

# FINANCIAL MODELING

## OREGON PUBLIC EMPLOYEES RETIREMENT SYSTEM

November 20, 2015

Presented by:

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# Introduction

- In September, we presented preliminary system average valuation results as of December 31, 2014 for the Tier 1/Tier 2 & OPSRP programs
  - December 31, 2014 valuation is advisory, not used to set rates
  - Actual 2017-2019 rates are determined based on the December 31, 2015 valuation at the September 2016 board meeting
- Today's presentation covers long-term financial modeling projections of system average contribution rates and funded status reflecting investment results through October 31, 2015 as published by Oregon State Treasury

# Financial Modeling

## Models and Inputs

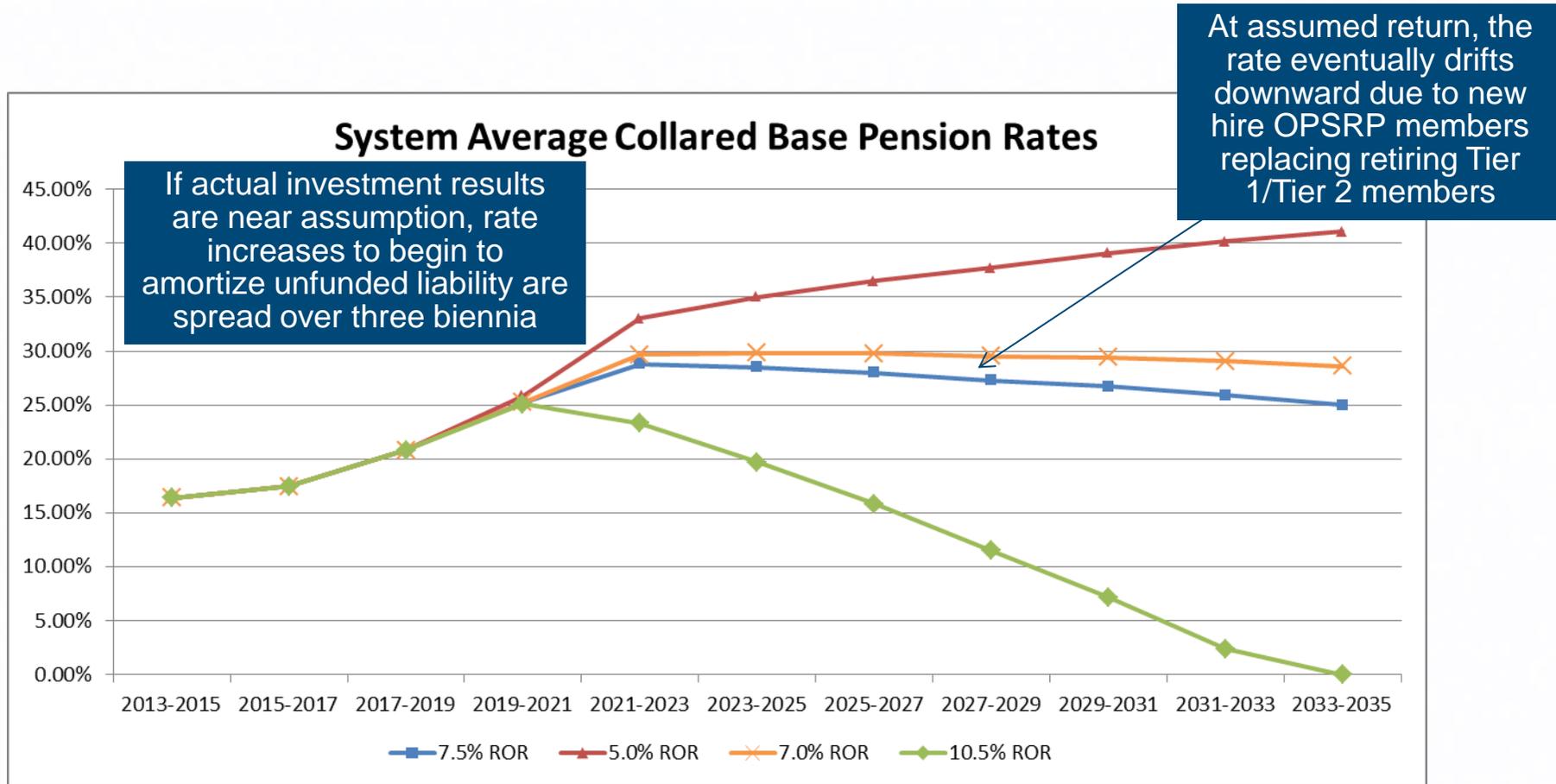
- Rates are projected with both a steady return model and a variable return model where investment returns change from year to year
- Modeling starts with liabilities and assumptions from the 12/31/2014 system-wide actuarial valuation
- Modeling uses 12/31/2014 assets adjusted for published regular account returns of 3.3% through October 2015
  - Returns for November and December vary in our model based on scenario

# Financial Modeling

## Comments on System Average Rates

- Projections depict system average funded status and contribution rates
  - Comparable to system average rates shown in September presentation
- No single employer pays the system average rate
- Under most scenarios, the maximum rate increases allowed by the rate collar are anticipated for the next two biennia
  - Primarily driven by benefit changes from *Moro* Supreme Court decision
- Rates shown do not include:
  - Individual Account Plan (IAP) contributions
  - Rates for the RHIA & RHIPA retiree healthcare programs
  - Debt service payments on pension obligation bonds

