

Valuation Methods & Assumptions – Including Assumed Investment Return

OREGON PUBLIC EMPLOYEES RETIREMENT SYSTEM July 31, 2015

Presented by:

Matt Larrabee, FSA, EA, MAAA

Scott Preppernau, FSA, EA, MAAA



Agenda

- Overview of recommended demographic assumptions
- Recap of economic assumptions and actuarial methods
 - Reviewed at the Board's May meeting
- Review of long-term investment return assumption
- Estimated effect of assumption changes
- Adoption of assumed return assumption

Executive Summary

- *Moro* ruling will increase contribution rates effective July 2017
 - May 2015 presentation: 3.7%* of payroll increase, with additional *Moro*-related increases “collared off” to subsequent biennia
- Assumption review analysis:
 - Decrease to the investment return assumption
 - Median return estimates are currently between 6.99% and 7.51%
 - Lowering the assumption to 7.50% would increase calculated UAL by \$1.7 billion and the uncollared system-average contribution rate by 2.0%* of payroll
 - Update to the mortality assumption’s projection scale
 - While the current assumption has tracked recent experience, consensus about the anticipated rate of future life expectancy improvement has changed
 - Increase UAL by \$1.8 billion, uncollared rate by 1.6%* of payroll
 - Reflecting all assumptions, increase of \$3.6 billion in UAL, 3.8%* in uncollared rate
 - Analysis-related changes in 2017-2019 collared rates will be far less, with additional analysis-related increases “collared off” to the subsequent biennia
- A second large rate increase, first effective July 2019, due to combined “collared off” effects is anticipated if future experience is near assumption

* system-average preliminary estimate

This work product was prepared for discussion purposes only and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Any recipient of this work product who desires professional guidance should engage qualified professionals for advice appropriate to its own specific needs.

Background Information

Two-Year Rate-Setting Cycle

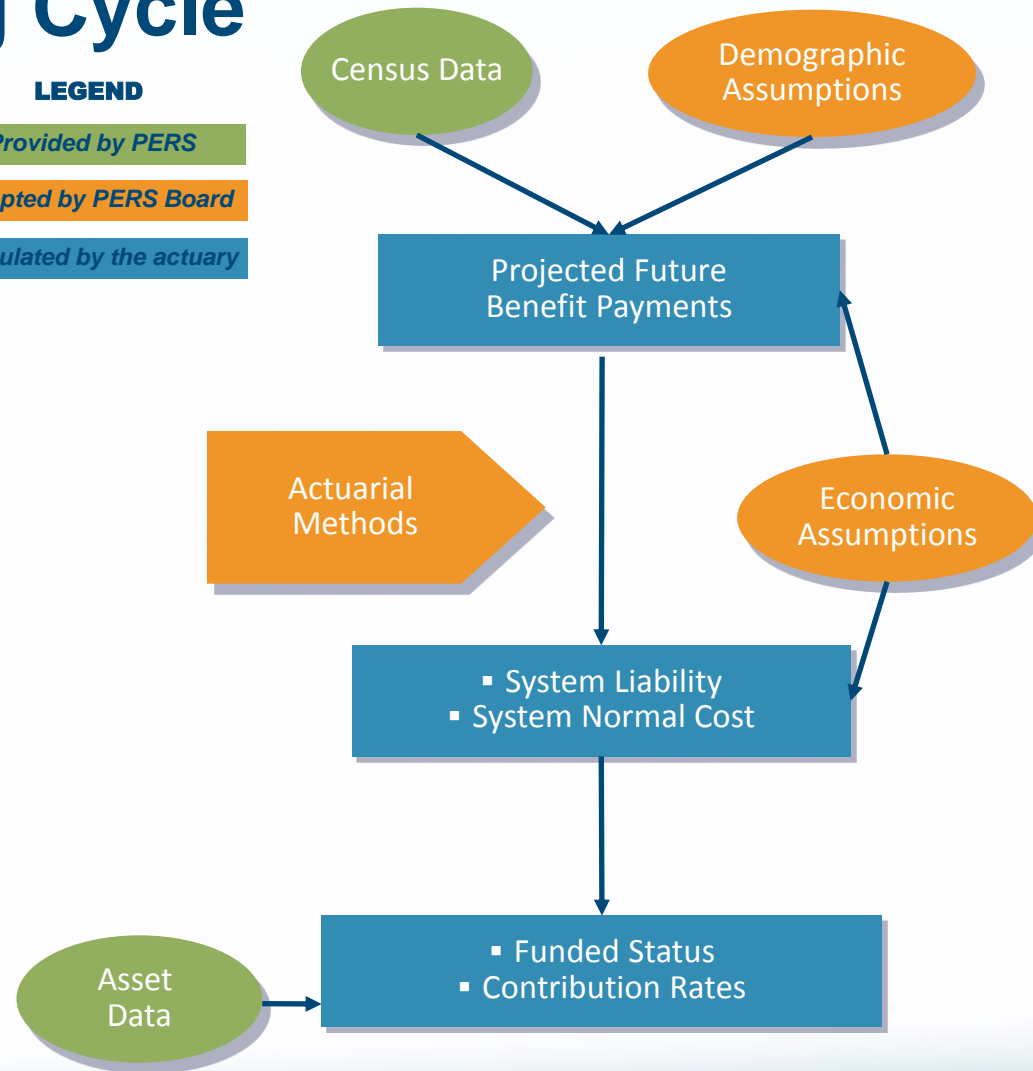
- July 2015: Assumptions & methods adopted by Board in consultation with the actuary
- September 2015: System-wide 12/31/14 “advisory” actuarial valuation results
- November 2015: Advisory 2017-2019 employer-specific contribution rates
- July 2016: System-wide 12/31/15 “rate-setting” actuarial valuation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

LEGEND

Provided by PERS

Adopted by PERS Board

Calculated by the actuary



Objectives for Actuarial Methods & Assumptions

- 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.

