

**OREGON PUBLIC EMPLOYEES RETIREMENT SYSTEM BOARD  
AND OREGON INVESTMENT COUNCIL JOINT MEETING**

<b>Friday</b> <b>May 29, 2015</b> <b>10:30 A.M. – 12:00 P.M.</b>		<b>PERS</b> <b>11410 SW 68<sup>th</sup> Parkway</b> <b>Tigard, OR</b>	
<b>ITEM</b>		<b>PRESENTER</b>	
<b>Discussion Items</b>			
1.	System Cost and Benefit Projections	MILLIMAN	
2.	OIC / PERS Board Roundtable Discussion		

**PERS Board**

Lawrence Furnstahl  
 Krystal Gema  
 John Thomas, Chair  
 Pat West, Vice Chair  
 Rhoni Wiswall

**Oregon Investment Council**

Rukaiyah Adams, Vice Chair  
 Katy Durant, Chair  
 Keith Larson  
 John Russell  
 Ted Wheeler, State Treasurer  
 Steve Rodeman, PERS Executive Director

<http://www.oregon.gov/PERS/>  
<http://www.oregon.gov/Treasury>

# Joint Meeting of: Oregon Investment Council Oregon PERS Board

## OREGON PUBLIC EMPLOYEES RETIREMENT SYSTEM

May 29, 2015

Presented by:

