

Service-Based Salary

PERS

Past Experience

Over the 26-year study period (excluding 2010-2012), we observed lower than expected salary increases at the beginning of a Public Employees' Retirement System (PERS) member's career, but higher than expected salary increases later in the PERS member's career.

The table below shows, by service, the Actual-to-Expected (A/E) ratios for PERS total salary increases.

PERS A/E Total Salary Increases			
Service	Actual	Expected*	Ratio
1	10.27%	10.37%	0.99
2	8.81%	9.01%	0.98
3	7.73%	7.97%	0.97
4	6.98%	7.04%	0.99
5	6.32%	6.31%	1.00
6-10	5.10%	5.03%	1.02
11-15	4.34%	4.30%	1.01
16-20	4.09%	4.07%	1.01
21+	3.99%	4.02%	0.99
Total	5.46%	5.47%	1.00

*Expected reflects (1+old service based salary scale) *(1+actual GSX) -1. Actual inflation=3.13% and actual productivity = 0.89%.

Methods and Format of Assumptions

As noted in the Data section above, we removed Great Recession data due to its short-term impact on salaries and consistency with the [2013 Economic Experience Study](#).

To get from total salary increases to service-based assumptions, we backed out an actual general salary increase developed during the [2013 Economic Experience Study](#). The actual PERS general salary increase was 4.02 percent.

We considered alternate formats for the assumptions and, ultimately, decided not to make any changes. For reference, we considered, but did not adopt:

- ◆ **Salary increase assumptions by valuation year.**
We studied the total salary increase, by valuation year, and did not observe a trend.
- ◆ **Salary increase assumptions by age.**
We think salary is more strongly tied to service than to age, so we chose not to use age-based salary increase assumptions.
- ◆ **Salary increase assumptions by plan.**
We studied the total salary increase, at each service level for Plans 2/3 and observed similar salary increase trends.

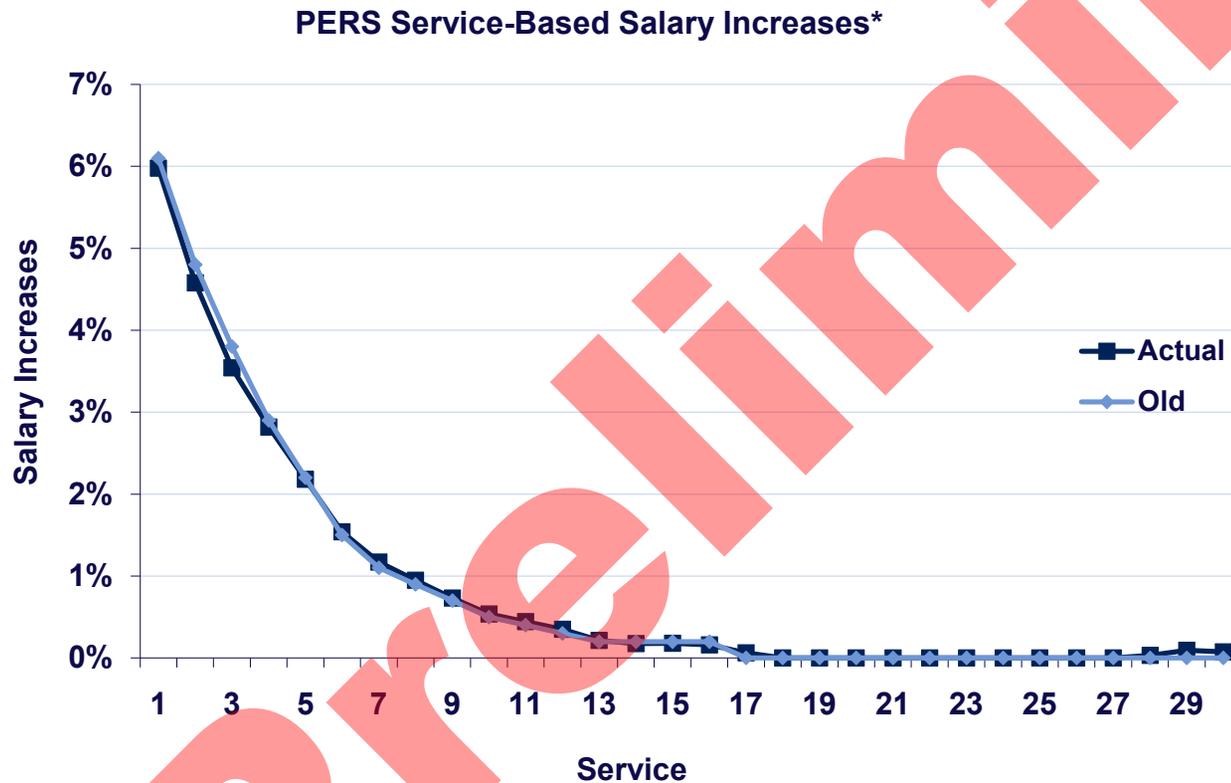
We chose not to apply separate salary increase assumptions for Plan 1, because experience in the closed plan is shrinking.
- ◆ **Salary increase assumptions by gender.**
We studied the total salary increase by valuation year, for males and females, and observed similar increases.