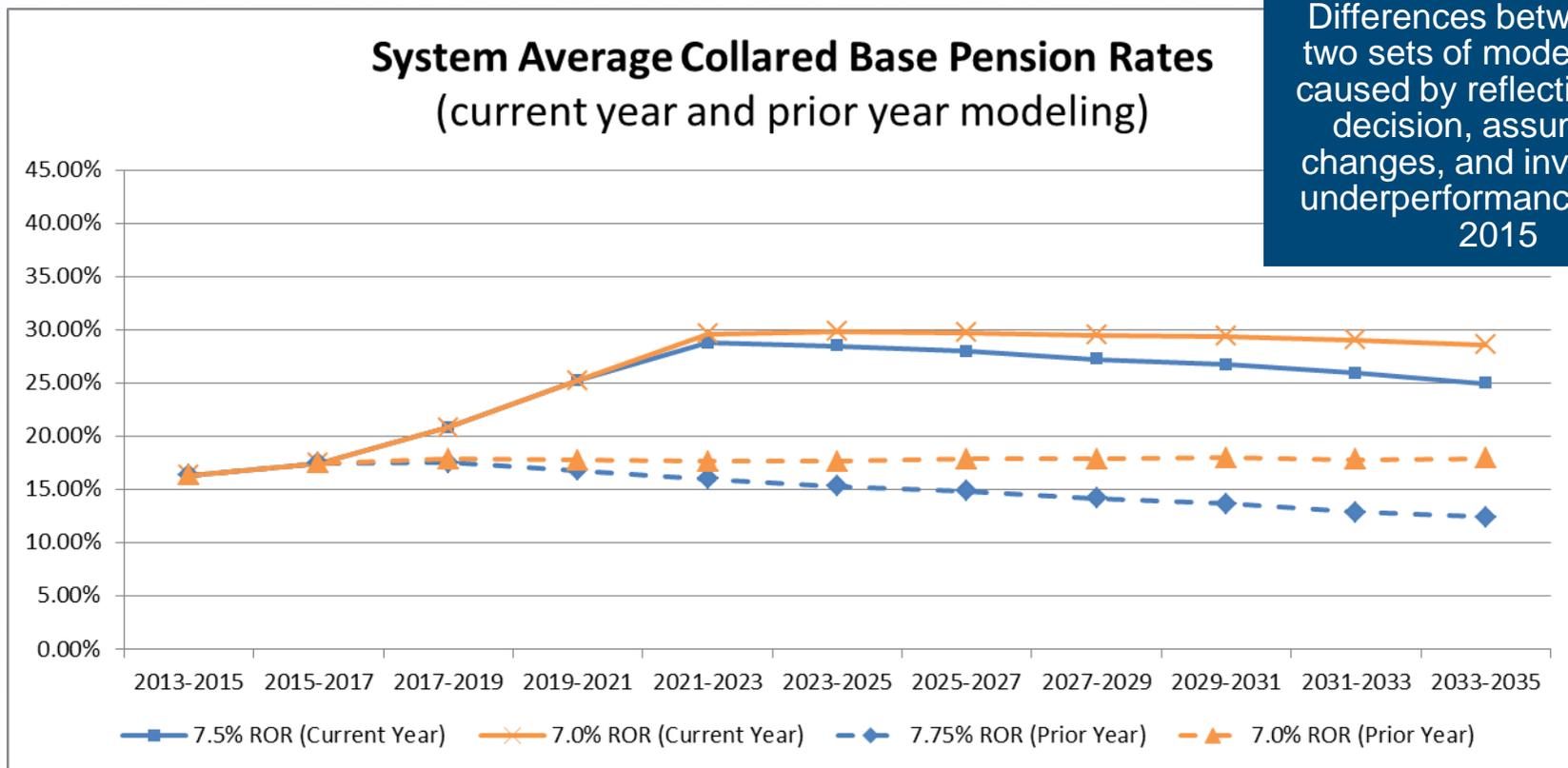
# Steady Return Model Projections



The steady rate model illustrates impact of consistently achieving the assumed 7.50% return and three alternative returns

# Steady Return Model Projections

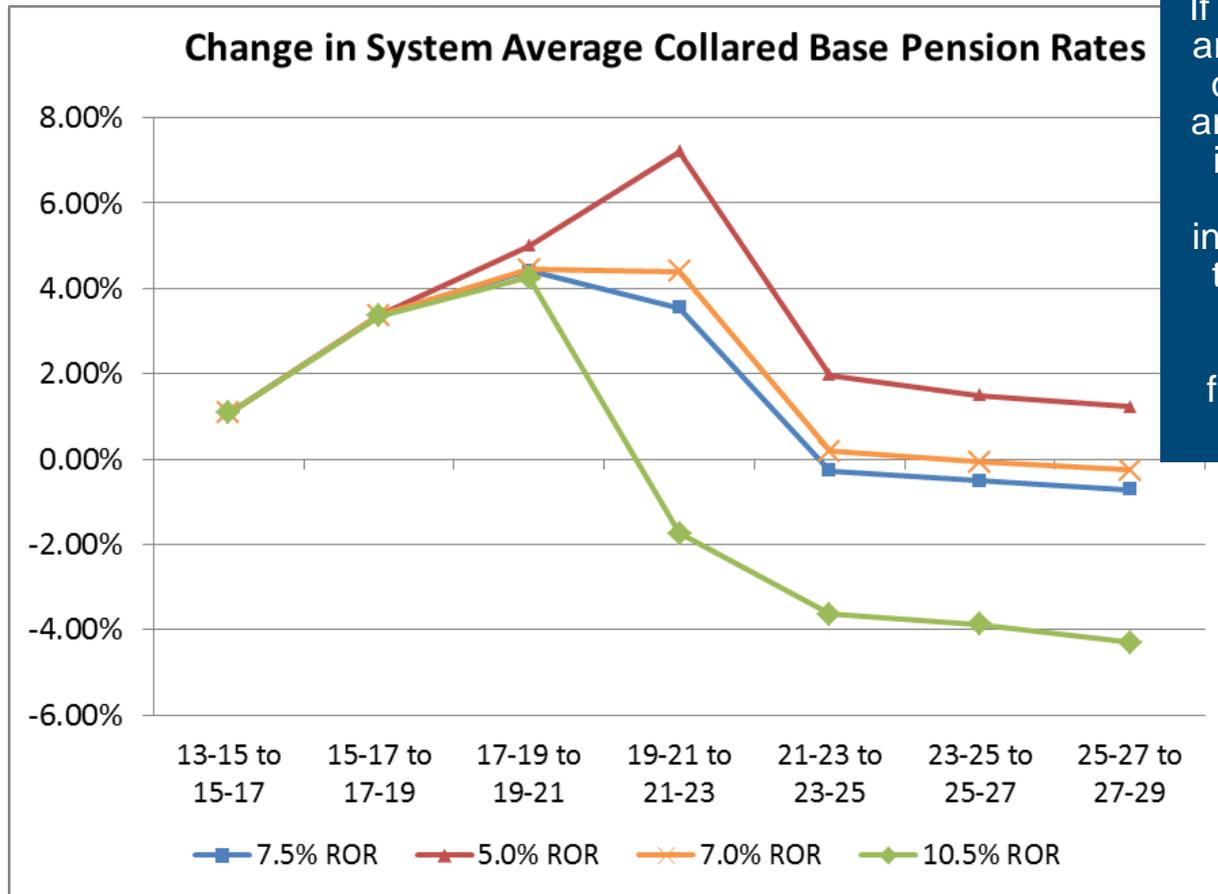
Differences between the two sets of model results caused by reflecting *Moro* decision, assumption changes, and investment underperformance during 2015



- Current Year: reflects *Moro* decision, 12/31/2014 valuation, and investment results through October 2015
- Prior year: pre-*Moro*, 12/31/2013 valuation, and investment results through October 2014

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# Steady Return Model Projections