The Fundamental Cost Equation

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

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

Governance Structure

- Benefits:
 - Plan design set by Oregon Legislature
 - Subject to judicial review
- Earnings:
 - Asset allocation set by OIC
 - Actual returns determined by market
- Contributions:
 - Funding, including methods & assumptions, set by PERS Board
 - Since contributions are the balancing item in the fundamental cost equation, PERS Board policies primarily affect the **timing** of contributions
 - Different actuarial methods and assumptions produce different expected contribution patterns



Demographic Assumptions

Demographic Assumptions

- We have statistically analyzed census data provided by PERS
 - Four years of data for most assumptions
 - Eight years of data for salary increases
- Recommended demographic assumptions were developed based on the statistical analysis
- Full details of the analysis will be in our formal experience study report
 - That report will be presented for adoption at the September PERS Board meeting, and will also reflect decisions made today regarding the investment return assumption

Summary of Demographic Assumptions

- Update mortality assumptions to reflect actuarial consensus regarding higher anticipated future rate of mortality improvement
 - Consistent with recent studies of Social Security data
- Adjust retirement rates to partially reflect higher recent experience
- Increase merit portion of salary assumption for all groups
- Adjust pre-retirement termination assumptions for two groups
- Updates to assumed final average salary adjustments for factors such as unused vacation and sick leave for most groups
- Adjustments to post-retirement medical program assumptions
 - Participation levels (RHIA & RHIPA)
 - Healthcare inflation assumption for RHIPA program

Mortality Assumption

- Per ORS 238.607, the adopted actuarial equivalency factors *must use the best actuarial information on mortality available at the time*
 - We separately reviewed police and fire mortality per ORS 238.608
 - Our review indicated recent experience for police and fire retirees was similar to that of non-school district general service members
- While the current assumption matched recent experience well, the best actuarial information for future experience has changed
 - We recommend a change to Projection Scale BB, which reflects updated expectations for future life expectancy improvement
 - Several large public systems have adopted Scale BB over the past year

Technical details on our recommendation and more information on the mortality assumption are in the Appendix

Mortality Assumption

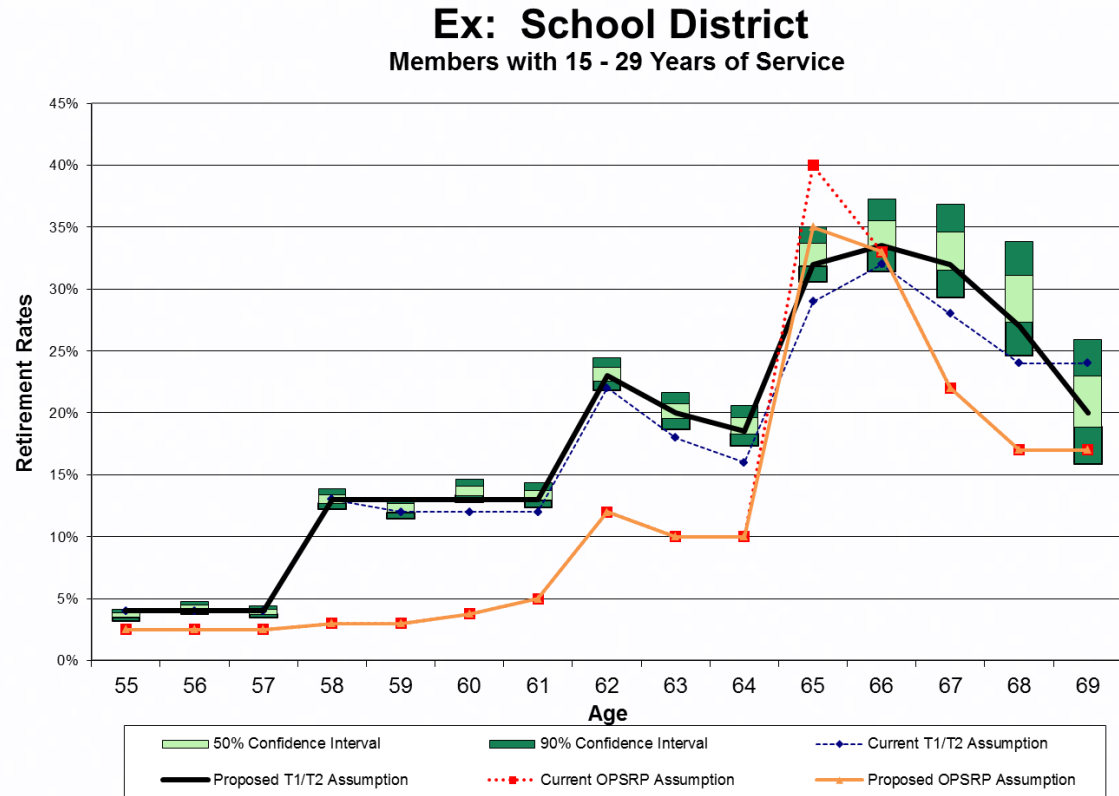
- Illustrative effect of assumption changes for healthy retiree:

Expected single life retirement period	Retires at Age 60 in 2015			Retires at Age 60 in 2035		
	Current	New	Change	Current	New	Change
School District Male	26.2	27.3	1.1	27.8	29.5	1.7
Other Male	25.6	26.7	1.1	27.1	28.8	1.7
School District Female	28.4	29.7	1.3	29.3	31.6	2.3
Other Female	26.5	28.0	1.5	27.4	29.9	2.5

- The table above has three assumed preconditions, all of which serve to increase the life expectancy:
 - The individual is assumed to have already survived to age 60
 - The individual is assumed to have served in PERS-covered employment
 - The individual is assumed to not be disabled as of age 60