◆ **Lagged inflation.**

We considered implementing a lagged (or delayed) inflation, but did not find a consistently stronger correlation between lagged inflation and salary increase than non-lagged inflation and the salary increase. We studied this to observe whether inflation had a delayed effect on salary.

Best Estimate Service-Based Salary Rates

The chart below shows a comparison of actual Service-Based Salary (SBS) increases and expected SBS increases under old assumptions.



*For display purposes only, we assumed service-based salary increases would not fall below zero.

PERS actual increases match expected increases fairly closely. We made minor adjustments to the old SBS increases.

Our new SBS increase rates rely on historical experience. We expect future SBS increases to follow past experience. We then used our professional judgment to set the new SBS increases.

For PERS, we created a new step to reflect the creation of a new salary increase step for PERS employees (Step M).

The table to the right shows the Actual (1984-2009), Old, and New SBS increases for PERS. We also display the Rate Change from old assumptions.

PERS Service Based Salary Increase				
Service	Actual*	Old	New	Rate Change
1	5.98%	6.10%	6.00%	(0.10%)
2	4.58%	4.80%	4.70%	(0.10%)
3	3.54%	3.80%	3.60%	(0.20%)
4	2.82%	2.90%	2.90%	0.00%
5	2.18%	2.20%	2.20%	0.00%
6	1.54%	1.50%	1.50%	0.00%
7	1.17%	1.10%	1.20%	0.10%
8	0.95%	0.90%	0.90%	0.00%
9	0.73%	0.70%	0.70%	0.00%
10	0.54%	0.50%	0.50%	0.00%
11	0.45%	0.40%	0.40%	0.00%
12	0.35%	0.30%	0.30%	0.00%
13	0.22%	0.20%	0.30%	0.10%
14	0.17%	0.20%	0.20%	0.00%
15	0.18%	0.20%	0.20%	0.00%
16	0.16%	0.20%	0.20%	0.00%
17	0.06%	0.00%	0.10%	0.10%
18	(0.00%)	0.00%	0.00%	0.00%
19	(0.03%)	0.00%	0.00%	0.00%
20	(0.03%)	0.00%	0.00%	0.00%
21	(0.05%)	0.00%	0.00%	0.00%
22	(0.07%)	0.00%	0.00%	0.00%
23	(0.11%)	0.00%	0.00%	0.00%
24	(0.04%)	0.00%	0.00%	0.00%
25	(0.16%)	0.00%	0.00%	0.00%
26	(0.06%)	0.00%	0.00%	0.00%
27	(0.10%)	0.00%	0.00%	0.00%
28	0.03%	0.00%	0.00%	0.00%
29	0.09%	0.00%	0.00%	0.00%
30	0.08%	0.00%	0.00%	0.00%

*Actual reflects Total Salary Growth divided by actual inflation and actual productivity. Actual inflation = 3.13% and actual productivity=0.89%.

The next table shows the Actual and Expected total salary increases for PERS, by service, using the new assumptions for experience from 1984-2009.