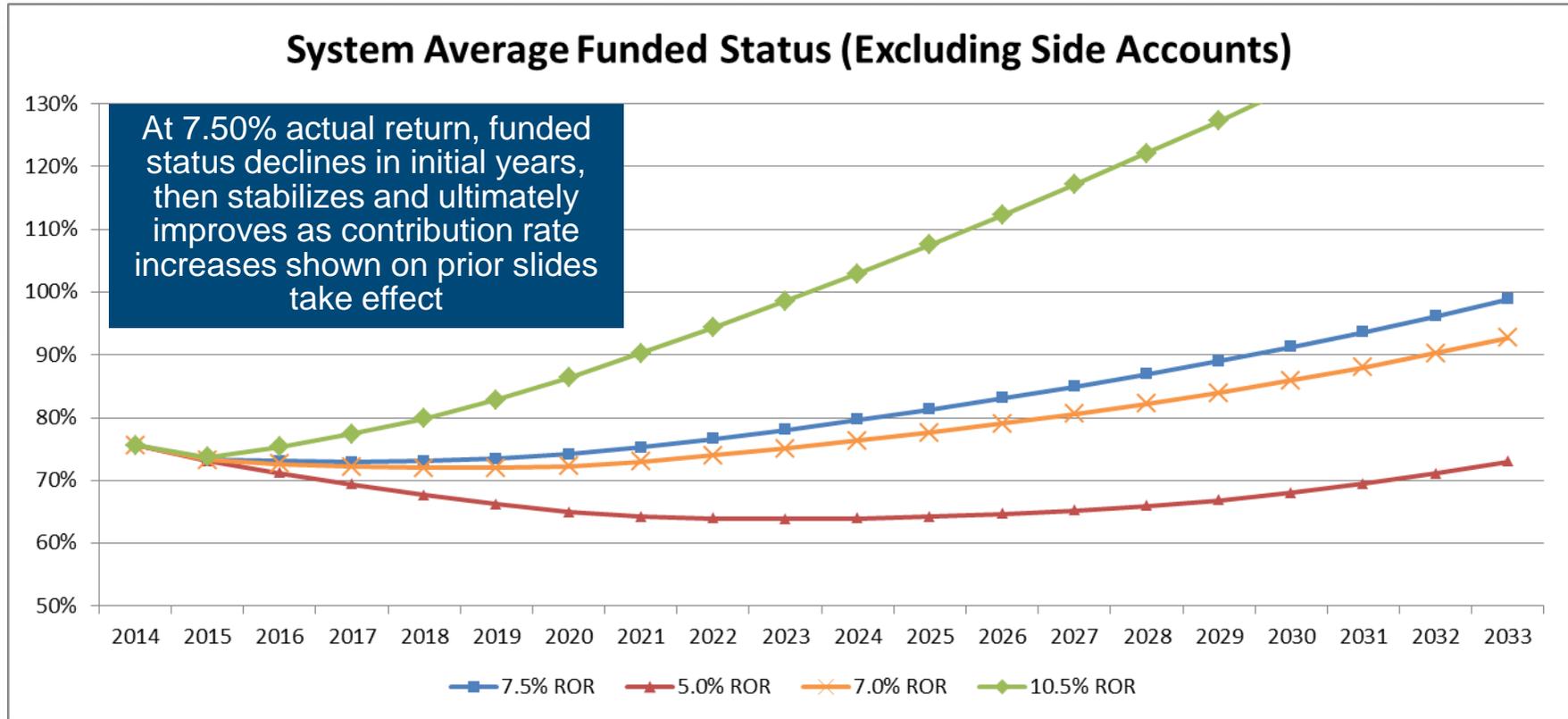


If actual investment returns are near assumption, base contribution increases of around 4% of payroll occur in each of the next three biennia, with those increases being necessary to position the system to return to 100% funded status over 20 years if future experience follows assumptions

Shows biennium to biennium changes under steady return projections

# Steady Return Model Projections

Funded status reaches 100% in 2033 in the model when actual investment returns equal 7.50%



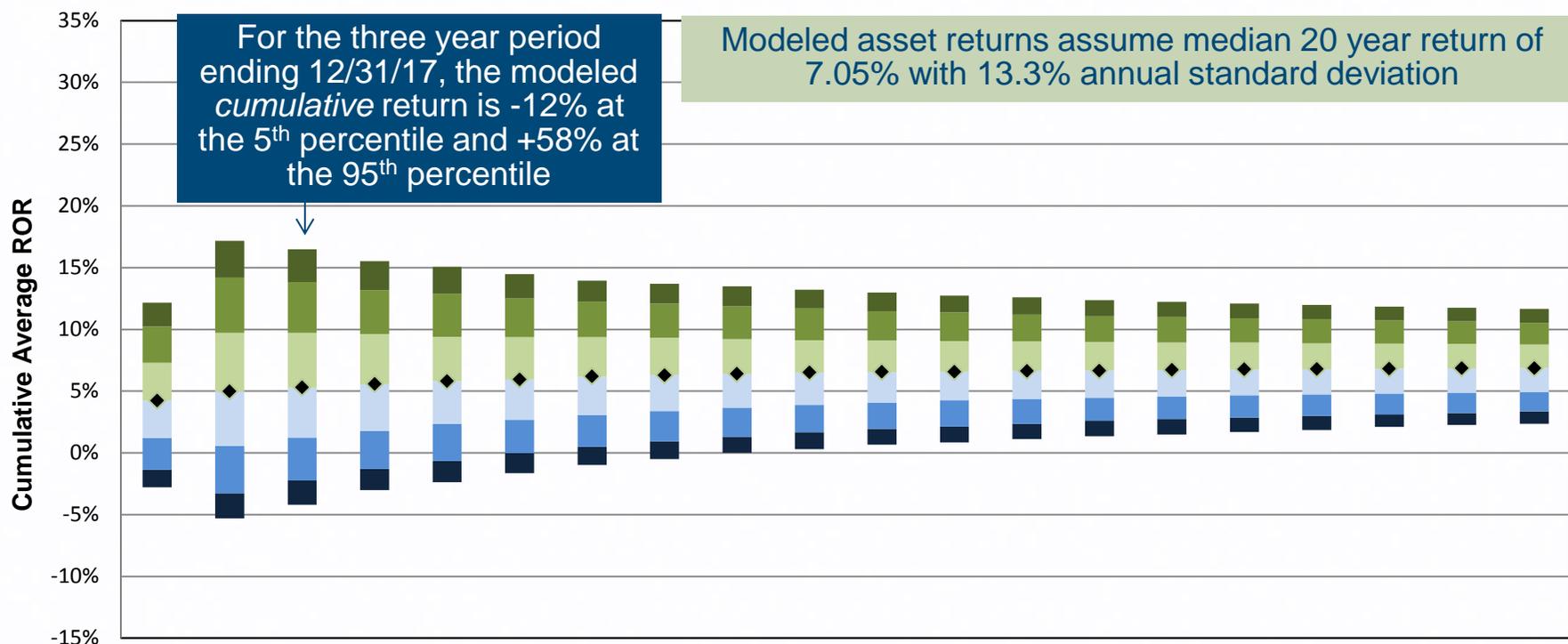
Shows projected funded status under steady return projections

# Variable Return Model

- Model results are likelihood ranges instead of a single amount
  - The distribution is based on a stochastic simulation using 10,000 trials
  - Scenarios were developed by our national capital market specialists, and use the current OPERF target asset allocation policy; for these scenarios, the median annualized average 20-year return is 7.05%
- In our results charts, the dots represent median outcomes
- We display model results from the 5<sup>th</sup> to 95<sup>th</sup> percentiles
  - Ten percent of model outcomes fall outside of the depicted range
- The chart format is demonstrated on the next slide
  - It shows the modeled range of potential future investment returns that could be experienced by the fund
  - Returns are shown as average annualized returns on a calendar year basis, and incorporate published 2015 returns through October 31