Retirement Assumptions

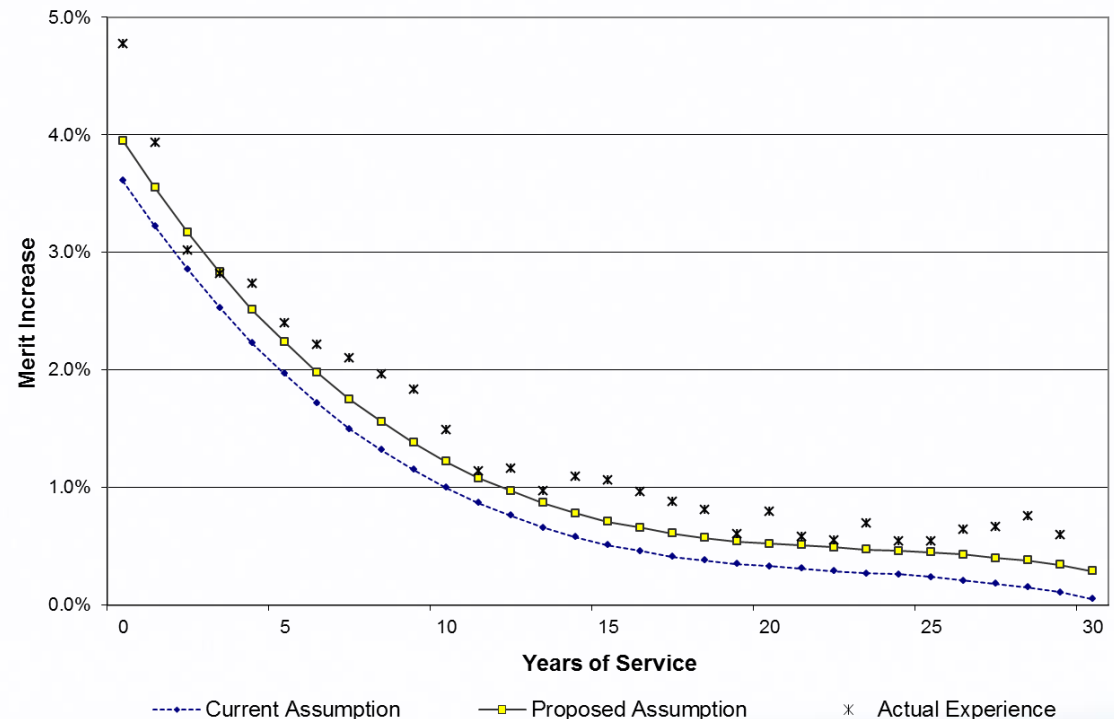
- Structure:
 - School District
 - Other General Service
 - Police & Fire
 - Each divided into 3 service bands
- Modifications made to most assumptions to more closely align with recent experience
 - Example shown at right



Merit Salary Increase Assumption

- Merit/longevity assumption reflects increase above inflation and general wage growth
- Study considered an 8 year period
- Structure:
 - School District
 - Other General Service
 - Police & Fire
- All groups had greater actual increases than were anticipated
- Assumptions were updated to reflect a blend of current assumption and recent observed experience