PERS A/E Total Salary Increases			
Service	Actual	Expected*	Ratio
1	10.27%	10.26%	1.00
2	8.81%	8.91%	0.99
3	7.73%	7.77%	1.00
4	6.98%	7.04%	0.99
5	6.32%	6.31%	1.00
6-10	5.10%	5.05%	1.01
11-15	4.34%	4.32%	1.01
16-20	4.09%	4.09%	1.00
21+	3.99%	4.02%	0.99
Total	5.46%	5.46%	1.00

*Expected reflects (1+ new service based actual salary scale) *(1+actual GSX) -1. Actual inflation=3.13% and actual productivity=0.89%.

TRS

Past Experience

Over the 26-year study period (excluding 2010-2012), we observed lower than expected salary increases at the beginning of a Teachers' Retirement System (TRS) member's career, but higher than expected salary increases later in the TRS member's career.

The table to the right shows, by service, the A/E ratios for TRS total salary increases.

TRS A/E Total Salary Increases			
Service	Actual	Expected*	Ratio
1	9.40%	10.14%	0.93
2	8.01%	8.58%	0.93
3	7.95%	8.37%	0.95
4	7.64%	7.75%	0.99
5	7.19%	7.33%	0.98
6-10	6.79%	6.62%	1.03
11-15	5.66%	5.55%	1.02
16-20	4.35%	4.27%	1.02
21+	4.12%	4.16%	0.99
Total	5.96%	6.03%	0.99

*Expected reflects (1+old service based salary scale) *(1+actual GSX) -1. Actual inflation=3.13% and actual productivity =0.97%.

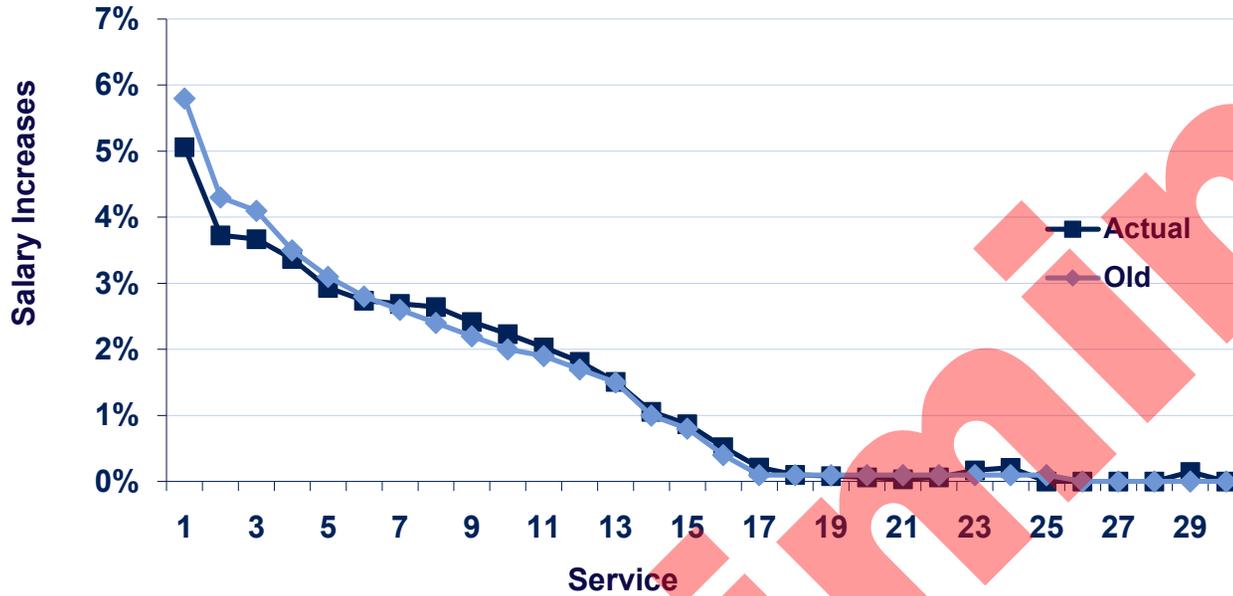
Methods and Format of Assumptions

The actual TRS general salary increase was 4.10 percent. Otherwise, for the TRS plans, we considered the same alternatives and made the same relative changes as in PERS. Please see the **PERS – Methods and Format of Assumptions** section above for more information.