# Average Annualized Rate of Investment Return

## Post-2014 Modeled Returns (Geometric Average)

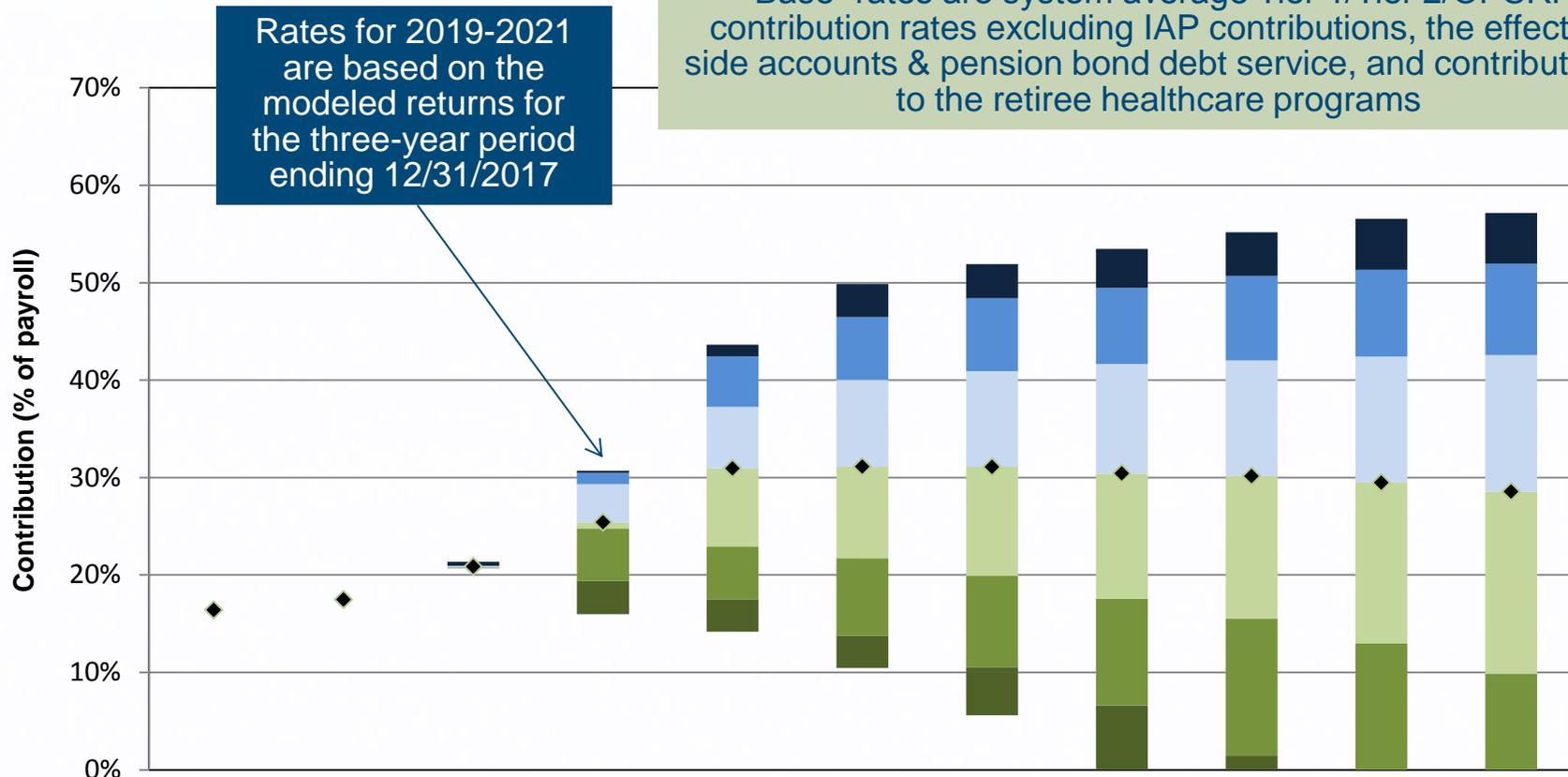


PY Ending 12/31	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
95th	12.2%	17.2%	16.5%	15.5%	15.1%	14.5%	13.9%	13.7%	13.5%	13.2%	13.0%	12.7%	12.6%	12.4%	12.2%	12.1%	12.0%	11.8%	11.7%	11.7%
90th	10.2%	14.2%	13.8%	13.2%	12.9%	12.5%	12.3%	12.1%	11.9%	11.7%	11.5%	11.4%	11.2%	11.1%	11.0%	10.9%	10.8%	10.7%	10.6%	10.5%
75th	7.3%	9.7%	9.7%	9.6%	9.4%	9.4%	9.4%	9.3%	9.2%	9.1%	9.1%	9.1%	9.0%	9.0%	8.9%	8.9%	8.9%	8.8%	8.8%	8.8%
50th	4.2%	5.0%	5.3%	5.6%	5.8%	5.9%	6.2%	6.3%	6.4%	6.5%	6.5%	6.6%	6.6%	6.6%	6.7%	6.8%	6.8%	6.8%	6.8%	6.9%
25th	1.2%	0.6%	1.2%	1.8%	2.3%	2.7%	3.1%	3.4%	3.7%	3.9%	4.1%	4.3%	4.4%	4.5%	4.6%	4.7%	4.7%	4.8%	4.9%	4.9%
10th	-1.4%	-3.3%	-2.2%	-1.3%	-0.7%	0.0%	0.5%	0.9%	1.3%	1.7%	2.0%	2.1%	2.4%	2.6%	2.7%	2.9%	3.0%	3.1%	3.2%	3.4%
5th	-2.8%	-5.3%	-4.2%	-3.0%	-2.4%	-1.6%	-1.0%	-0.5%	0.0%	0.3%	0.7%	0.9%	1.1%	1.4%	1.5%	1.7%	1.9%	2.1%	2.3%	2.4%

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# Collared System Average Base Contribution Rates

“Base” rates are system average Tier 1/Tier 2/OPSRP contribution rates excluding IAP contributions, the effect of side accounts & pension bond debt service, and contributions to the retiree healthcare programs



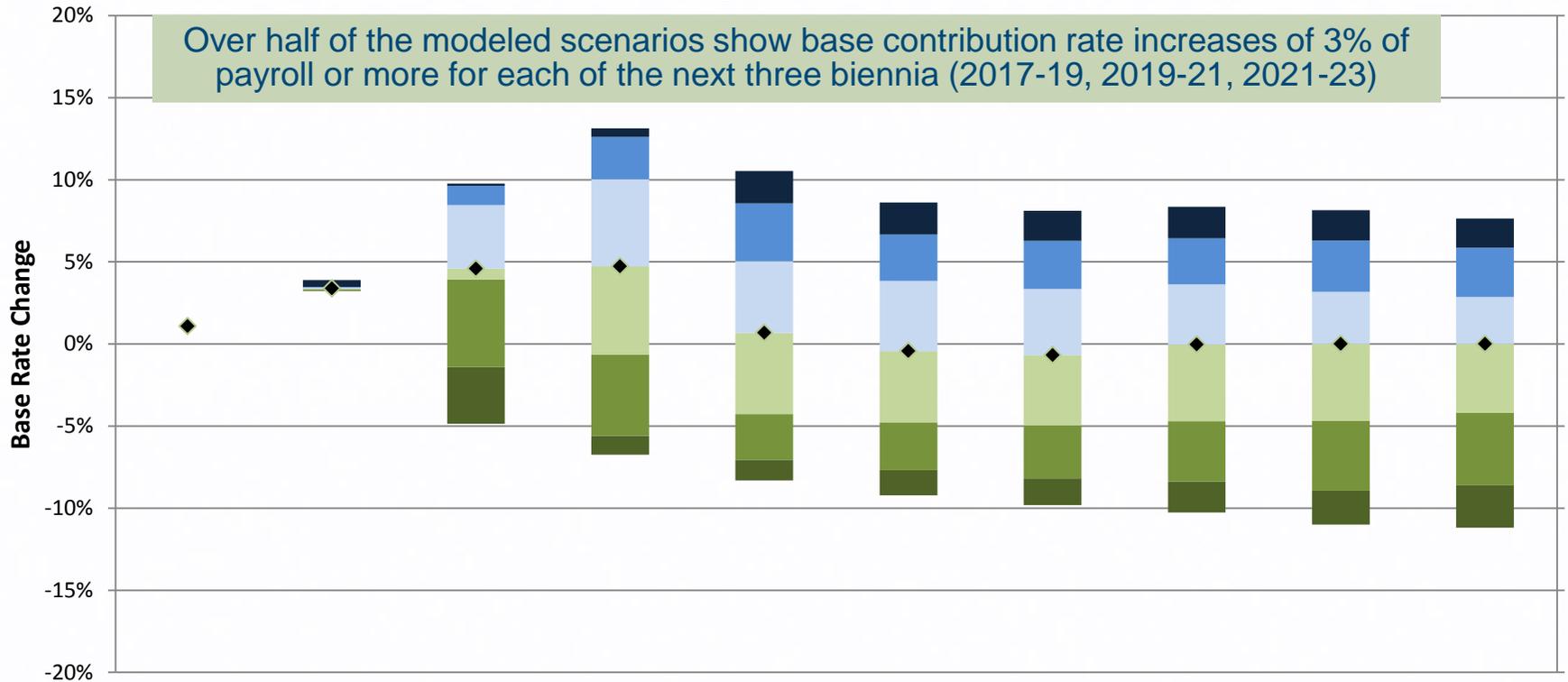
Biennium	2013-2015	2015-2017	2017-2019	2019-2021	2021-2023	2023-2025	2025-2027	2027-2029	2029-2031	2031-2033	2033-2035
5th	16.4%	17.5%	21.4%	30.7%	43.6%	49.9%	51.9%	53.5%	55.2%	56.5%	57.2%
10th	16.4%	17.5%	20.9%	30.5%	42.4%	46.5%	48.4%	49.5%	50.7%	51.3%	52.0%
25th	16.4%	17.5%	20.9%	29.3%	37.2%	40.0%	40.9%	41.7%	42.0%	42.4%	42.6%
50th	16.4%	17.5%	20.8%	25.4%	30.9%	31.1%	31.1%	30.4%	30.1%	29.5%	28.5%
75th	16.4%	17.5%	20.8%	24.8%	22.9%	21.7%	19.9%	17.6%	15.5%	13.0%	9.9%
90th	16.4%	17.5%	20.7%	19.4%	17.5%	13.7%	10.6%	6.6%	1.4%	0.0%	0.0%
95th	16.4%	17.5%	20.7%	16.0%	14.2%	10.5%	5.6%	0.0%	0.0%	0.0%	0.0%