Matt Larrabee, FSA, EA

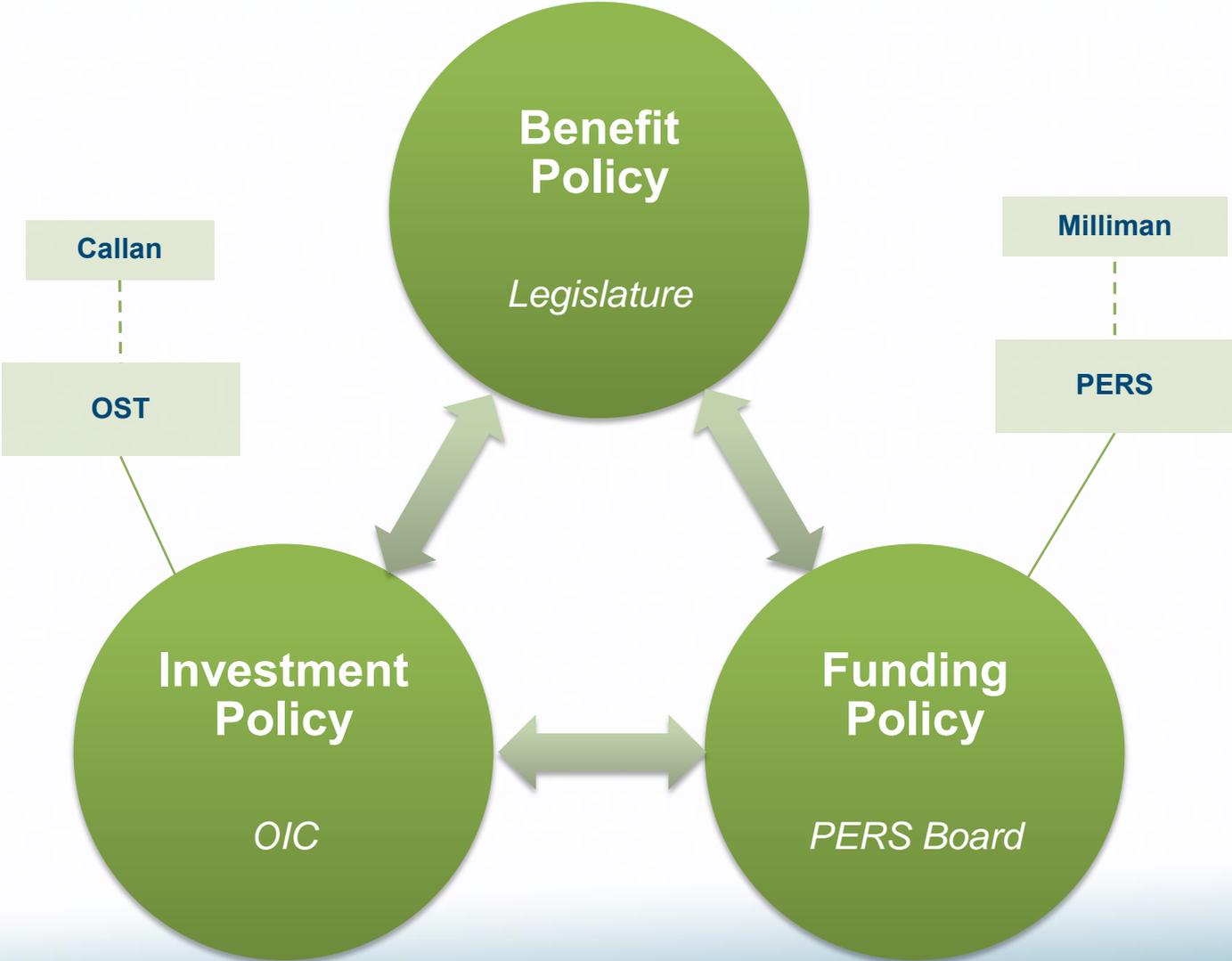
Scott Preppernau, FSA, EA



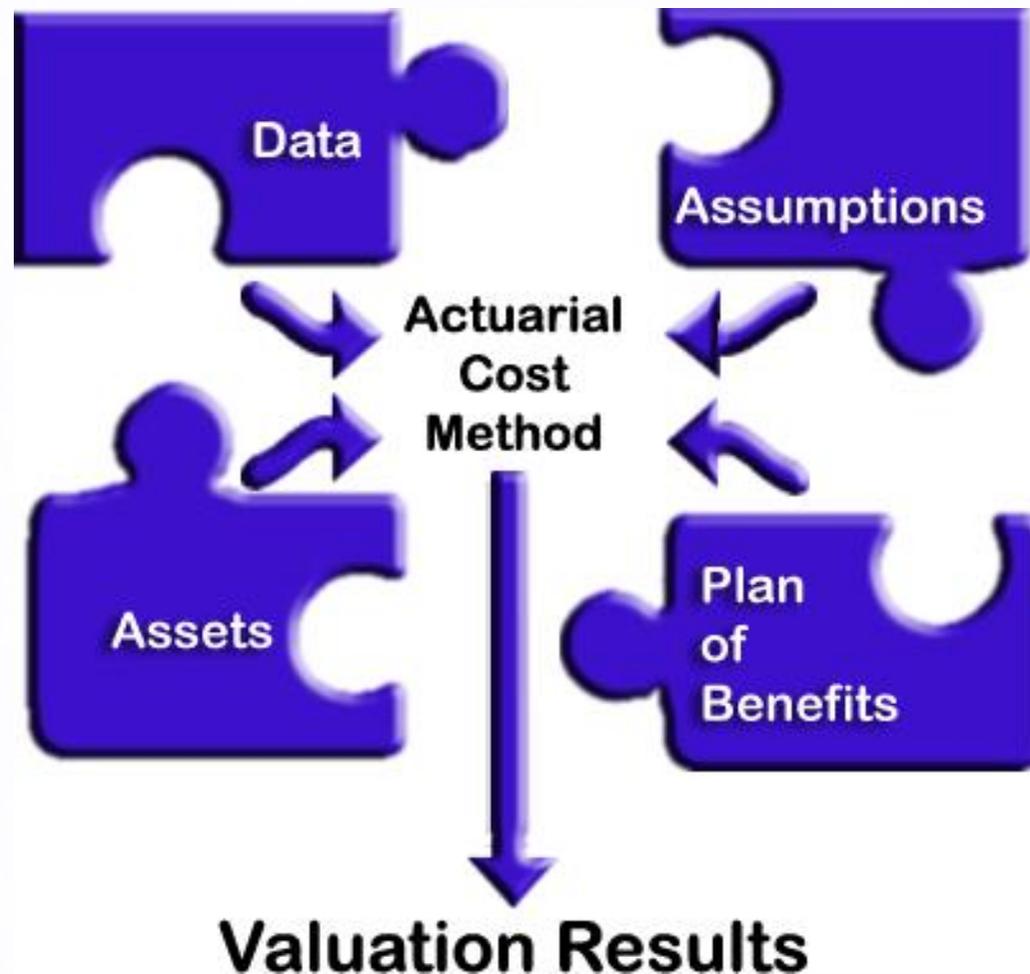
# Agenda

- Introductory material
- Projected benefits and the *Moro* decision
- Contribution rates
- The investment return assumption
- Possible risk tolerance metrics

# Governance Structure



# The Elements of an Actuarial Valuation



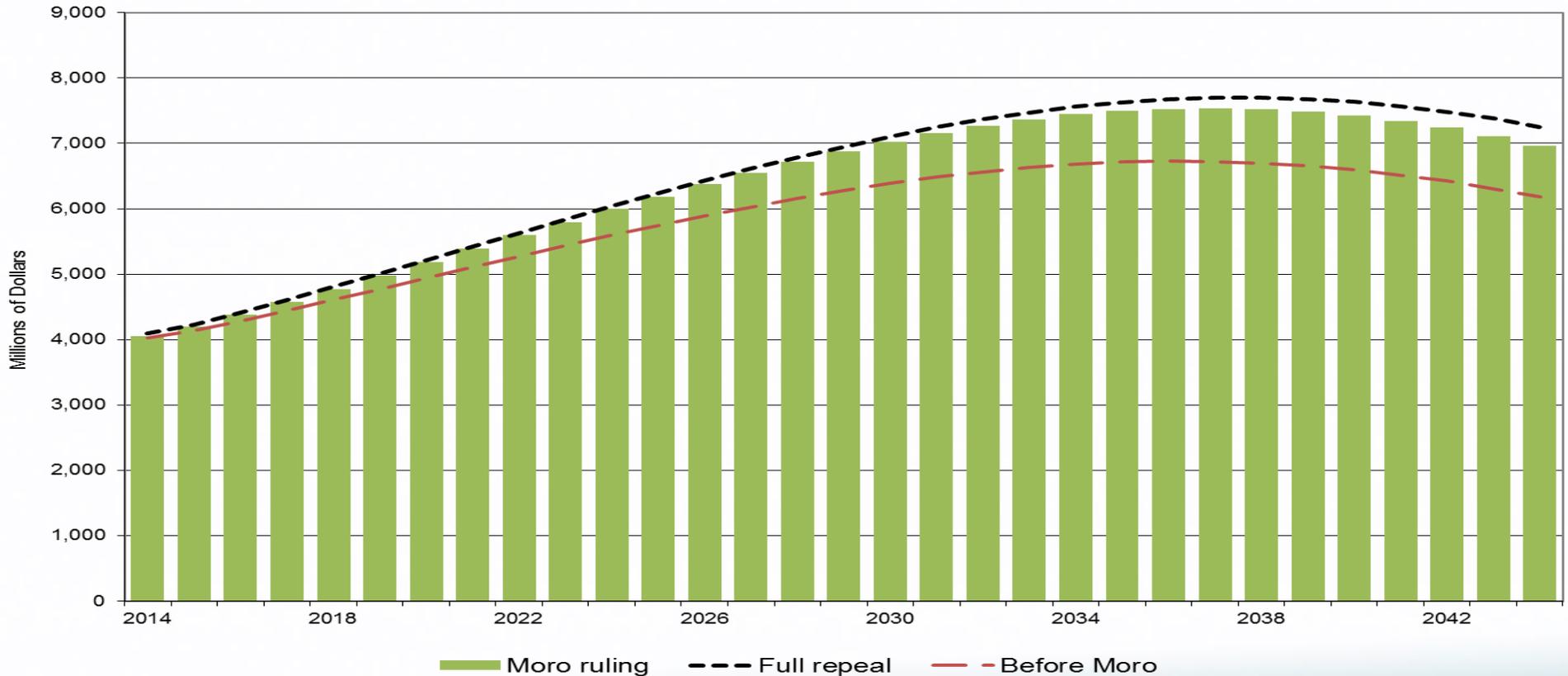
# Year-by-year Effect of Reforms and *Moro*