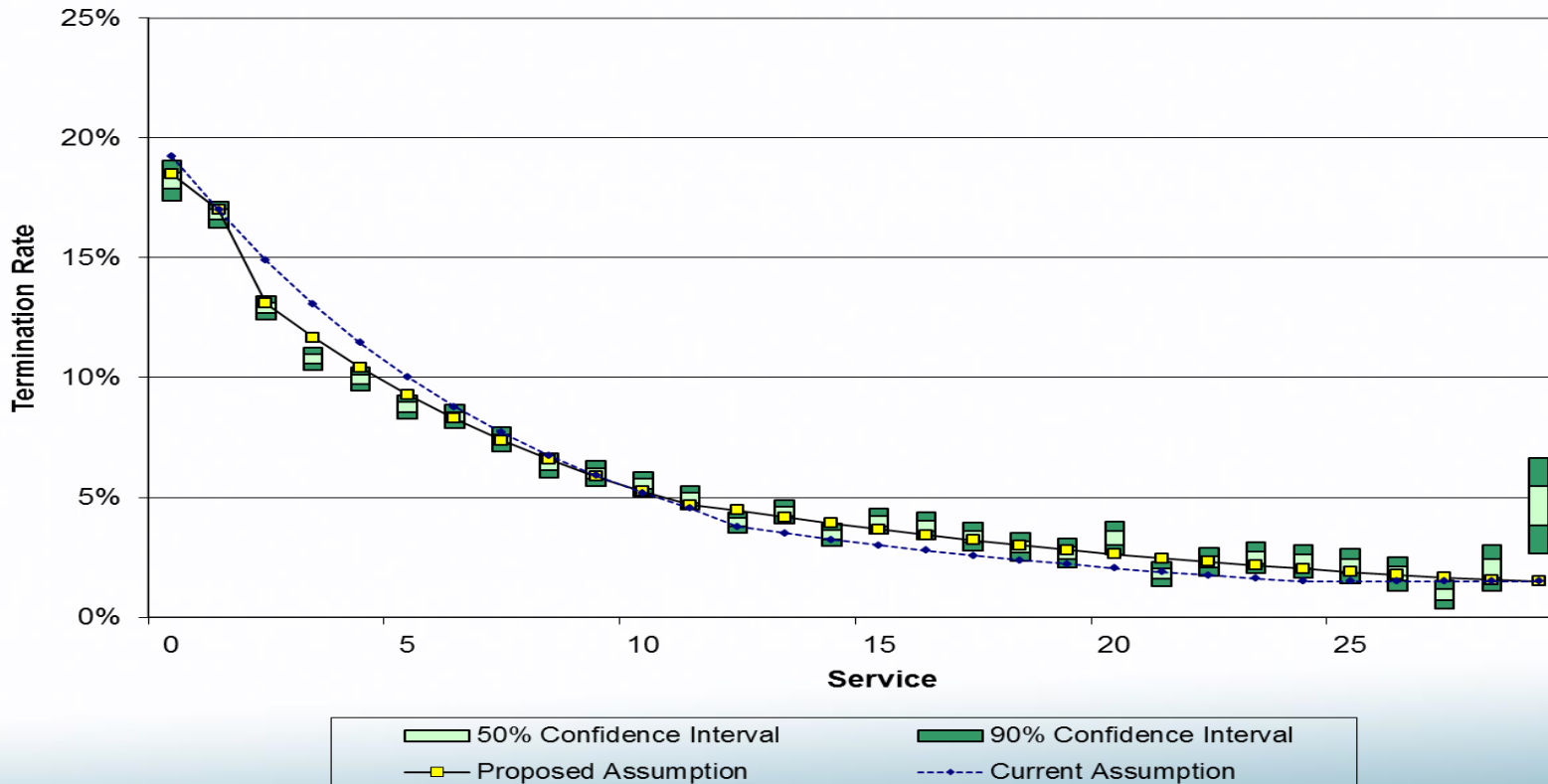
Ex: Other General Service



Termination Assumption

- We recommend adjustments to the assumption for two of five groups for relatively minor, but statistically significant differences between the current assumption and observed experience

Ex: Other General Service Female



This work product was prepared for discussion purposes only and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Any recipient of this work product who desires professional guidance should engage qualified professionals for advice appropriate to its own specific needs.

Final Average Salary Adjustments

- In the valuation, we apply assumptions regarding increase in final average salary for Tier 1/Tier 2 members attributable to:
 - Unused sick leave cash outs
 - Lump sum distribution of vacation pay (only affects benefits for Tier 1)
- Only relevant when benefits are calculated using Full Formula or Formula Plus Annuity
- We recommend adjustments to more closely track recent experience:

Unused Sick Leave	Current Assumption	Proposed Assumption
State GS Male	6.25%	6.25%
State GS Female	3.75%	3.75%
School District Male	7.75%	7.25%
School District Female	5.75%	5.75%
Local GS Male	4.75%	4.75%
Local GS Female	3.00%	3.25%
State Police & Fire	4.75%	4.75%
Local Police & Fire	7.50%	7.50%
Inactive Members	2.25%	3.00%

Tier 1 Vacation Cash Out	Current Assumption	Proposed Assumption
State GS	0.70%	1.60%
School District	0.25%	0.25%
Local GS	1.00%	2.20%
State Police & Fire	0.80%	1.80%
Local Police & Fire	2.00%	2.90%

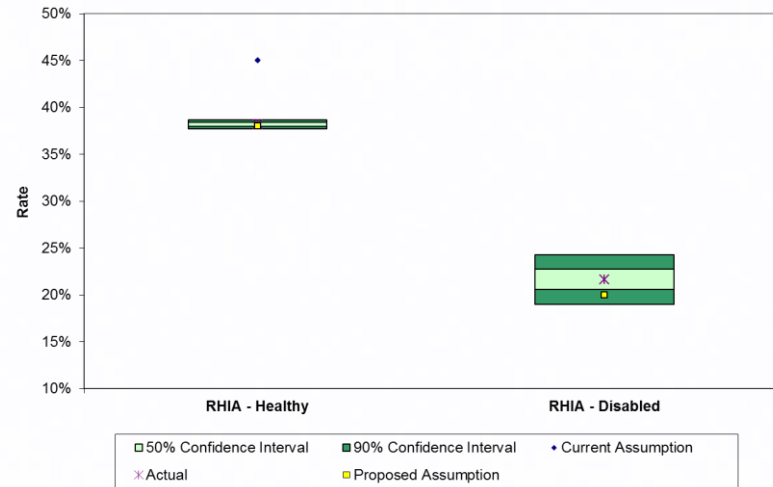
This work product was prepared for discussion purposes only and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Any recipient of this work product who desires professional guidance should engage qualified professionals for advice appropriate to its own specific needs.

RHIA and RHIPA Assumptions

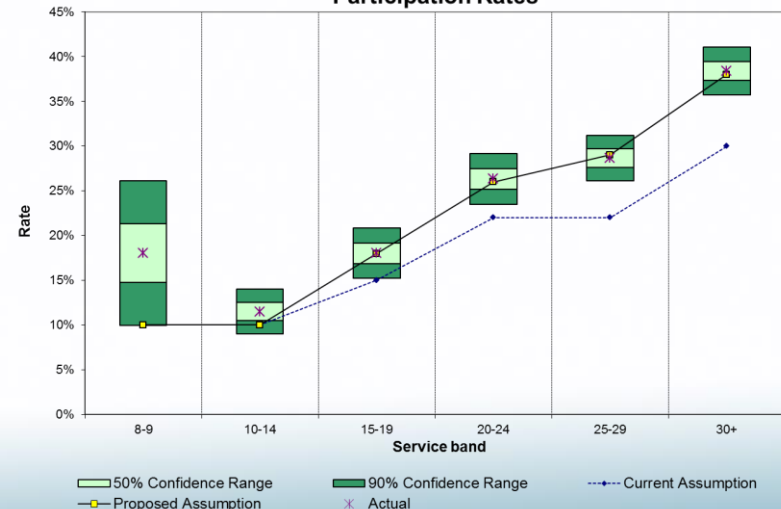
- Updates to retiree healthcare participation:
 - Healthy RHIA: Lower rates
 - Disabled RHIA: No change
 - RHIPA: Increase assumed participation for longer-service categories

- Health care cost trend assumption applied to RHIPA full subsidy amount will also be updated
 - Based on analysis by Milliman health actuaries

**RHIA
Participation Rates**



**RHIPA
Participation Rates**



Economic Assumptions and Actuarial Methods

Economic Assumptions and Actuarial Methods

- At the May meeting, the Board reviewed
 - Non-investment economic assumptions
 - Actuarial methods
 - Investment return assumption
- Our recommendations regarding non-investment economic assumptions and actuarial methods are unchanged since May
- We have updated the investment return analysis to reflect
 - Changes made to OPERF asset allocation targets at June OIC meeting
 - Capital market assumption changes made by Callan (OIC's advisor)

Economic Assumptions

Details of these recommendations are included in our May 2015 presentation

	12/31/2013 Valuation Actual Assumption	12/31/2014 Valuation Recommended Assumption
Inflation	2.75%	2.50%
Real Wage Growth	<u>1.00%</u>	<u>1.00%</u>
Payroll Growth	3.75%	3.50%
<u>Administrative Expenses:</u>		
- OPSRP	\$5.5 million	\$5.5 million
- Tier 1/Tier 2	No explicit assumption	\$33.0 million

No explicit assumption is made for investment-related expenses, which are accounted for implicitly in the analysis of the long-term investment return assumption.