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# Collared System Average Base Contribution Rates

## Biennium to Biennium Changes

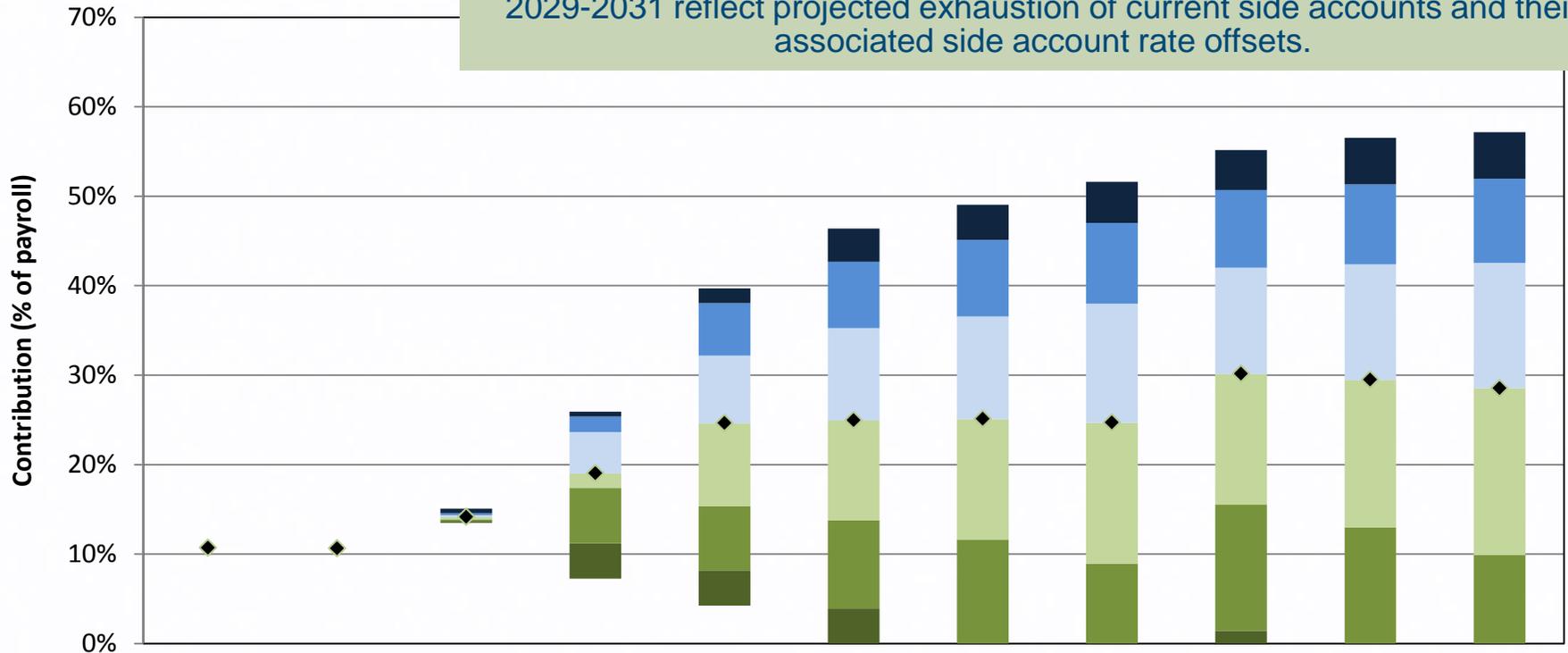


Change from:	13-15 to 15-17	15-17 to 17-19	17-19 to 19-21	19-21 to 21-23	21-23 to 23-25	23-25 to 25-27	25-27 to 27-29	27-29 to 29-31	29-31 to 31-33	31-33 to 33-35
5th	1.1%	3.9%	9.8%	13.1%	10.5%	8.6%	8.1%	8.4%	8.1%	7.6%
10th	1.1%	3.5%	9.6%	12.6%	8.6%	6.7%	6.3%	6.4%	6.3%	5.9%
25th	1.1%	3.4%	8.5%	10.0%	5.0%	3.8%	3.4%	3.6%	3.2%	2.9%
50th	1.1%	3.4%	4.6%	4.7%	0.7%	-0.4%	-0.7%	0.0%	0.0%	0.0%
75th	1.1%	3.3%	3.9%	-0.7%	-4.3%	-4.8%	-5.0%	-4.7%	-4.7%	-4.2%
90th	1.1%	3.3%	-1.4%	-5.6%	-7.1%	-7.7%	-8.2%	-8.4%	-8.9%	-8.6%
95th	1.1%	3.2%	-4.9%	-6.7%	-8.3%	-9.2%	-9.8%	-10.3%	-11.0%	-11.2%

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# System Average Net Contribution Rates

“Net” rates are base rates adjusted to reflect the projected effect of side account rate offsets and pre-SLGRP rate offsets. Net rate increases in 2029-2031 reflect projected exhaustion of current side accounts and their associated side account rate offsets.