From May 2015  
PERS Board  
materials

Liabilities are calculated from projected benefit payments

## Tier 1/Tier 2 & OPSRP Expected Benefit Payments

Members as of 12/31/2013 (without considering future entrants)

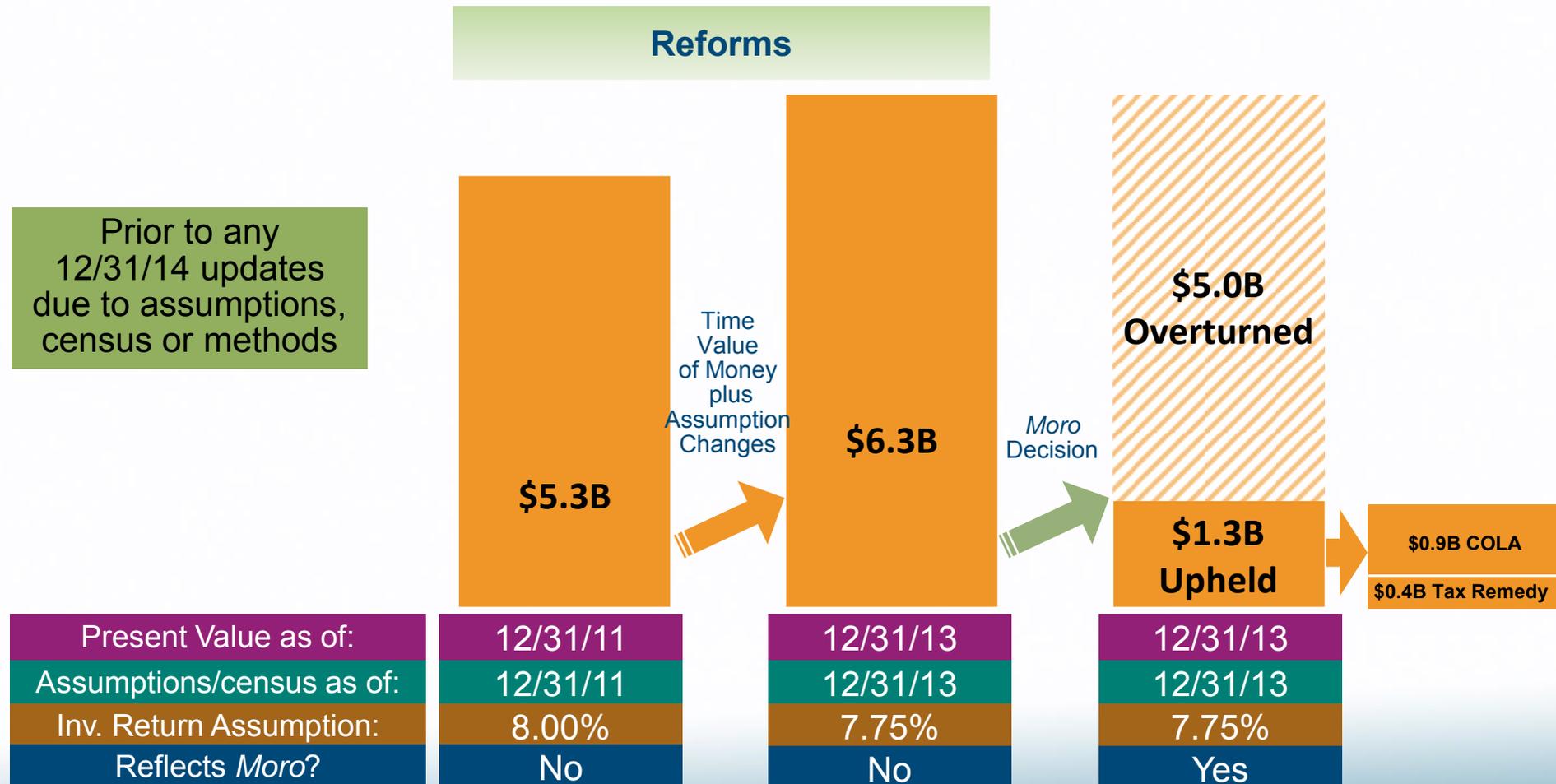


Based on COLA calculation interpretation as detailed in the Appendix of May 29 PERS Board materials

# Financial Magnitude of Reforms and *Moro*

From May 2015  
PERS Board  
materials

## Effect on Present Value of Future Benefits (PVFB) Basis



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# Contribution Rates

- What does the PERS Board control?
- Why change rates?
- Why are rates so sensitive?
- How does OPERS stack up?

# What Does the PERS Board Control?

Long-term program costs are the contributions, which are governed by the fundamental cost equation:

$$\begin{aligned} & \textit{BENEFITS} = \\ & \textit{EARNINGS} + \\ & \textit{CONTRIBUTIONS} \end{aligned}$$

Contributions are the balancing item in the equation; as a result, the PERS Board influences cost timing, but does not control long-term cost

