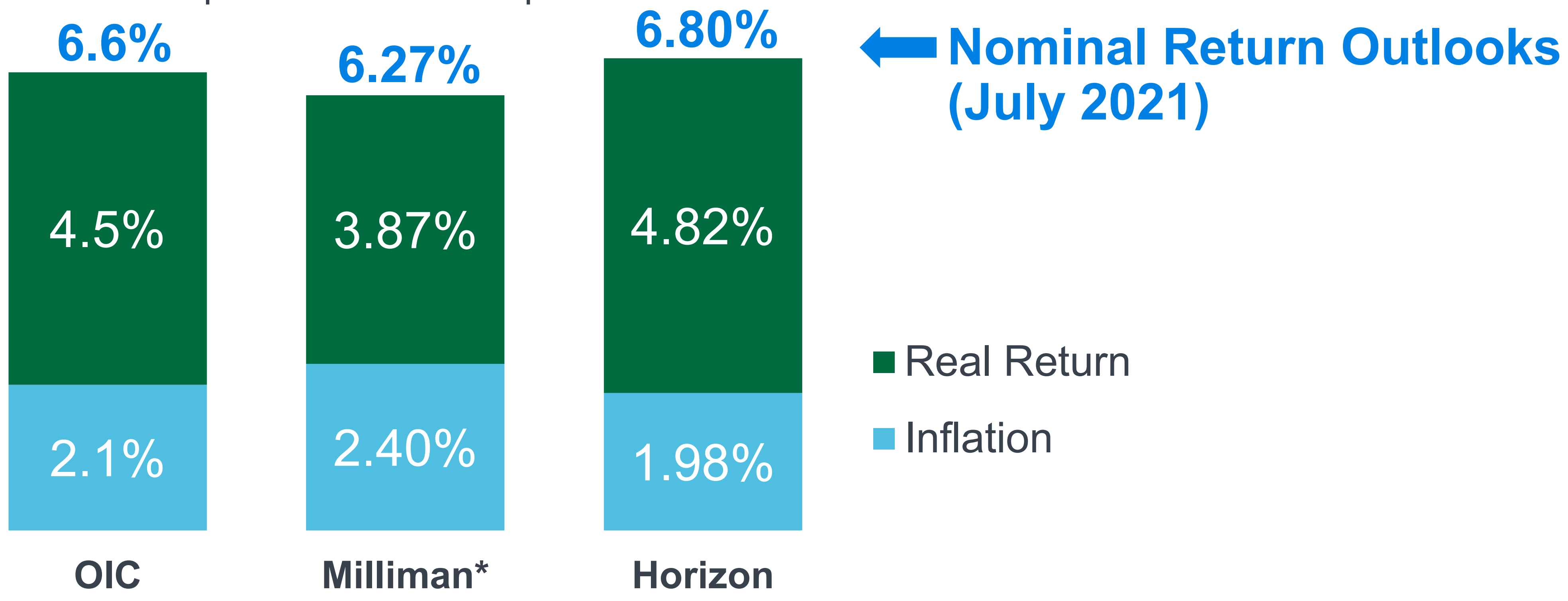
Investment Return 50th Percentile Outlooks

Geometric Returns from Outlook Models in Prior Six Reviews



Assumed Rate - Data Used in Prior Board Decision

- The graph below is from the **July 2021** Board meeting
  - Estimates are geometric annualized average returns based on the OIC's long-term asset allocation for each set of capital market assumptions