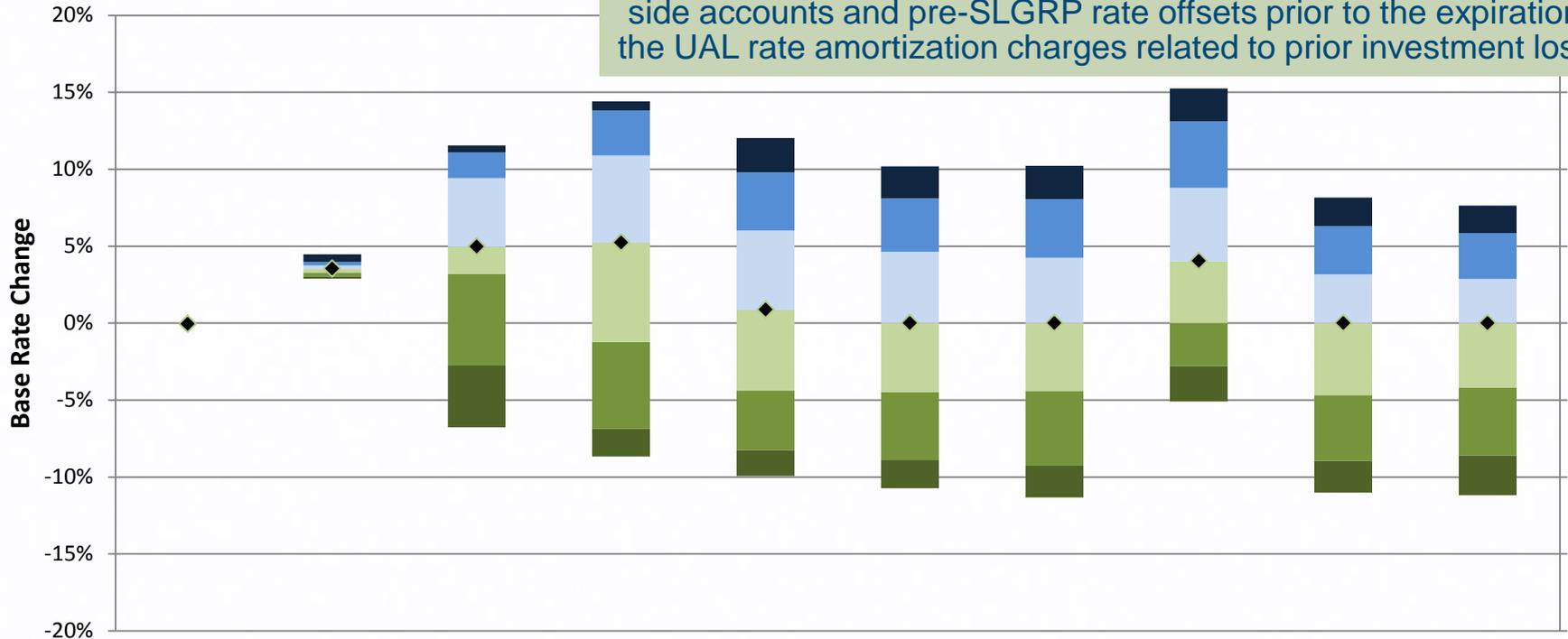
Biennium	2013-2015	2015-2017	2017-2019	2019-2021	2021-2023	2023-2025	2025-2027	2027-2029	2029-2031	2031-2033	2033-2035
5th	10.7%	10.6%	15.1%	25.9%	39.7%	46.4%	49.1%	51.6%	55.2%	56.5%	57.2%
10th	10.7%	10.6%	14.6%	25.4%	38.0%	42.7%	45.1%	47.0%	50.7%	51.3%	52.0%
25th	10.7%	10.6%	14.4%	23.6%	32.2%	35.2%	36.6%	38.0%	42.0%	42.4%	42.6%
50th	10.7%	10.6%	14.1%	19.0%	24.6%	24.9%	25.1%	24.7%	30.1%	29.5%	28.5%
75th	10.7%	10.6%	13.9%	17.4%	15.4%	13.7%	11.6%	8.9%	15.5%	13.0%	9.9%
90th	10.7%	10.6%	13.7%	11.2%	8.2%	3.9%	0.0%	0.0%	1.4%	0.0%	0.0%
95th	10.7%	10.6%	13.5%	7.3%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

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# System Average Net Contribution Rates

## Biennium to Biennium Changes

The July 2029 increase is related to the projected exhaustion of side accounts and pre-SLGRP rate offsets prior to the expiration of the UAL rate amortization charges related to prior investment losses

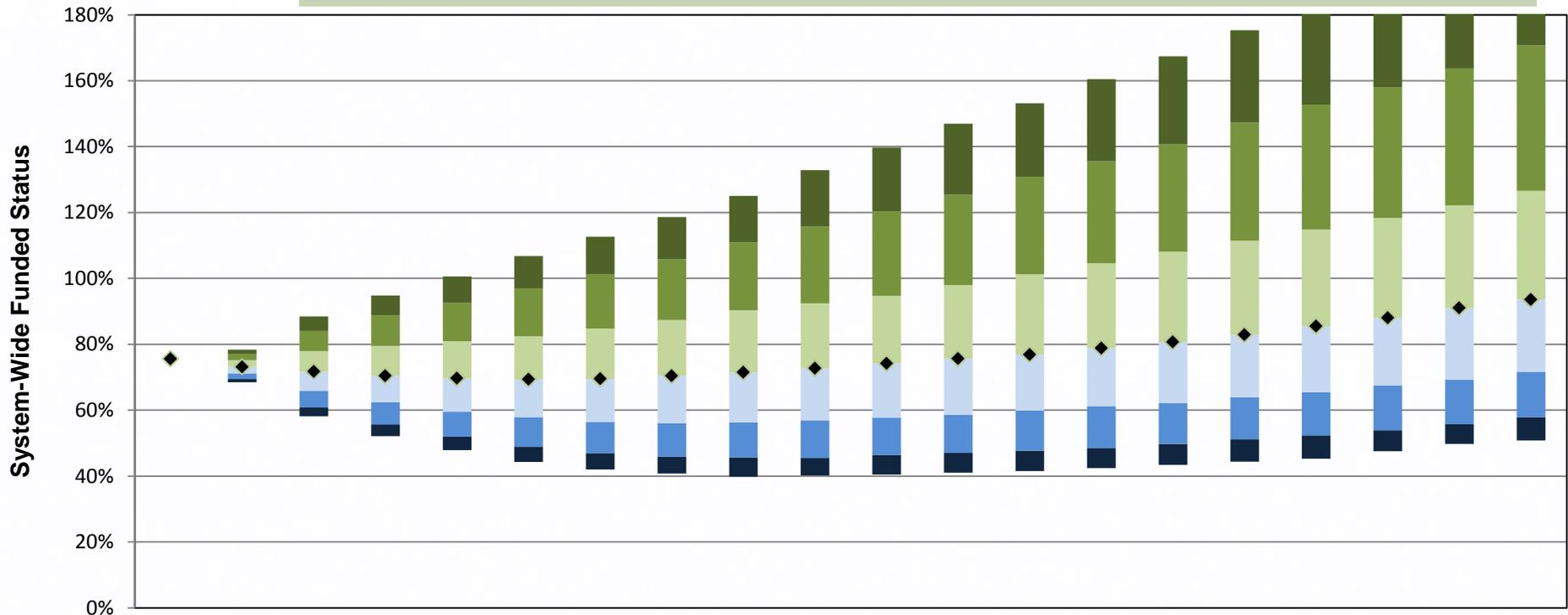


Change from:	13-15 to 15-17	15-17 to 17-19	17-19 to 19-21	19-21 to 21-23	21-23 to 23-25	23-25 to 25-27	25-27 to 27-29	27-29 to 29-31	29-31 to 31-33	31-33 to 33-35
5th	-0.1%	4.5%	11.5%	14.4%	12.0%	10.2%	10.2%	15.2%	8.1%	7.6%
10th	-0.1%	4.0%	11.1%	13.8%	9.8%	8.1%	8.1%	13.1%	6.3%	5.9%
25th	-0.1%	3.8%	9.4%	10.9%	6.0%	4.6%	4.3%	8.8%	3.2%	2.9%
50th	-0.1%	3.5%	5.0%	5.2%	0.9%	0.0%	0.0%	4.0%	0.0%	0.0%
75th	-0.1%	3.3%	3.2%	-1.2%	-4.4%	-4.5%	-4.4%	0.0%	-4.7%	-4.2%
90th	-0.1%	3.0%	-2.7%	-6.9%	-8.3%	-8.9%	-9.3%	-2.8%	-8.9%	-8.6%
95th	-0.1%	2.9%	-6.8%	-8.7%	-9.9%	-10.7%	-11.3%	-5.1%	-11.0%	-11.2%

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# Funded Status (Excluding Side Accounts)

At the 50<sup>th</sup> percentile, funded status is 73% at year-end 2015, and decreases by 3-4% over the next four years before starting to improve, reaching 93% by the end of 2033