# Two-Year Rate-Setting Cycle

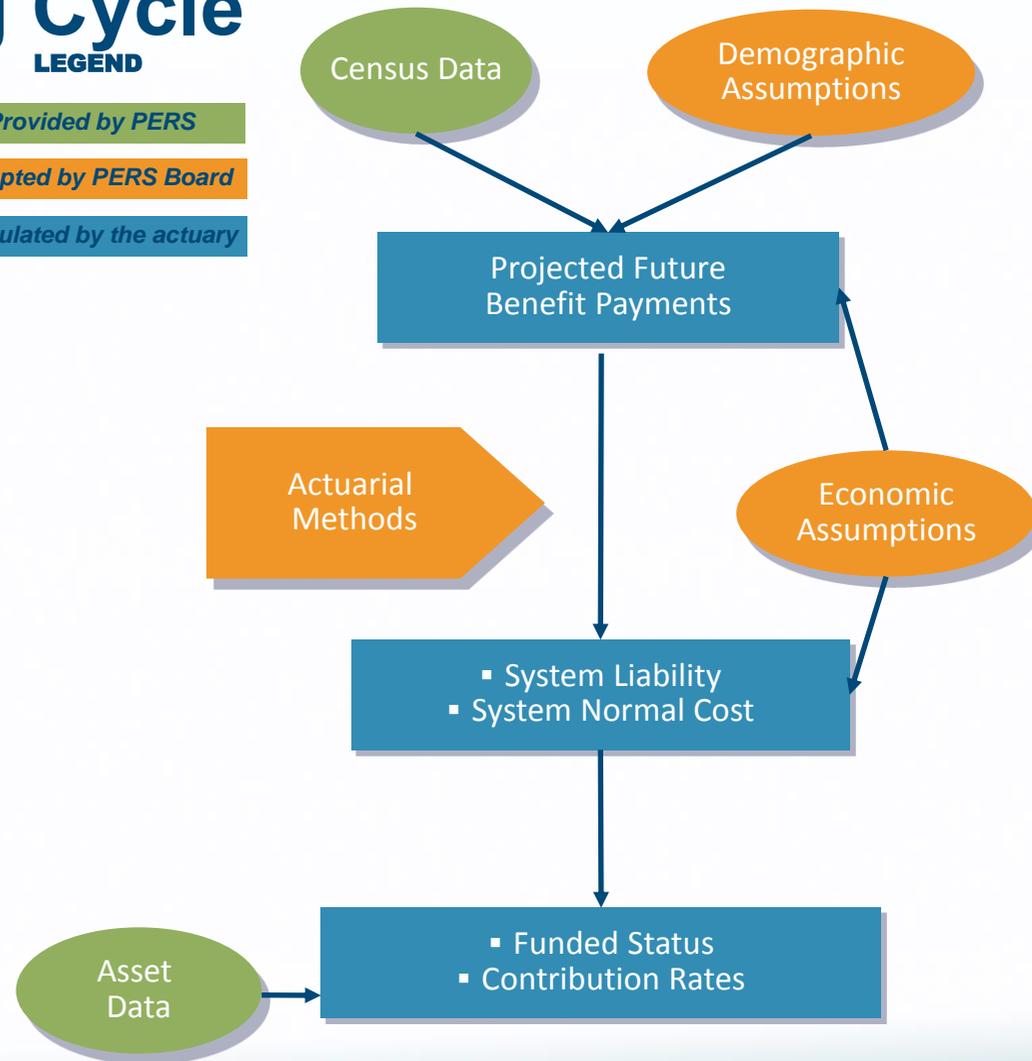
## LEGEND

*Provided by PERS*

*Adopted by PERS Board*

*Calculated by the actuary*

- July 2015: Assumptions & methods adopted by Board in consultation with the actuary
- September 2015: System-wide 12/31/14 “advisory” actuarial valuation results
- November 2015: Advisory 2017-2019 employer-specific contribution rates
- July 2016: System-wide 12/31/15 “rate-setting” actuarial valuation results
- September 2016: Disclosure & adoption of employer-specific 2017-2019 contribution rates



# Why Change Rates?

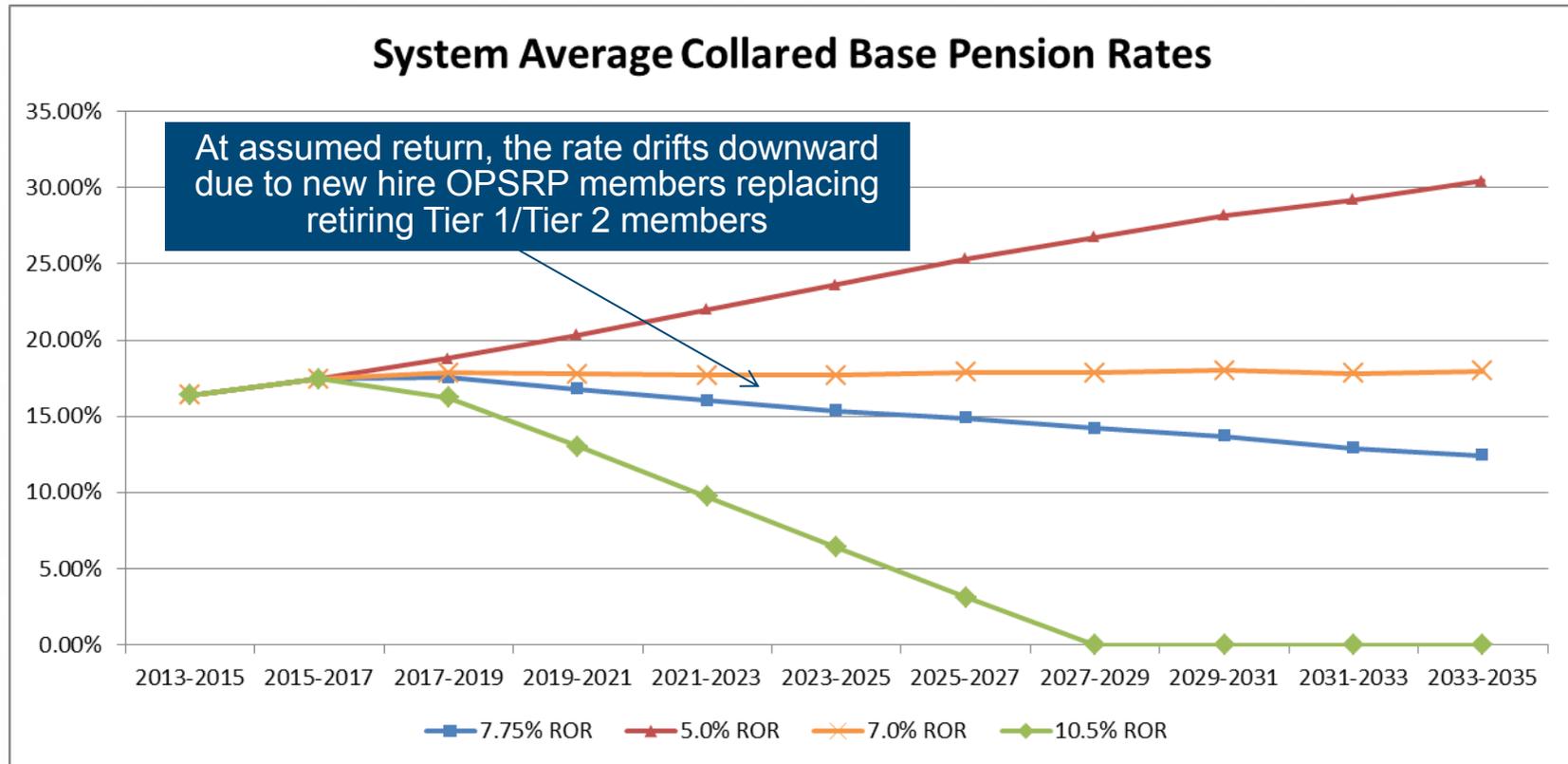
## PERS Board Contribution Rate Policy Objectives