**Reflects real returns from Milliman capital market outlook assumptions adjusted for 2.40% inflation assumption*

Preliminary Updates to Milliman Outlooks

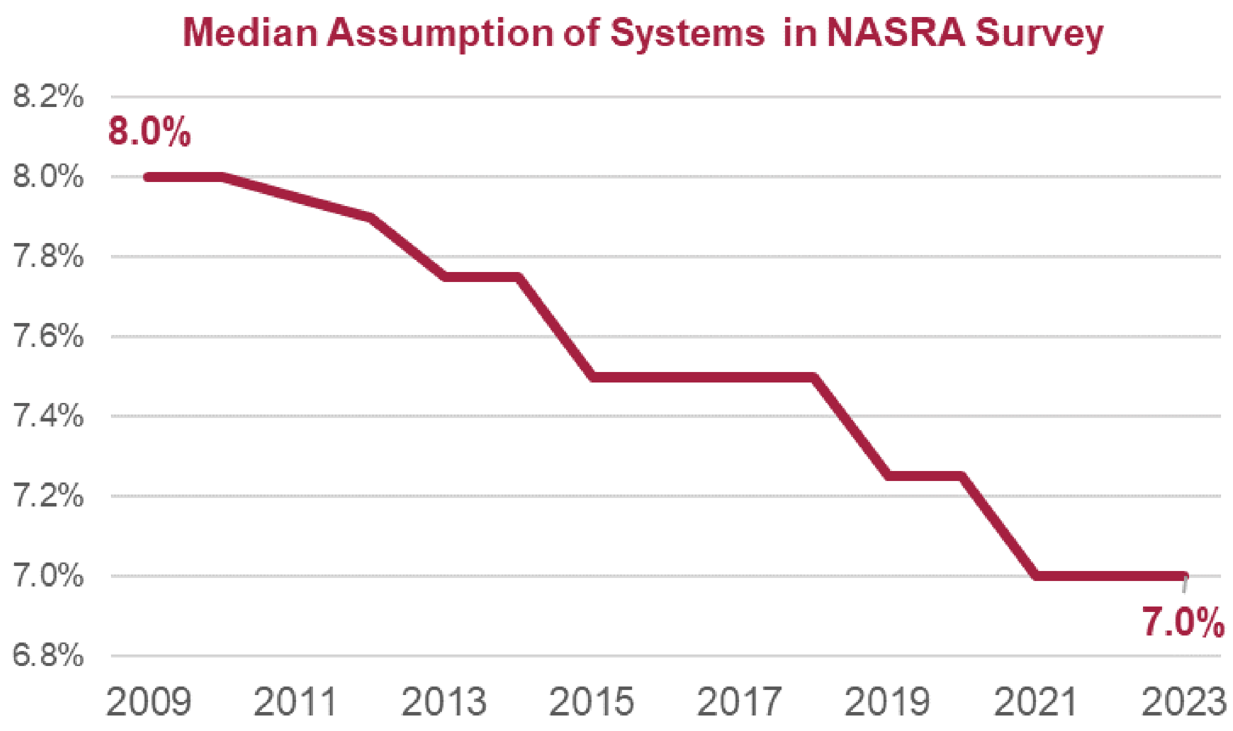
	2021 Outlook Milliman* Final	2023 Outlook Milliman Preliminary	2023 Outlook Milliman Preliminary
Median Annualized Geometric Return	**6.27%**	**7.11%**	**7.46%**
Assumed Inflation	2.40%	2.40%	2.35%
Time Horizon Modeled	20 years	10 years	20 years

**Reflects real returns from Milliman capital market outlook assumptions adjusted for 2.40% inflation assumption*

- **OIC consultant outlooks will be shared on May 31**
- Milliman's capital market assumptions increased since 2021 due to lower equity price-to-earnings ratios and higher bond yields after 2022 market losses
  - Reverse of the dynamic that lowered forward-looking expectations for most of the previous decade
  - Expectations are heavily influenced by financial market conditions at a particular snapshot date

What About the Assumptions of Other Systems?