Key Actuarial Methods

Details of these recommendations are included in our May 2015 presentation

	12/31/2013 Valuation Actual Assumption	12/31/2014 Valuation Recommended Assumption
Cost Allocation Method	Entry Age Normal	No change
Shortfall Amortization Method	Level percent of pay, layered fixed periods: Tier 1/Tier 2: 20 years OPSRP: 16 years RHIA/RHIPA: 10 Years	No change
Rate Collar	Limits change in based contribution rate to larger of 20% of current rate or 3.00% of payroll; Collar widens when funded status below 70%	No change

This work product was prepared for discussion purposes only and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Any recipient of this work product who desires professional guidance should engage qualified professionals for advice appropriate to its own specific needs.

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 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)
- Milliman’s 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

- Estimates are based on OIC’s target long-term asset allocation
 - Current actual allocation differs somewhat from the target allocation
- Target allocations were change at OIC June meeting to slightly reduce private equity investments
- 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	6.99%	7.51%	7.25%
Assumed Inflation	2.50%	2.25%	2.41%
Timeframe Modeled	20 years	10-20 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

Investment Return Estimates

- Prior slide shows median expectation of each market outlook
 - Each model produces a distribution of projected outcomes
 - Median is the 50th percentile of the distribution
- Illustrated below for Milliman model
 - Projected median returns are lower over shorter periods due to current low interest market environment

Milliman Capital Market Outlook: Average annualized returns	5 Years	10 Years	20 Years
75 th Percentile	10.23%	9.42%	8.99%
60 th Percentile	7.70%	7.64%	7.74%
50 th Percentile	6.20%	6.58%	6.99%
40 th Percentile	4.73%	5.54%	6.25%
25 th Percentile	2.32%	3.82%	5.03%

This work product was prepared for discussion purposes only and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Any recipient of this work product who desires professional guidance should engage qualified professionals for advice appropriate to its own specific needs.

Effects of Lowering the Assumed Return

- A lower investment return assumption would produce higher calculated liabilities and contribution rates since liabilities are net present values, as of the valuation date, of a year-by-year benefit payment projection that stretches far into the future
 - Changing the assumption tilts the estimated balance of the fundamental cost equation between estimated future investment earnings and estimated future contributions
 - Long-term, the actual balance depends on actual investment earnings
- For PERS, such a change would also lower benefits for future retirements calculated under Money Match
 - Illustration for a hypothetical member shown on next slide

Effects of Lowering the Assumed Return

- Lowering the assumption to either 7.50% or 7.25% would affect the Money Match calculation for a member age 59½ with a \$135,000 member account balance as of 6/30/2015 as shown:

Benefit Commencement	Starting Benefit Under Assumed Rate		
	7.75%	7.50%	7.25%
7/1/2015	\$2,041		
12/1/2015	\$2,117		
1/1/2016		\$2,088	\$2,043
3/1/2016		\$2,119	\$2,073
6/1/2016		\$2,166	\$2,118

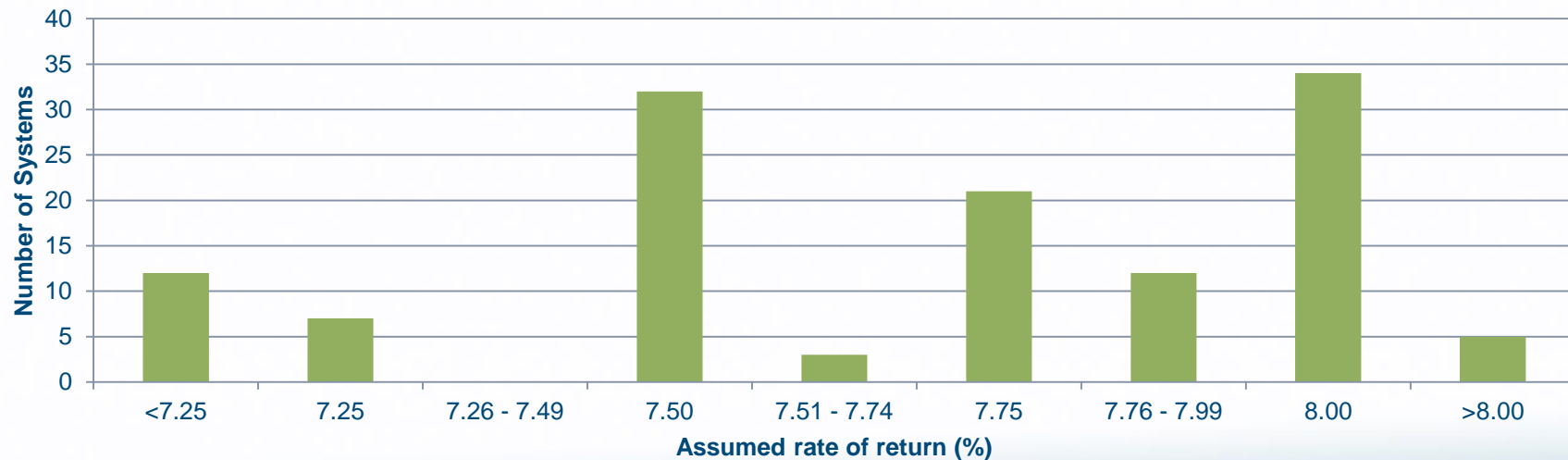
- At a 7.50% assumption, it would take about three months without retirement for the December 2015 initial benefit level to be reached
 - At a 7.25% assumed return, it would take about six months