- Transparent
- Predictable and stable rates
- Protect funded status
- Equitable across generations
- Actuarially sound
- GASB compliant

Some of the objectives can conflict, particularly in periods with significant volatility in investment return or projected benefit levels. Overall system funding policies should seek an appropriate balance between conflicting objectives.

# How Sensitive Are Rates?

From November 2014 PERS Board materials, prior to reflecting *Moro* decision

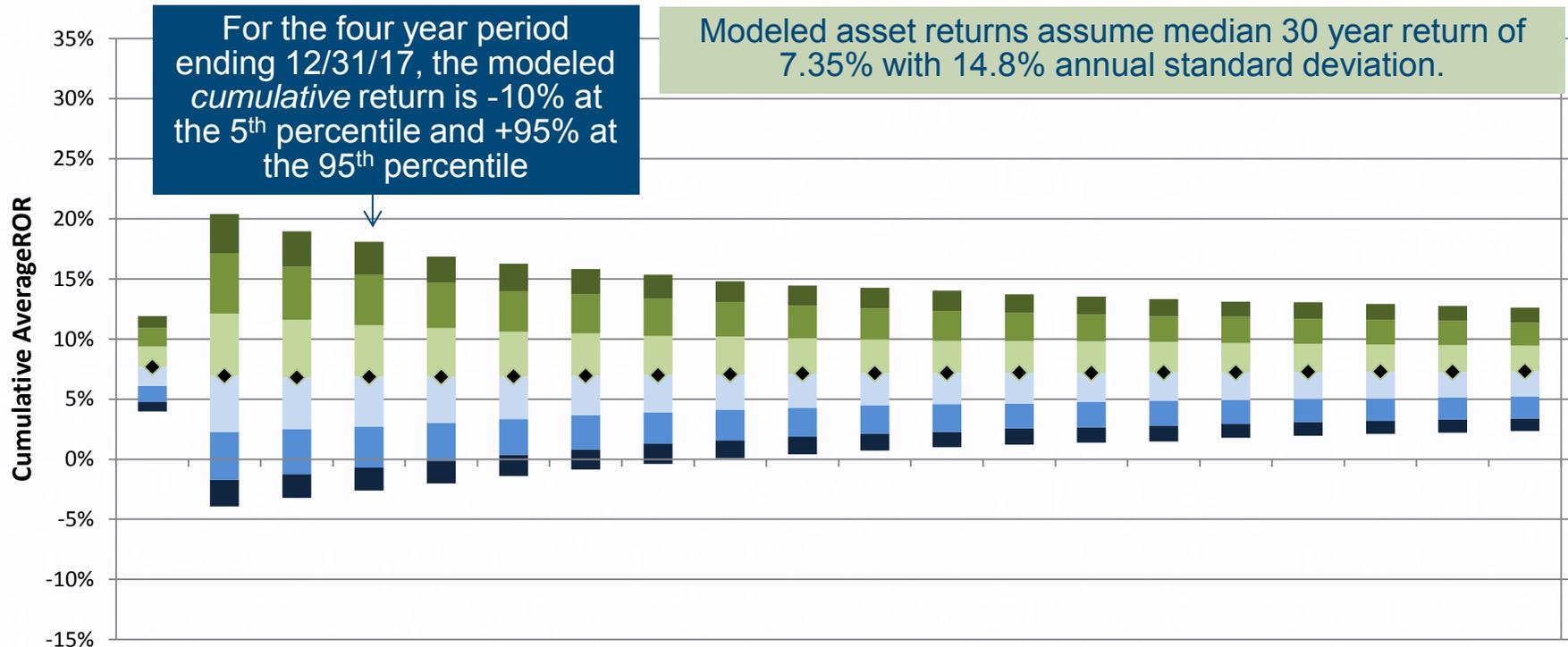


The steady rate model illustrates impact of consistently achieving the assumed 7.75% return and three alternative returns

# How Sensitive Are Rates?

From November 2014  
PERS Board materials

## Modeled Annualized Investment Returns (Geometric Avg.)



PY Ending 12/31	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
95th	11.9%	20.4%	19.0%	18.1%	16.9%	16.3%	15.8%	15.3%	14.8%	14.5%	14.3%	14.0%	13.7%	13.5%	13.3%	13.1%	13.1%	12.9%	12.8%	12.6%
90th	10.9%	17.2%	16.0%	15.3%	14.7%	14.0%	13.7%	13.3%	13.1%	12.8%	12.6%	12.4%	12.2%	12.0%	11.9%	11.9%	11.7%	11.6%	11.5%	11.4%
75th	9.4%	12.1%	11.6%	11.2%	10.9%	10.6%	10.5%	10.3%	10.2%	10.1%	10.0%	9.9%	9.8%	9.8%	9.7%	9.7%	9.6%	9.5%	9.5%	9.5%
50th	7.7%	6.9%	6.8%	6.9%	6.8%	6.9%	6.9%	7.0%	7.1%	7.1%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.3%	7.3%	7.3%	7.3%
25th	6.1%	2.2%	2.5%	2.7%	3.0%	3.3%	3.7%	3.9%	4.1%	4.3%	4.5%	4.6%	4.6%	4.8%	4.9%	4.9%	5.0%	5.0%	5.1%	5.2%
10th	4.8%	-1.7%	-1.2%	-0.7%	-0.1%	0.4%	0.8%	1.3%	1.6%	1.9%	2.1%	2.3%	2.6%	2.7%	2.8%	3.0%	3.1%	3.2%	3.3%	3.4%
5th	4.0%	-3.9%	-3.2%	-2.6%	-2.0%	-1.4%	-0.9%	-0.4%	0.1%	0.4%	0.7%	1.0%	1.2%	1.4%	1.5%	1.8%	1.9%	2.1%	2.2%	2.4%

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# How Sensitive Are Rates?