- This line shows the median return assumption over time for about 130 large and/or statewide public systems



- The median decreased to **7.0%** by the end of 2021
  - The mid-point of public systems' return assumptions decreased by a full 1.0% in just over a decade, and has remained at that level in recent years

Considerations in Setting the Return Assumption

- Due to recent financial markets, capital market outlooks currently show higher expected returns than last assumption review
  - Results based on a different date (such as the Horizon Survey published in August 2022) may look significantly different due to the speed with which markets changed
- Even if median forward-looking expectations are above the current 6.9% investment return assumption, the Board should consider leaving unchanged
  - Lowering the assumed rate for evolving expectations took a decade; it remains to be seen if the December 31, 2022 market conditions are temporary or enduring
  - If 2023 returns are strong, expectations may be lower at rate-setting valuation date of December 31, 2023
  - Actuarial Standards of Practice allow assumptions to reflect a margin for adverse deviation, if desired

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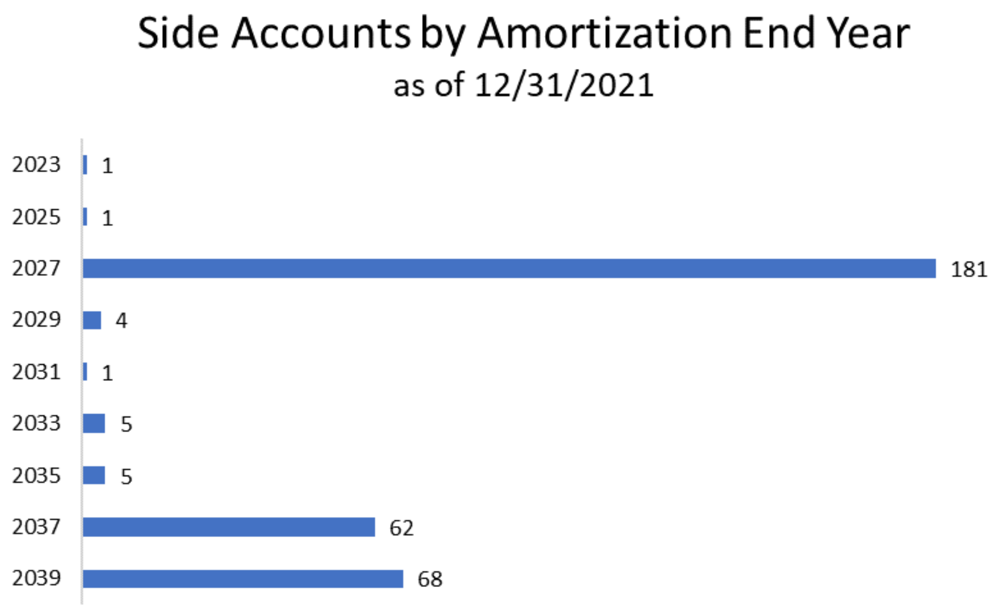
Amortization of Side Accounts and PreSLGRP Amounts

Background

- Special amortization periods apply to rate adjustments for employers with:
  - **Side accounts**
  - Experience related to pooling with the SLGRP
    - Employer-specific **transition liability/surplus** from joining the SLGRP
    - A grouped **Pre-SLGRP liability** for state & community colleges and **Pre-SLGRP surplus** for employers who participated in the LGRP

- Current rate calculations based on amortization through December 31, 2027 for most balances
  - Recent side account deposits and transition liabilities/surpluses generally amortize to a later date
  - 300+ employers have transition liability/ surplus with 2027 amortization end year



Methodology for Expiring Amortizations

- PERS will need to establish procedures for how and when individual employer contribution rates adjust for an expiring amortization base
- We understand staff has begun exploring potential approaches and soliciting employer input on the process
  - Will adoption of methodology occur with Experience Study or as separate rulemaking?