Best Estimate Service-Based Salary Rates

The chart below shows a comparison of actual SBS increases and expected SBS increases under old assumptions.

TRS Service-Based Salary Increases*



*For display purposes only, we assumed service-based salary increases would not fall below zero.

TRS actual increases match expected increases fairly closely. We made minor adjustments to the old SBS increases. Service levels one and two were the only salary increase steps that changed by more than 20 basis points from the old assumptions.

Our new SBS increase rates rely on historical experience. We expect future SBS increases to follow past experience. We then used our professional judgment to set the new SBS increases.

The table to the right shows the Actual (1984-2009), Old, and New SBS increases for TRS. We also display the Rate Change from old assumptions.

TRS Service Based Salary Increase				
Service	Actual*	Old	New	Rate Change
1	5.06%	5.80%	5.10%	(0.70%)
2	3.73%	4.30%	3.90%	(0.40%)
3	3.67%	4.10%	3.90%	(0.20%)
4	3.37%	3.50%	3.50%	0.00%
5	2.93%	3.10%	3.00%	(0.10%)
6	2.74%	2.80%	2.70%	(0.10%)
7	2.69%	2.60%	2.70%	0.10%
8	2.64%	2.40%	2.60%	0.20%
9	2.41%	2.20%	2.40%	0.20%
10	2.23%	2.00%	2.20%	0.20%
11	2.03%	1.90%	2.00%	0.10%
12	1.81%	1.70%	1.80%	0.10%
13	1.51%	1.50%	1.50%	0.00%
14	1.06%	1.00%	1.20%	0.20%
15	0.87%	0.80%	0.90%	0.10%
16	0.52%	0.40%	0.50%	0.10%
17	0.21%	0.10%	0.20%	0.10%
18	0.10%	0.10%	0.10%	0.00%
19	0.08%	0.10%	0.10%	0.00%
20	0.06%	0.10%	0.10%	0.00%
21	0.04%	0.10%	0.10%	0.00%
22	0.07%	0.10%	0.10%	0.00%
23	0.17%	0.10%	0.10%	0.00%
24	0.21%	0.10%	0.10%	0.00%
25	(0.02%)	0.10%	0.10%	0.00%
26	(0.24%)	0.00%	0.00%	0.00%
27	(0.36%)	0.00%	0.00%	0.00%
28	(0.02%)	0.00%	0.00%	0.00%
29	0.14%	0.00%	0.00%	0.00%
30	(0.10%)	0.00%	0.00%	0.00%

*Actual reflects Total Salary Growth divided by actual inflation and actual productivity. Actual inflation= 3.13% and actual productivity=0.97%.

The table below shows the Actual and Expected total salary increases for TRS, by service, using the new assumptions for experience from 1984-2009.

TRS A/E Total Salary Increases			
Service	Actual	Expected*	Ratio
1	9.40%	9.41%	1.00
2	8.01%	8.16%	0.98
3	7.95%	8.16%	0.97
4	7.64%	7.75%	0.99
5	7.19%	7.23%	0.99
6-10	6.79%	6.74%	1.01
11-15	5.66%	5.65%	1.00
16-20	4.35%	4.32%	1.01
21+	4.12%	4.16%	0.99
Total	5.96%	6.00%	0.99

*Expected reflects (1+ new service based salary scale) \times (1+actual GSX) -1. Actual inflation =3.13% and actual productivity =0.97%.

SERS

Past Experience

Over the 26-year study period (excluding 2010-2012), we observed lower-than-expected salary increases at the beginning of a School Employees' Retirement System (SERS) member's career, but higher-than-expected salary increases later in the SERS member's career.

The table to the right shows, by service, the A/E ratios for SERS total salary increases.

SERS A/E Total Salary Increases			
Service	Actual	Expected*	Ratio
1	10.28%	10.86%	0.95
2	7.65%	7.75%	0.99
3	6.54%	6.71%	0.97
4	5.99%	6.09%	0.98
5	5.73%	5.99%	0.96
6-10	4.95%	4.94%	1.00
11-15	4.19%	4.12%	1.02
16-20	3.94%	3.79%	1.04
21+	3.92%	3.70%	1.06
Total	5.37%	5.40%	0.99

*Expected reflects (1+old service based salary scale) \times (1+actual GSX) -1. Actual inflation=3.13% and actual productivity =0.57%.