From November 2014 PERS Board materials, prior to reflecting *Moro* decision

- Probability of a rate increase exceeding a selected threshold in at least one of the next three biennial rate changes
  - Changes at July 2017, July 2019 and July 2021

## Likelihood of a Biennial Rate Increase Exceeding Threshold at Some Point in Next Three Biennia

<u>Threshold Increase</u>	<u>Base Rate</u>	<u>Net Rate</u>
3% of Pay	65%	68%
4% of Pay	49%	62%
5% of Pay	31%	47%

Comparison of Base Rate and Net Rate likelihoods illustrates the increased volatility associated with Side Accounts

# Variable Return Model Stress Test

From November 2014 PERS Board materials, prior to reflecting *Moro* decision

- We also used the variable return model to do a “stress test” of the likelihood of certain events in the 10,000 scenarios modeled
- The likelihood of specified events occurring at some point during the 20 year projection period is shown below

## Likelihood of Event Occurring at Some Point in Next 20 Years

Funded Status (Excluding Side Accounts) > 100%	75%
Funded Status (Excluding Side Accounts) < 60%	44%
Funded Status (Excluding Side Accounts) < 40%	11%
Base Rate (Excluding Retiree Healthcare) >30% of Pay	41%

# Why Are Rates So Sensitive?

- Rates are charged on payroll
  - When assets and liabilities are large relative to payroll, deviations from expectation produce relatively larger rate changes
- Often, the most significant deviation is difference between assumed and actual investment return



For a given % level of asset deviation (e.g., 5.00% actual return vs. 7.75% assumed return equals -2.75% deviation), the larger assets are relative to payroll, the more the contribution rate impact

# Are Oregon Rates More Sensitive than Others?

- US Census bureau study illustrates sensitivity for west US public systems aggregated by state, with active member headcount as a proxy for payroll

## Ratio of Public System Assets to Active Members



Source: NASRA summarization of US Census Bureau's 2013 Survey of Public Pensions (survey published February 2015)

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# Long-Term Investment Return Assumption

- Uses of the investment return assumption
  - As a “discount rate” for establishing the:
    - Actuarial accrued liability, which is a net present value
    - Associated unfunded actuarial liability, also called the UAL or actuarial shortfall
  - Guaranteed crediting level for regular Tier 1 active member account balances
  - Annuitization rate for converting member account balances to lifetime money match monthly benefits



Reflecting expectations for both investment earnings and benefit levels for certain members, the assumption helps set a reasonable and appropriate budgeting glide path for estimated mid-to-long term employer contribution rates

# Investment Return Estimates

- To assist the PERS Board, we developed return estimates based on capital market outlook assumptions from three sources and an industry standard mean/variance model
  - Milliman
  - Callan
  - 2014 Horizon survey of capital market assumptions (survey of 21 advisors)
- Estimates do not reflect any possible “alpha” due to selected managers potentially outperforming market benchmarks over the long term, net of fees
- Today’s speakers are not credentialed investment advisors
  - We are presenting results based on capital market outlook assumptions developed by Milliman’s credentialed investment professionals

Details on each set of capital market outlook assumptions is in the appendix

# Investment Return Estimates

From May 2015  
PERS Board  
materials

- Estimates are based on OIC's target long-term asset allocation
  - Current actual allocation differs somewhat from the target allocation
- Target allocations are under review by OIC, and could change by the PERS Board's July meeting
- Callan and Horizon estimates are calibrated over a shorter investment timeframe than Milliman's estimates
  - Also reflect lower level of assumed inflation

	Milliman	Callan	Horizon
Median Annualized Return	7.05%	7.45%	7.32%
Assumed Inflation	2.50%	2.30%	2.41%
Timeframe Modeled	20 years	10 years	10 years

The median returns shown above are geometric annualized average returns over the timeframes indicated above for each provided set of capital market assumptions

# Possible Risk Tolerance Metrics

- Risk analysis metrics can expand beyond investment-only measures to include funded status and contribution rates
  - Moves beyond considering expected asset volatility to consider implications of that volatility
- Possible metrics for PERS could include:
  - Identifying a “maximum sustainable employer contribution rate” and developing policies that lower the likelihood of breaching that rate
  - Developing a similar metric for “minimum acceptable funded status”
- Development of such metrics should be based on input from PERS, OIC and other stakeholders and interested parties

# Caveats and Disclaimers

This presentation includes excerpted slide of actuarial calculation results presented at the November 2014 and May 2015 public meetings of the Public Employees Retirement Board (“PERB”). Full explanations of the data, assumptions, methods & provisions used to derive those calculations are detailed in the formal PERB presentation materials for those respective meetings. The statements of reliance and limitations on the use of material noted in those presentations still apply to this presentation, and are incorporated by reference into this presentation.

In preparing this presentation, we relied, without audit, on information (some oral and some in writing) supplied by the System’s staff, as well as capital market expectations provided by Callan. 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 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.

Milliman’s work product was prepared exclusively for Oregon PERS for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning PERS’ operations, and uses PERS’ data, which Milliman has not audited. It is not for the use or benefit of any third party for any purpose. To the extent that Milliman’s work is not subject to disclosure under applicable public records laws, Milliman’s work may not be provided to third parties without Milliman’s prior written consent. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. Any third party recipient of Milliman’s work product who desires professional guidance should not rely upon Milliman’s work product, but should engage qualified professionals for advice appropriate to its own specific needs.