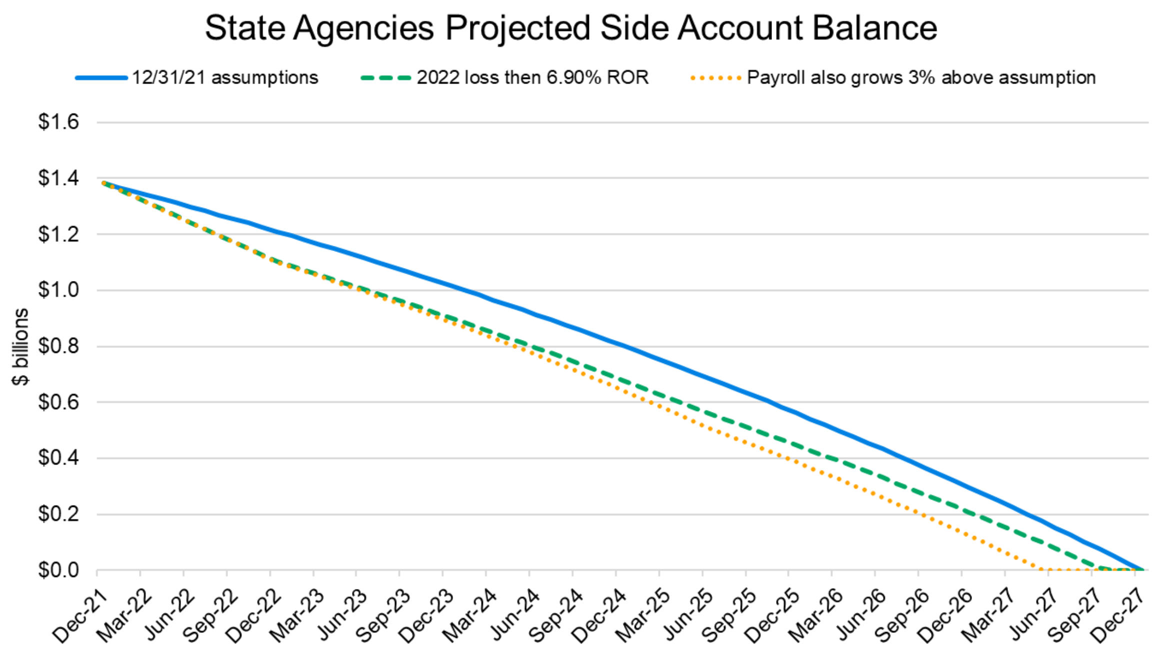
Employer Rates Effective July 1, 2023 for State Agencies

	Payroll				
	Tier 1/Tier 2			OPSRP	
	Default	Optional Separate Rates			
	All T1/T2 Payroll	General Service	Police & Fire	General Service	Police & Fire
Pension					
Normal cost rate	16.27%	15.14%	21.79%	9.89%	14.68%
Tier 1/Tier 2 UAL rate[1]	12.61%	12.61%	12.61%	12.61%	12.61%
OPSRP UAL rate	1.69%	1.69%	1.69%	1.69%	1.69%
Pre-SLGRP pooled liability rate	1.33%	1.33%	1.33%	1.33%	1.33%
Transition liability/(surplus) rate[2]	0.00%	0.00%	0.00%	0.00%	0.00%
Side account rate relief [2]	(6.59%)	(6.59%)	(6.59%)	(6.59%)	(6.59%)
Member redirect offset [3]	(2.40%)	(2.40%)	(2.40%)	(0.65%)	(0.65%)
Net employer pension contribution rate	**22.91%**	**21.78%**	**28.43%**	**18.28%**	**23.07%**
Retiree Healthcare					
Normal cost rate	0.13%	0.13%	0.13%	0.00%	0.00%
UAL rate	(0.13%)	(0.13%)	(0.13%)	0.00%	0.00%
Net retiree healthcare rate	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**
Total net employer contribution rate	**22.91%**	**21.78%**	**28.43%**	**18.28%**	**23.07%**

Expiring Amortizations – State Agencies Example

- Side account offset calculated as if rate takes effect immediately and all assumptions are met (illustrated by blue line in graph)
- Actual balance will be affected by asset and payroll experience, and reflects biennial timing of rate changes
  - Dotted lines illustrate how investment losses and higher payroll growth combining to exhaust the side account balance several months prior to 12/31/2027

Development of State Agencies Side Account Rate Offset	
A.) 12/31/2021 Side Account Balance	$1.381 billion
B.) Projected 2022 payroll	$3.908 billion
C.) Amortization factor to 12/31/2027	5.363
D.) Side account rate offset *(A. / B. / C.)*	6.59%