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	75.6%	78.4%	88.5%	94.8%	100.6%	106.8%	112.7%	118.6%	125.0%	132.9%	139.7%	147.0%	153.2%	160.5%	167.4%	175.3%	184.6%	192.0%	201.6%	208.7%
90th	75.6%	77.1%	84.1%	88.8%	92.5%	97.0%	101.1%	105.8%	110.9%	115.7%	120.4%	125.4%	130.8%	135.6%	140.7%	147.3%	152.7%	158.0%	163.7%	170.7%
75th	75.6%	75.2%	77.9%	79.5%	81.0%	82.4%	84.8%	87.4%	90.4%	92.4%	94.8%	98.0%	101.2%	104.6%	108.1%	111.4%	114.8%	118.3%	122.2%	126.6%
50th	75.6%	73.1%	71.7%	70.4%	69.6%	69.3%	69.5%	70.4%	71.4%	72.7%	74.2%	75.6%	76.9%	78.8%	80.7%	82.8%	85.5%	88.0%	91.0%	93.6%
25th	75.6%	71.2%	65.9%	62.3%	59.6%	57.9%	56.4%	56.0%	56.3%	56.9%	57.8%	58.6%	59.9%	61.2%	62.2%	63.9%	65.4%	67.5%	69.2%	71.6%
10th	75.6%	69.5%	60.8%	55.7%	51.9%	48.8%	47.0%	45.9%	45.7%	45.5%	46.4%	47.0%	47.7%	48.5%	49.8%	51.1%	52.4%	53.9%	55.8%	57.8%
5th	75.6%	68.5%	58.1%	52.1%	47.9%	44.3%	42.0%	40.8%	39.8%	40.2%	40.4%	41.0%	41.5%	42.4%	43.4%	44.3%	45.3%	47.5%	49.7%	50.8%

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# Variable Return Model Stress Test

- Similar to last year, 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%	60%
Funded Status (Excluding Side Accounts) < 60%	61%
Funded Status (Excluding Side Accounts) < 40%	13%
Base Rate (Excluding Retiree Healthcare) >30% of Pay	74%

# Variable Return Model Stress Test

- Likelihood in the model 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	>99%	98%
4% of Pay	82%	80%
5% of Pay	63%	67%

# Variable Return Model Stress Test

- Likelihood in the model of a rate increase exceeding a selected threshold at the July 2019 rate change

Likelihood of the July 2019 Rate Increase Exceeding Threshold		
<u>Threshold Increase</u>	<u>Base Rate</u>	<u>Net Rate</u>
3% of Pay	79%	76%
4% of Pay	74%	66%
5% of Pay	46%	49%

# Variable Return Model Stress Test

- Likelihood in the model of cumulative 2019 and 2021 rate increases exceeding a selected threshold

## Likelihood of Cumulative 2019 and 2021 Rate Increases Exceeding Threshold

<u>Threshold Increase</u>	<u>Base Rate</u>	<u>Net Rate</u>
6% of Pay	64%	63%
8% of Pay	57%	57%
10% of Pay	50%	51%

# Advisory 2017-2019 Individual Employer Rates

- Advisory 2017-2019 employer-specific contribution rates from the December 31, 2014 actuarial valuation are included with today's Board materials and posted on PERS' website
  - PERS is distributing full reports to each individual employer
- Individual employer rate changes can vary from behavior of system-average results for several reasons, including:
  - Side accounts
  - Changes in payroll significantly different than assumed
    - Affects rate offset for side accounts, and rate charge/offset for Transition Liability/Surplus amounts for SLGRP employers
  - Employer demographic changes
    - Especially for independent employers or SLGRP employers with a change in the split between Police & Fire versus General Service

# Wrap Up / Next Steps

- Questions?
- At the January meeting, preliminary year-end 2015 investment results will be available
  - We can then comment on estimated impact on the 12/31/2015 valuation results, which will develop 2017 – 2019 contribution rates

# Certification

This presentation summarizes deterministic and stochastic modeling for the Oregon Public Employees Retirement System (“PERS” or “the System”) over a 20 year period beginning December 31, 2014 under a wide range of potential economic scenarios. The results are based upon the same assumptions, methods, and plan provisions as described in the December 31, 2014 System-Wide Actuarial Valuation Report, except where noted otherwise.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by the System’s staff. 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 our best estimate of anticipated experience affecting the System.

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. The PERS Board has the final decision regarding the appropriateness of the assumptions.

Actuarial computations presented in this report are for purposes of determining the recommended funding amounts for the System. The computations prepared for other purposes may differ as disclosed in our report. The calculations in the enclosed report have been made on a basis consistent with our understanding of the System’s funding requirements and goals.

# 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 this 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 pension actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

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

## Actuarial Basis Data

We have based our calculation of the liabilities on the data supplied by the Oregon Public Employees Retirement System and summarized in the Valuation Report.

Assets as of December 31, 2014, were based on values provided by Oregon PERS reflecting the Board's earnings crediting decisions for 2014, as shown in the Valuation Report. Financial model projections reflect October 31, 2015 investment results for regular and variable accounts as published by Oregon State Treasury.

### **Methods / Policies**

*Actuarial Cost Method:* Entry Age Normal, adopted effective December 31, 2012.

*UAL Amortization:* The UAL for OPSRP and Retiree Health Care as of December 31, 2007 are amortized as a level percentage of combined valuation payroll over a closed 16 year period for OPSRP and a closed 10 year period for Retiree Health Care. For the Tier 1/Tier 2 UAL, the amortization period was reset at 20 years as of December 31, 2013. Gains and losses between subsequent odd-year valuations are amortized as a level percentage of combined valuation payroll over the amortization period (20 years for Tier/Tier 1, 16 years for OPSRP, 10 years for Retiree Health Care) from the odd-year valuation in which they are first recognized.

# Appendix

## Actuarial Basis

### Methods / Policies (cont'd)

*Contribution rate stabilization method:* Contribution rates for a rate pool (e.g. Tier 1/Tier 2 SLGRP, Tier 1/Tier 2 School Districts, OPSRP) are confined to a collar based on the prior contribution rate (prior to application of side accounts, pre-SLGRP liabilities, and 6 percent Independent Employer minimum). The new contribution rate will generally not increase or decrease from the prior contribution rate by more than the greater of 3 percentage points or 20 percent of the prior contribution rate. If the funded percentage excluding side accounts drops below 60% or increases above 140%, the size of the collar doubles. If the funded percentage excluding side accounts is between 60% and 70% or between 130% and 140%, the size of the rate collar is increased on a graded scale.

*Expenses:* OPSRP administration expenses are assumed to be equal to \$5.5M and are added to the OPSRP normal cost. Tier 1/Tier 2 administration expenses are assumed to be equal to \$33M and are added to the Tier 1/Tier 2 normal cost.

*Actuarial Value of Assets:* Equal to Market Value of Assets excluding Contingency and Tier 1 Rate Guarantee Reserves. The Tier 1 Rate Guarantee Reserve is not excluded from assets if it is negative (i.e. in deficit status).

### Assumptions

Assumptions for valuation calculations are as described in the 2014 Experience Study for Oregon PERS.

### Provisions

Provisions valued are as detailed in the Valuation Report.

# Appendix

## Rate Projection Basis

### Assumptions

In general, all assumptions are as described in the 2014 Experience Study Report.

The major assumptions used in our projections are shown below. They are aggregate average assumptions that apply to the whole population and were held constant throughout the projection period. The economic experience adjustments were allowed to vary in future years given the conditions defined in each economic scenario.

- Valuation interest rate – 7.50%
- Tier 1 Regular account growth – 7.50%
- Actual fund investment return– Varies by scenario according to capital market assumptions
- Variable account growth – Equal to investment return on public equity portion of the fund
- Inflation assumption – 2.50%
- Inflation experience – Varies by scenario according to capital market assumptions
- Wage growth assumption – 3.50%
- Wage growth experience– 1.00% greater than inflation experience
- Demographic experience – as described in 2014 Experience Study report

# Appendix

## Rate Projection Basis

### Reserve Projection

Contingency Reserve as of 12/31/2014 was assumed to be \$651.2M. No future increases or decreases to this reserve were assumed.

The Tier 1 Rate Guarantee Reserve (“RGR”) was assumed to be \$446.0M as of 12/31/2014. The reserve was assumed to grow with returns in excess of 7.50% on Tier 1 Member Accounts. When aggregate returns were below 7.50%, applicable amounts from the RGR were transferred to Tier 1 Member Accounts to maintain the 7.50% target growth on the member accounts. The RGR reserve is allowed to be negative, but the reserve is not excluded from valuation assets when it is negative. We did not include in rates any potential additional employer levy that could be required to eliminate a persistent negative RGR.