The consultants who worked on this assignment are pension actuaries. Milliman’s advice is not intended to be a substitute for qualified legal or accounting counsel. The signing actuaries are independent of the plan sponsors. 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. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.

# Appendix – Capital Market Assumptions

## Capital Market Assumptions - Milliman

For assessing the expected portfolio return under Milliman’s capital market assumptions, we considered the Oregon PERS Fund to be allocated among the model’s asset classes as shown below. This allocation is based on the Oregon Investment Council’s Statement of Investment Objectives and Policy Framework for the Oregon PERS Fund, as revised December 3, 2014.

	Annual Arithmetic Mean	20-Year Annualized Geometric Mean	Annual Standard Deviation	Policy Allocation
US Large/Mid-Cap Equity	7.96%	6.70%	17.07%	15.75%
US Small Cap Equity	8.93%	6.99%	21.35%	1.31%
US Micro-Cap Equity	9.37%	7.01%	23.72%	1.31%
Non-US Developed Equity	8.34%	6.73%	19.40%	13.13%
Emerging Markets Equity	10.56%	7.25%	28.45%	4.13%
Non-US Small Cap Equity	9.01%	7.22%	20.55%	1.88%
Private Equity	11.60%	7.97%	30.00%	20.00%
US Universal Fixed Income	4.10%	4.00%	4.68%	8.00%
US Short-Term Bonds	3.65%	3.61%	2.74%	8.00%
US Bank/Leveraged Loans	5.69%	5.42%	7.82%	3.00%
High Yield Bonds	6.67%	6.20%	10.28%	1.00%
Real Estate	6.48%	5.84%	12.00%	10.00%
Global REITs	8.74%	6.69%	22.02%	2.50%
Timber	6.60%	5.85%	13.00%	1.50%
Farmland	7.11%	6.37%	13.00%	1.50%
Infrastructure	8.31%	7.13%	16.50%	3.00%
Commodities	6.07%	4.58%	18.40%	1.50%
Hedge Fund of Funds - Diversified	4.94%	4.64%	8.09%	2.00%
Hedge Fund Event-Driven	7.07%	6.72%	8.90%	0.50%
US Inflation (CPI-U)		2.50%		N/A
<b>Fund Total (reflecting asset class correlations)</b>	<b>7.92%</b>	<b>7.09%*</b>	<b>13.76%</b>	<b>100.00%</b>

\* Reflects 0.10% average reduction to model passive investment expenses. The model does not try to assess the actual investment expenses for active management. The model’s 20-year annualized geometric median is 7.05%.

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# Appendix – Capital Market Assumptions

## Capital Market Assumptions - Callan

For assessing the expected portfolio return under Callan’s capital market assumptions, we applied the assumptions shown below provided by Callan.

	<b>Annual Arithmetic Mean</b>	<b>Annual Standard Deviation</b>	<b>Policy Allocation</b>	<b>10-Year Annualized Geometric Median</b>
Global Equity	9.5%	19.6%	<b>37.5%</b>	
Private Equity	12.0%	24.0%	<b>20.0%</b>	
Fixed Income	3.1%	3.75%	<b>20.0%</b>	
Real Assets	8.0%	15.0%	<b>20.0%</b>	
Diversifying Assets	7.0%	11.0%	<b>2.5%</b>	
<b>Fund Total (reflecting asset class correlations)</b>	<b>8.36%</b>	<b>14.07%</b>	<b>100.0%</b>	<b>7.45%</b>

# Appendix – Capital Market Assumptions

## Capital Market Assumptions - Horizon

For assessing the expected portfolio return under an additional set of capital market assumptions, we applied the assumptions from the 2014 Survey of Capital Market Assumptions published by Horizon Actuarial Services, LLC. According to the survey report, the 10-year return assumptions shown below represent an average of the expectations for 21 investment advisors responding to the survey.

	<b>10-Year Annualized Geometric Mean</b>	<b>Annual Standard Deviation</b>	<b>Policy Allocation</b>
US Equity – Large Cap	7.01%	17.48%	<b>15.75%</b>
US Equity – Small/Mid Cap	7.37%	21.11%	<b>5.13%</b>
Non-US Equity – Developed	7.41%	19.77%	<b>15.00%</b>
Non-US Equity – Emerging	8.70%	26.36%	<b>4.12%</b>
US Corporate Bonds – Core	3.46%	5.36%	<b>12.00%</b>
US Corporate Bonds – High Yield	5.51%	11.46%	<b>4.00%</b>
US Treasuries (Cash Equivalents)	2.21%	2.28%	<b>4.00%</b>
Real Estate	6.38%	13.13%	<b>13.00%</b>
Hedge Funds	5.77%	8.95%	<b>2.50%</b>
Commodities	4.50%	18.01%	<b>1.50%</b>
Infrastructure	7.71%	13.51%	<b>3.00%</b>
Private Equity	9.43%	24.82%	<b>20.00%</b>
Inflation	2.41%	2.08%	<b>N/A</b>
<b>Fund Total (reflecting asset class correlations)</b>	<b>7.40%*</b>		<b>100.00%</b>

\* 10-year annualized geometric median is 7.32%.