Considerations

- Due to fluctuating payroll and investment returns, it is unlikely any side account balances will draw down to zero exactly at the nominal end date of the amortization period
  - May occur earlier or later
  - We understand PERS can track side account balances monthly
- Some employers funded side accounts with POBs and structured a repayment schedule around the period they expected to receive a rate offset
- Transition liabilities/surpluses and Pre-SLGRP amounts also fluctuate with payroll, but not with actual investment returns
  - These balances are only tracked in annual valuation, not on a monthly basis
- Rate adjustments typically happen on July 1, 18 months after a rate-setting valuation date
  - Mid-biennium adjustments would be a new process to implement and communicate

Agenda for Upcoming Experience Study Presentations

- May 31: Assumed rate
  - Joint board meeting with Oregon Investment Council (OIC)
  - Outlooks from OIC's consultants, updates to Milliman's model

- June 2: Economic assumptions, rate-setting methods
  - Inflation and system payroll growth
  - Amortization and contribution rate collaring

- July 28: Demographic assumptions, Board decisions
  - Member-specific assumptions based on study of recent PERS experience
  - Assumptions and methods adopted will be used for:
    - 12/31/2022 actuarial valuation with advisory 2025-2027 contribution rates
    - 12/31/2023 actuarial valuation with 2025-2027 contribution rates proposed for adoption

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Revised ASOP 4

Background

- Actuarial Standards Board (ASB) establishes and improves standards of actuarial practice
  - Currently 17 actuarial standards of practice (ASOPs) that can apply to pension work
- *ASOP 4: Measuring Pension Obligations and Determining Plan Costs or Contributions* was recently revised, largely responding to requests for additional information about public plans
  - Effective for measurement dates after February 15, 2023
- New requirements will apply to Oregon PERS December 31, 2023 actuarial valuation but can be reflected earlier if desired

Key Changes

- Sensitivity disclosure: Low-default-risk obligation measure (LDROM)
  - New requirement for funding valuations, requires calculation and disclosure of a “low-default-risk” liability measure in addition to funding liabilities
  - According to the ASB, not intended to suggest this value is the “right” liability measure but to provide a more complete assessment of the plan’s funded status and additional information regarding benefit security
  - Primary difference in calculating LDROM is discount rate
    - Should be derived from “low-default risk fixed income securities” (e.g., yields on Treasuries, high-quality corporate bonds)
  - Comparison of funding liability measures to LDROM can alternatively be viewed as:
    - A measure of *expected* (but not guaranteed) savings to the system by investing long-term in a return-seeking portfolio
    - Contribution cost of shifting system assets to hypothetical low-default-risk portfolio aligned with expected benefit payments of the system

Key Changes

- Other requirements: will mainly affect report wording
  - Disclose whether there is any significant bias in the combined effect of the assumptions
  - Commentary regarding significance of LDROM
  - Description of any output smoothing method used
  - Actuary "should consider" reflecting contribution lag in calculation of contributions, if applicable
  - Disclose estimated period over which the UAL is expected to be fully amortized (or disclose if not)
  - If applicable, disclose estimate of how long until contributions under the plan's funding policy are expected to exceed the normal cost, plus interest on the UAAL
  - Disclose the results of gain and loss analysis separated by source
  - Disclose reasonable actuarially determined contribution (ADC), if not otherwise calculated under the funding policy

Appendix

Certification

This presentation discusses actuarial methods and assumptions for use in the valuation of the Oregon Public Employees Retirement System ("PERS" or "the System"). For the most recent complete actuarial valuation results, including cautions regarding the limitations of use of valuation calculations, please refer to our formal Actuarial Valuation Report as of December 31, 2021 ("the Valuation Report") published on September 19, 2022. The Valuation Report, including all supporting information regarding data, assumptions, methods, and provisions, is incorporated by reference into this presentation. The statements of reliance and limitations on the use of this material is reflected in the actuarial report and still apply to this presentation. The Valuation Report should be referenced for additional detail on the assumptions, methods, and plan provisions underlying this presentation.