Comparison to Peer Systems

- There is a downward trend in public plan return assumptions
- Over half of the 126 state-wide systems tracked by the NASRA Public Fund Survey have reduced their assumption since 2008
 - Mean return assumption is 7.68%; median assumption is 7.75%

Distribution of investment return assumption

NASRA Public Survey - May 2015



Considerations in Setting the Assumption

- In our opinion, the long-term future investment return assumption should be lowered based on the data from the investment forecasts and review of the guiding principles
- Actual investment returns are not determined by the assumed return
- Setting an assumed return above the median annualized return implies a greater than 50% expectation of actual experience falling short of assumption

Estimated Effect of Assumption Changes

Preliminary Effect of Changes – Liability

- Estimated effect on combined Tier 1, Tier 2, and OPSRP liabilities based on preliminary valuation work
 - For illustration, considers investment return assumption of 7.50%

	12/31/2014 Accrued Liability
Current assumptions (reflecting <i>Moro</i> decision)	\$69.8 B
Mortality	\$1.8 B
Retirement	\$0.2 B
Other demographic assumptions	(\$0.1B)
Assumed return - 7.50%	<u>\$1.7 B</u>
Revised assumptions	\$73.4 B

Combined effect of illustrated changes: \$3.6B

An assumed return other than 7.50% would have a liability change proportional to that shown above (e.g., a 7.25% return would have a \$3.4 B effect)

Preliminary Effect of Changes – Uncollared Rates

- Estimated impact on uncollared system-average advisory pension rates for 2017-2019 based on preliminary valuation work

	Tier 1 / Tier 2/OPSRP	
	UAL	Normal Cost
Mortality	1.4%	0.2%
Retirement	0.2%	0.1%
Other demographic assumptions	(0.1%)	0.0%
Assumed return - 7.50%	<u>1.4%</u>	<u>0.6%</u>
Total	2.9%	0.9%

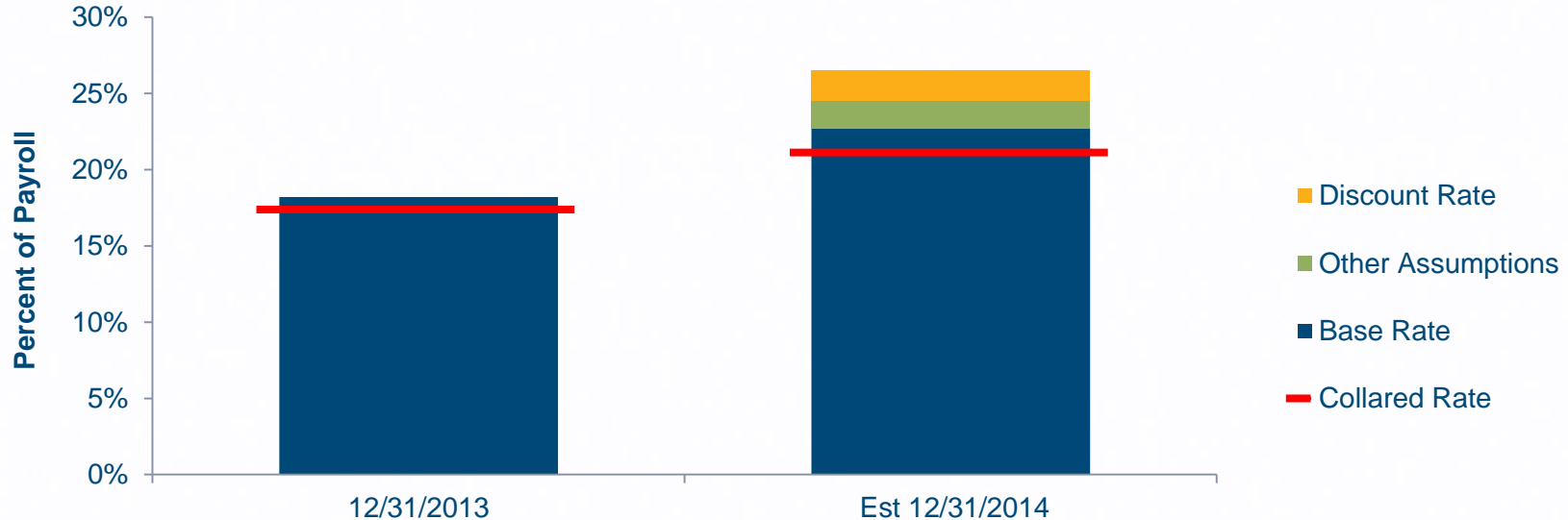
**Total effect:
3.8% of
payroll**

Changes shown are as stated a percent of payroll and exclude changes for the RHIA & RHIPA retiree healthcare programs

This work product was prepared for discussion purposes only and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Any recipient of this work product who desires professional guidance should engage qualified professionals for advice appropriate to its own specific needs.

Preliminary Effect of Changes – Collared Rates

- The size of 2017 base rate increases will very likely be set by the rate collar, since the *Moro* decision significantly increases rates
 - If the 2017-2019 uncollared rate is greater than the 2017 increase allowed by the rate collar, a portion of the increase will be deferred to 2019



Rates shown are system-average base rates for the pension program and exclude contributions for the Individual Account Program (IAP) and the RHIA and RHIPA retiree healthcare programs

Agenda Items – July & September Meetings

- July action item:
 - Selection of a long-term investment return assumption for actuarial valuation
- July discussion item:
 - Feedback on recommendations for other assumptions and methods
- September action item:
 - Formal acceptance and adoption of the 2014 Experience Study Report, which details all economic and demographic assumptions
 - Adoption of actuarial equivalency factors effective January 1, 2016

Methods and assumptions adopted will be used in:

- December 31, 2014 “advisory” valuation that estimates 2017-2019 rates
- December 31, 2015 valuation that sets recommended 2017-2019 rates

Caveats and Disclaimers

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, 2013 (“the Valuation Report”) published on September 29, 2014. 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.