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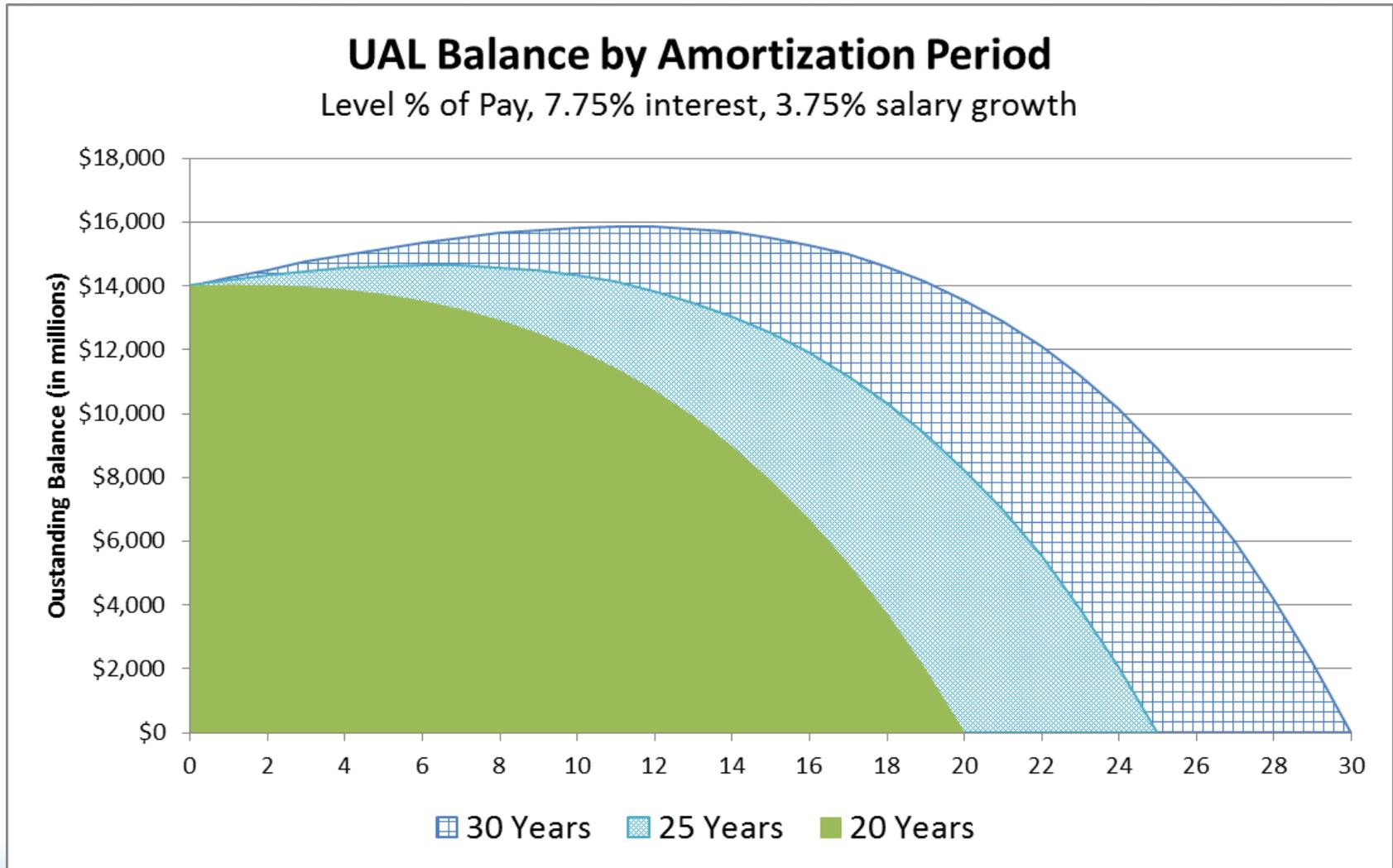
# Appendix - Contribution Rate Components

- “Base” pension contribution rates have two funding sources:
  - Employer contributions
  - Transfers from employer side accounts
- Those rates have two major components:
  - Normal Cost Rate – Economic value of benefits for current year service
  - UAL Rate – Amortization of shortfalls related to past service

# Appendix - Shortfall Amortization Periods

- A key part of contribution rate calculations is amortization of Tier 1 / Tier 2 shortfalls over twenty years as a level percentage of payroll
  - As part of changes made in the prior experience study, UAL as of December 31, 2013 was re-amortized over twenty years
  - Subsequent gains or losses amortized over twenty years from the rate-setting valuations in which they are recognized
- Twenty years avoids significant negative amortization, where shortfall actually increases in the initial “pay down” years even if assumptions are met and contributions are made
  - The following slide illustrates pay down of a \$14 billion shortfall over periods of 20, 25 or 30 years at current assumptions

# Appendix - Shortfall Amortization Periods



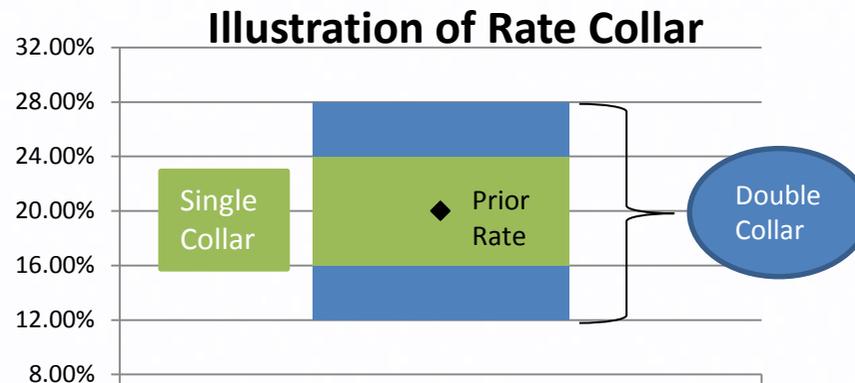
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# Appendix - The Rate Collar

- In 2005, the PERS Board adopted an employer contribution rate smoothing method called the “rate collar”
- After a major change in unfunded actuarial liability (UAL), the difference between the current contribution rate and the updated actuarially calculated rate can be large
  - The rate collar is a formulaic approach that spreads large employer contribution rate changes systematically across several biennia
- It allows employers to see both:
  - An advanced estimate of the maximum base rate change per biennium
  - The currently estimated long-term (20-year) contribution rate on a current market value of assets basis

# Appendix - The Rate Collar's Current Design

- The maximum change typically permitted by the collar is:
  - 20% of the rate currently in effect (3% of payroll minimum collar width)
- If funded status is 60% or lower, the width of the collar doubles
  - 40% of rate currently in effect (6% of payroll minimum collar width)
- If the funded status is between 60% and 70%, the collar size is pro-rated between the initial collar and double collar level



- Collars are calculated at a rate pool level and limit the biennium to biennium increase in the UAL Rate for a given rate pool