# Appendix

## Rate Projection Basis

### Capital Market Model

For each 20-year projection, we ran 10,000 stochastic scenarios for inflation and asset class rates of return. The scenarios were calibrated to represent Milliman's capital market assumptions in terms of expected average returns, the expected year-to-year volatility of the returns, and the expected correlation between the returns of different asset classes. Annual rates of return for each of the asset classes and inflation are generated from a multivariate lognormal probability distribution. Rates of return are independent from year to year.

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 the OIC's Statement of Investment Objectives and Policy Framework for the Oregon PERS Fund, as revised December 3, 2014, and changes adopted in June 2015

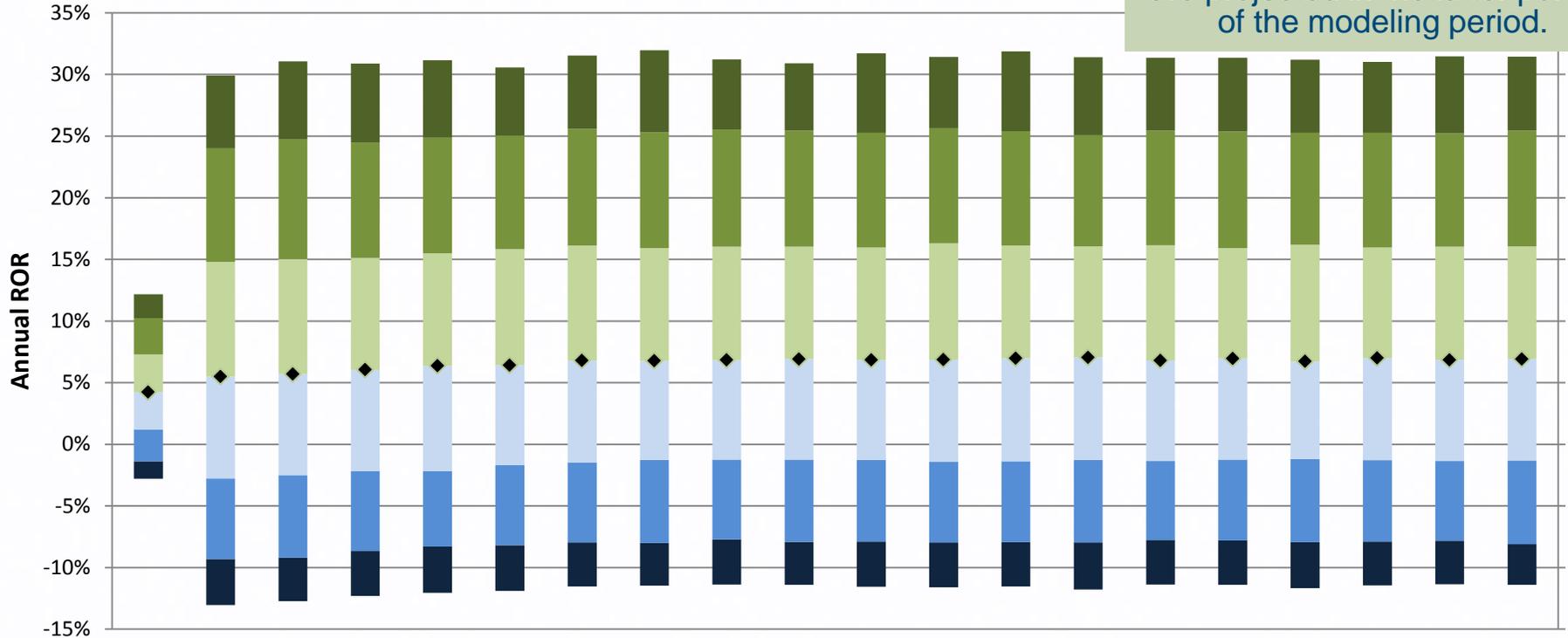
	<b>Annual Arithmetic Mean</b>	<b>20-Year Annualized Geometric Mean</b>	<b>Annual Standard Deviation</b>	<b>Policy Allocation</b>
US Broad Equity	7.91%	6.62%	17.26%	<b>18.37%</b>
Non-US Developed Large/Mid-Cap Equity	8.54%	6.92%	19.40%	<b>15.00%</b>
Emerging Markets Equity	10.73%	7.42%	28.45%	<b>4.13%</b>
Private Equity	11.51%	7.87%	30.00%	<b>17.50%</b>
US Universal Fixed Income	4.29%	4.19%	4.68%	<b>8.00%</b>
US Short Duration Bonds	3.76%	3.73%	2.74%	<b>8.00%</b>
Leveraged Loans	5.90%	5.62%	7.82%	<b>3.00%</b>
High Yield	6.81%	6.34%	10.28%	<b>1.00%</b>
Real Estate	6.51%	5.87%	12.00%	<b>10.00%</b>
Global REITs	8.44%	6.37%	22.02%	<b>2.50%</b>
Natural Resources	6.62%	5.87%	13.00%	<b>2.81%</b>
Infrastructure	8.05%	6.87%	16.50%	<b>3.75%</b>
Commodities	6.16%	4.67%	18.40%	<b>2.81%</b>
Hedge Funds	6.79%	6.42%	9.08%	<b>3.13%</b>
US Inflation (CPI-U)	2.50%	2.50%	1.85%	<b>N/A</b>
<b>Fund Total (reflecting asset class correlations)</b>	<b>7.82%</b>	<b>7.05%</b>	<b>13.25%</b>	<b>100%</b>

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# PERS Fund Rate of Return

## Single Calendar Year Investment Returns

Our capital market outlook model projects lower median returns in the first five years following 2015 due to current low yields on fixed income. Higher median returns are projected in the latter portion of the modeling period.



PY Ending 12/31	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
95th	12.2%	29.9%	31.1%	30.9%	31.2%	30.6%	31.5%	32.0%	31.2%	30.9%	31.7%	31.4%	31.9%	31.4%	31.4%	31.4%	31.2%	31.0%	31.5%	31.4%
90th	10.2%	24.0%	24.7%	24.5%	24.9%	25.1%	25.6%	25.3%	25.5%	25.5%	25.3%	25.6%	25.4%	25.1%	25.5%	25.4%	25.3%	25.3%	25.2%	25.5%
75th	7.3%	14.8%	15.0%	15.1%	15.5%	15.8%	16.1%	15.9%	16.0%	16.0%	16.0%	16.3%	16.1%	16.1%	16.2%	15.9%	16.2%	16.0%	16.0%	16.1%
50th	4.2%	5.5%	5.7%	6.0%	6.4%	6.4%	6.8%	6.8%	6.8%	6.9%	6.8%	6.9%	7.0%	7.1%	6.8%	7.0%	6.7%	7.0%	6.8%	6.9%
25th	1.2%	-2.8%	-2.5%	-2.2%	-2.2%	-1.7%	-1.5%	-1.3%	-1.3%	-1.3%	-1.3%	-1.4%	-1.4%	-1.3%	-1.4%	-1.3%	-1.2%	-1.3%	-1.4%	-1.3%
10th	-1.4%	-9.3%	-9.2%	-8.7%	-8.3%	-8.2%	-8.0%	-8.0%	-7.7%	-7.9%	-7.9%	-8.0%	-7.9%	-8.0%	-7.8%	-7.8%	-7.9%	-7.9%	-7.8%	-8.1%
5th	-2.8%	-13.0%	-12.7%	-12.3%	-12.0%	-11.9%	-11.5%	-11.5%	-11.4%	-11.4%	-11.6%	-11.6%	-11.5%	-11.8%	-11.4%	-11.4%	-11.7%	-11.4%	-11.4%	-11.4%

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