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.

This work product was prepared for discussion purposes only and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Any recipient of this work product who desires professional guidance should engage qualified professionals for advice appropriate to its own specific needs.

Appendix – Mortality Assumption

- PERS-specific mortality experience is analyzed separately for:
 - Healthy annuitant mortality
 - Disabled retiree mortality
 - Non-retired mortality
- Assumptions are grouped by gender and employment category
- For each group, the mortality assumption consists of two parts:
 - A ***base table***
 - For a given age, lists the probability of death in that year
 - A ***projection scale***
 - Modifies base table entries to reflect anticipated life expectancy improvements
 - Reflects common-sense understanding that a child born today has a longer life expectancy than a child born 40 years ago...and that a child born 40 years from now is anticipated to have an even longer life expectancy

Appendix – Mortality Assumption

- Current PERS assumptions reflect Society of Actuaries (SOA) pension plan mortality studies issued in 2000:
 - Base tables: Versions of standard RP-2000 mortality tables
 - Projection scale: Scale AA
- In late 2014, first full SOA mortality study since 2000 was issued
- The 2014 study concluded that since 2000 life expectancy has increased more rapidly than projected by Scale AA
 - Basis: Statistically significant multi-year Social Security experience
- Emerging actuarial consensus: Projection scale should be updated to one that reflects post-2000 experience

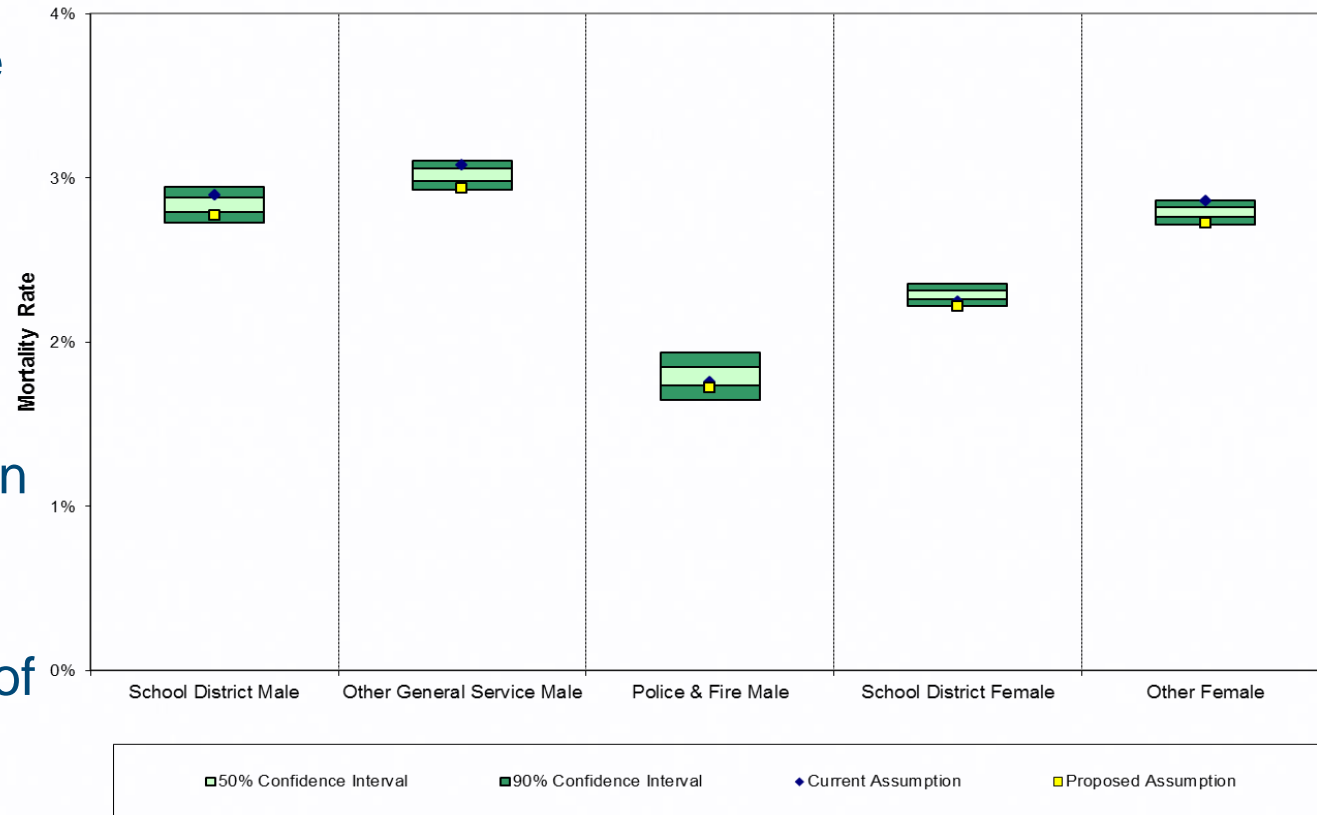
Appendix – Mortality Assumption

- As part of the recent mortality study, the SOA published two different projection scales: Scale BB and Scale MP-2014
 - Scale BB is the less technically complex of the two scales to implement
 - Several large public systems have adopted Scale BB over the past year
- We recommend using Scale BB as the new projection scale
- The 2014 study also included a new set of RP-2014 base tables
 - RP-2014 tables are based solely on private plan experience
 - The report noted public and private plan experience differed noticeably
 - A SOA study to analyze public plan experience is about to commence
- We recommend continued use of the RP-2000 base tables at this time

Appendix – Mortality Assumption

- Current assumptions generally modeled the aggregate mortality experience fairly well
 - Within confidence intervals for most groups
- Updating the projection scale aligns more closely with current consensus estimates of future changes in life expectancy

Healthy Retiree Mortality
Aggregate Confidence Intervals and Rates



Aggregate mortality rates shown are functions of both mortality rates and the ages of members of the group. Since average ages differ by group, you cannot conclude from the graph that, for example, Police & Fire males have lower mortality than other groups.