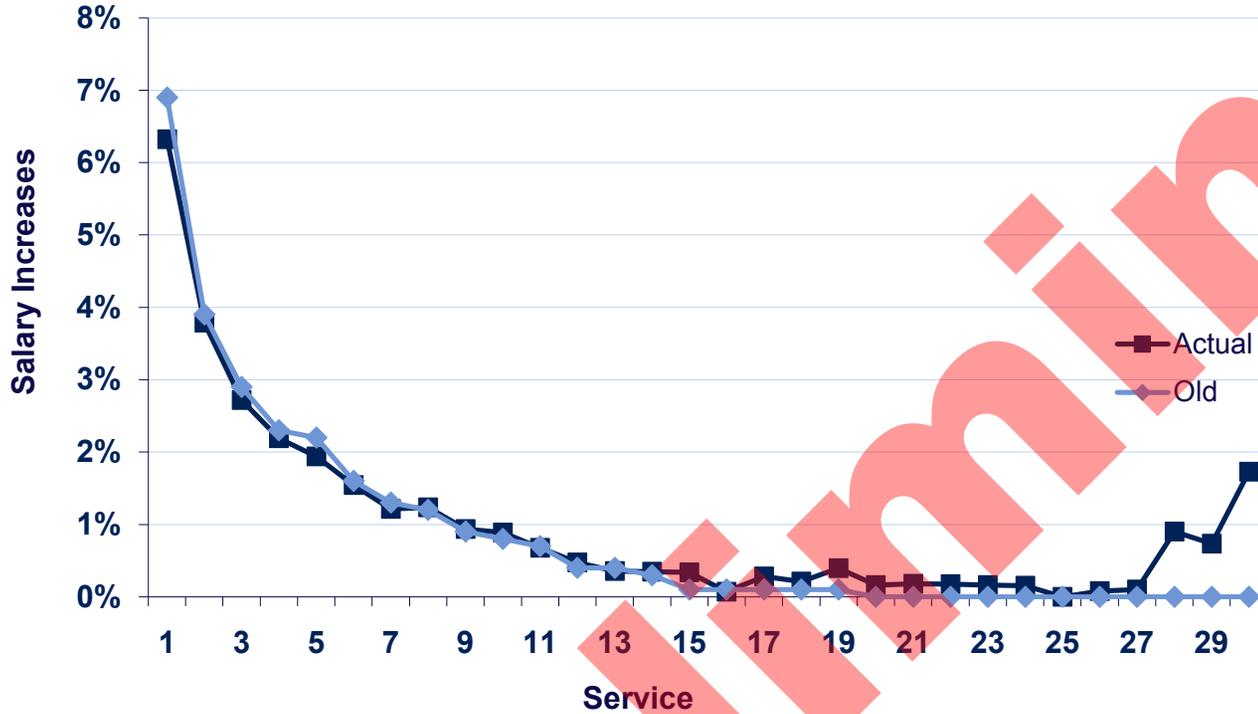
Methods and Format of Assumptions

The actual SERS general salary increase was 3.7 percent. Otherwise, for the SERS plans, where applicable, we considered the same alternatives and made the same relative changes as in PERS. Please see the **PERS – Methods and Format of Assumptions** section above for more information.

Best Estimate Service-Based Salary Rates

The following chart shows a comparison of Actual SBS increases and expected SBS increases under Old assumptions.

SERS Service-Based Salary Increases*



*For display purposes only, we assumed service-based salary increases would not fall below zero.

SERS actual increases match expected increases fairly closely. We made minor adjustments to the old SBS increases.

Our new SBS increase rates rely on historical experience. We expect future SBS increases to follow past experience. We then used our professional judgment to set the new SBS increases.

The table displayed to the right shows the Actual (1984-2009), Old, and New SBS increases for SERS. We also display the Rate Change from old assumptions.