In preparing this presentation, we relied, without audit, on information (some oral and some in writing) supplied by the System's staff and information published by Oregon State Treasury. This information includes, but is not limited to, statutory provisions, employee data, and financial information. We found this information to be reasonably consistent and comparable with information used for other purposes. The valuation results depend on the integrity of this information. If any of this information is inaccurate or incomplete our results may be different and our calculations may need to be revised.

All costs, liabilities, rates of interest, and other factors for the System have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of the System and reasonable expectations); and which, in combination, offer a reasonable estimate of anticipated experience affecting the System. The valuation results were developed using models intended for valuations that use standard actuarial techniques. We have reviewed the models, including their inputs, calculations, and outputs for consistency, reasonableness, and appropriateness to the intended purpose and in compliance with generally accepted actuarial practice and relevant actuarial standards of practice. We have incorporated other sources of economic data in assessing the reasonableness of the assumptions. Reliance on other experts is reflected in Milliman's capital market assumptions and in Milliman's expected return model, both of which are developed by credentialed investment consultants. We have also considered the System's investment policy, capital market assumptions, and the expected return analysis provided by the System's investment consultant in our assessment of the investment return assumption.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of future measurements. Our annual financially modeling presentation to the PERS Board should be referenced for additional analysis of the potential variation in future measurements. The PERS Board has the final decision regarding the appropriateness of the assumptions.

Certification

The calculations in this report have been made on a basis consistent with our understanding of the plan provisions described in the appendix of the Valuation Report. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes.

Milliman's work is prepared solely for the internal business use of the Oregon Public Employees Retirement System. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product.

No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

The consultants who worked on this assignment are retirement actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

The signing actuaries are independent of the System. We are not aware of any relationship that would impair the objectivity of our work.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board and the *Code of Professional Conduct* and *Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion in the United States* published by the American Academy of Actuaries. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.

Appendix
Actuarial Basis

Capital Market Assumptions - Milliman

For this purpose, we considered the Oregon PERS Fund to be allocated among the model's asset classes as shown below. This allocation is based on input provided by Meketa (OIC's primary consultant) and reflects proposed changes to the OIC's target allocation for the Oregon PERS fund adopted at the January 25, 2023 OIC meeting.

Reflects Milliman's capital market assumptions as of December 31, 2022.

	Annual Arithmetic Mean	**20-Year Annualized Geometric Mean**	**Annual Standard Deviation**	**Policy Allocation**
Global Equity	8.57%	7.07%	17.99%	27.500%
Private Equity	12.89%	8.83%	30.00%	25.500%
Real Estate	6.90%	5.83%	15.13%	12.250%
US Core Fixed Income	4.59%	4.50%	4.22%	25.000%
Hedge Fund – Macro	5.44%	4.83%	7.49%	5.625%
Hedge Fund – Equity Hedge	7.39%	6.48%	12.04%	0.625%
Hedge Fund – Multistrategy	6.81%	6.27%	9.04%	1.250%
Infrastructure	7.88%	6.51%	17.11%	1.500%
Master Limited Partnerships	9.41%	6.02%	27.04%	0.750%
US Inflation (CPI-U)	2.35%	2.35%	1.41%	**N/A**
Fund Total (reflecting asset class correlations)	**8.26%**	**7.50%***	**13.30%**	**100.00%**

* The model's 20-year annualized geometric median is **7.46%**.

Retirement System Risks

- Oregon PERS, like all defined benefit systems, is subject to various risks that will affect future system liabilities and contribution requirements, including:
  - **Investment risk**: the potential that investment returns will be different than assumed
  - **Demographic risks**: the potential that mortality experience, retirement behavior, or other demographic experience for the system membership will be different than assumed
  - **Contribution risk**: the potential that actual future contributions will be materially different than expected, for example if there are material changes in the system's covered payroll
- The results of an actuarial valuation are based on one set of reasonable assumptions, but it is almost certain that future experience will not exactly match the assumptions.
- Further discussion of system risks and historical information regarding system experience are shown in our annual actuarial valuations. In addition, our annual financial modeling presentation to the PERS Board illustrates future outcomes under a wide range of future scenarios reflecting variation in key risk factors.