This work product was prepared for discussion purposes only and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Any recipient of this work product who desires professional guidance should engage qualified professionals for advice appropriate to its own specific needs.

Appendix - Mortality Assumption

	Current Assumption	Proposed Changes
Healthy Retired	RP 2000, Generational, with Scale AA Combined Active/Healthy Retired, Sex distinct	RP 2000, Generational, with Scale BB Combined Active/Healthy Retired, Sex distinct
<ul style="list-style-type: none"> School district male Other GS male P&F male 	No collar, set back 2 years 25% blue/75% white collar, set back 2 years 25% blue/75% white collar, set back 2 years	No change No change No change
<ul style="list-style-type: none"> School district female Other female 	White collar, set back 2 years White collar, no set back	No collar, set back 2 years Blend 25% blue/75% white collar, no set back
Disabled Retired	RP 2000 Disabled, Static Sex distinct	RP 2000 Disabled, Generational with BB Sex distinct
<ul style="list-style-type: none"> Male Female 	65% of rates 90% of rates	70% of rates 90% of rates
Non-Retired Mortality	% of Healthy Retired Mortality	% of Healthy Retired Mortality
<ul style="list-style-type: none"> School district male Other GS male P&F male 	70% 85% 95%	60% 75% 75%
<ul style="list-style-type: none"> School district female Other female 	60% 55%	55% 60%

This work product was prepared for discussion purposes only and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Any recipient of this work product who desires professional guidance should engage qualified professionals for advice appropriate to its own specific needs.

Appendix

Actuarial Basis 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 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.

	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%	17.50%
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%	1.88%
Farmland	7.11%	6.37%	13.00%	1.88%
Infrastructure	8.31%	7.13%	16.50%	3.75%
Commodities	6.07%	4.58%	18.40%	1.88%
Hedge Fund of Funds - Diversified	4.94%	4.64%	8.09%	2.50%
Hedge Fund Event-Driven	7.07%	6.72%	8.90%	0.63%
US Inflation (CPI-U)		2.50%		N/A
Fund Total (reflecting asset class correlations)	7.92%	7.03%*	13.76%	100.0%

* 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 6.99%.

This work product was prepared for discussion purposes only and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Any recipient of this work product who desires professional guidance should engage qualified professionals for advice appropriate to its own specific needs.

Appendix

Actuarial Basis

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.

	Annual Arithmetic Mean	Annual Standard Deviation	Policy Allocation	10-Year Annualized Geometric Median
Global Equity	9.5%	19.6%	37.5%	
Private Equity	12.0%	24.0%	17.5%	
Fixed Income	3.1%	3.75%	20.0%	
Real Assets	8.0%	15.0%	20.0%	
Diversifying Assets	7.0%	11.0%	5.0%	
Fund Total (reflecting asset class correlations)	8.36%	14.07%	100.0%	7.51%

Appendix

Actuarial Basis

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.

	10-Year Annualized Geometric Mean	Annual Standard Deviation	Policy Allocation
US Equity – Large Cap	7.01%	17.48%	15.75%
US Equity – Small/Mid Cap	7.37%	21.11%	5.13%
Non-US Equity – Developed	7.41%	19.77%	15.00%
Non-US Equity – Emerging	8.70%	26.36%	4.12%
US Corporate Bonds – Core	3.46%	5.36%	12.00%
US Corporate Bonds – High Yield	5.51%	11.46%	4.00%
US Treasuries (Cash Equivalents)	2.21%	2.28%	4.00%
Real Estate	6.38%	13.13%	13.75%
Hedge Funds	5.77%	8.95%	3.13%
Commodities	4.50%	18.01%	1.88%
Infrastructure	7.71%	13.51%	3.75%
Private Equity	9.43%	24.82%	17.50%
Inflation	2.41%	2.08%	N/A
Fund Total (reflecting asset class correlations)	7.33%*		100.00%

* 10-year annualized geometric median is 7.25%.

Appendix

Blended COLA

Moro Decision

The Oregon Supreme Court decision in *Moro v. State of Oregon* stated that the reduced COLA amounts provided by Senate Bills 822 and 861 (both passed in 2013) only apply to benefits earned after the effective date of the legislation. According to the Court, PERS members who earned benefits before and after the effective date “will be entitled to receive during retirement a blended COLA rate that reflects the different COLA provisions applicable to benefits earned at different times.”

The Supreme Court did not articulate a specific methodology for determining a member’s blended COLA. For purposes of the estimates in this presentation, the blending was based on the creditable service earned before and after the effective date.

The example below illustrates this blended COLA approach for a member with 30 years of service at retirement, 20 of which were earned prior to the effective date of the SB 861 COLA.

Annual Benefit COLA Applies to:	COLA prior to SB 822 & 861	SB 861 COLA	Blended COLA
<\$60,000	2.00%	1.25%	$\frac{(20/30) \times 2.00\% + (10/30) \times 1.25\%}{= 1.75\%}$
>\$60,000	2.00%	0.15%	$\frac{(20/30) \times 2.00\% + (10/30) \times 0.15\%}{= 1.38\%}$

In compliance with the Americans with Disabilities Act, PERS will provide this document in an alternate format upon request. To request this, contact PERS at 888-320-7377 or TTY 503-603-7766.