SERS Service Based Salary Increase				
Service	Actual*	Old	New	Rate Change
1	6.32%	6.90%	6.60%	(0.30%)
2	3.79%	3.90%	3.90%	0.00%
3	2.72%	2.90%	2.80%	(0.10%)
4	2.19%	2.30%	2.30%	0.00%
5	1.94%	2.20%	2.10%	(0.10%)
6	1.54%	1.60%	1.60%	0.00%
7	1.21%	1.30%	1.20%	(0.10%)
8	1.24%	1.20%	1.20%	0.00%
9	0.94%	0.90%	0.90%	0.00%
10	0.89%	0.80%	0.90%	0.10%
11	0.68%	0.70%	0.70%	0.00%
12	0.48%	0.40%	0.50%	0.10%
13	0.36%	0.40%	0.40%	0.00%
14	0.34%	0.30%	0.30%	0.00%
15	0.34%	0.10%	0.20%	0.10%
16	0.07%	0.10%	0.20%	0.10%
17	0.28%	0.10%	0.20%	0.10%
18	0.21%	0.10%	0.20%	0.10%
19	0.40%	0.10%	0.10%	0.00%
20	0.16%	0.00%	0.10%	0.10%
21	0.18%	0.00%	0.00%	0.00%
22	0.17%	0.00%	0.00%	0.00%
23	0.16%	0.00%	0.00%	0.00%
24	0.15%	0.00%	0.00%	0.00%
25	(0.05%)	0.00%	0.00%	0.00%
26	0.08%	0.00%	0.00%	0.00%
27	0.10%	0.00%	0.00%	0.00%
28	0.90%	0.00%	0.00%	0.00%
29	0.73%	0.00%	0.00%	0.00%
30	1.73%	0.00%	0.00%	0.00%

*Actual reflects Total Salary Growth divided by actual inflation and actual productivity. Actual inflation=3.13% and actual productivity=0.57%.

The table to the right shows the Actual and Expected total salary increases for SERS, by service, using the new assumptions for experience from 1984-2009.

SERS A/E Total Salary Increases			
Service	Actual	Expected*	Ratio
1	10.28%	10.60%	0.97
2	7.65%	7.80%	0.98
3	6.54%	6.66%	0.98
4	5.99%	6.14%	0.98
5	5.73%	5.93%	0.97
6-10	4.95%	4.98%	0.99
11-15	4.19%	4.21%	1.00
16-20	3.94%	3.93%	1.00
21+	3.92%	3.75%	1.05
Total	5.37%	5.44%	0.99

*Expected reflects (1+ new service based salary scale) *(1+actual GSX) -1. Actual inflation=3.13% and actual productivity =0.57%.

PSERS

The Public Safety Employees' Retirement System (PSERS) Plan 2 opened in 2006, and does not have enough experience data to develop plan-specific assumptions. We will continue to assume PERS SBS increases for PSERS and monitor the appropriateness of this assumption.

LEOFF

Past Experience

Over the 26-year study period (excluding 2010-2012), we observed the salary increases to be similar to the expected salary increases.

The table displayed on the right shows, by service, the A/E ratios for the Law Enforcement Officers' and Fire Fighters' Retirement System (LEOFF) total salary increases.

LEOFF A/E Total Salary Increases			
Service	Actual	Expected*	Ratio
1	14.90%	14.87%	1.00
2	11.47%	11.46%	1.00
3	9.56%	9.80%	0.98
4	7.54%	7.63%	0.99
5	6.38%	6.39%	1.00
6-10	5.13%	5.19%	0.99
11-15	4.83%	4.83%	1.00
16-20	4.74%	4.63%	1.02
21+	4.03%	3.49%	1.16
Total	5.91%	5.84%	1.01

*Expected reflects (1+old service based salary scale) *(1+actual GSX) -1. Actual inflation = 3.13% and actual productivity =0.36%.

Methods and Format of Assumptions

“Ninety Percent Approach”

Productivity and inflation are economic assumptions and should be consistent among the systems. During the [2013 Economic Experience Study](#), we determined the currently assumed LEOFF 2 SBS was too high and resulted in a low actual productivity relative to other systems. In the table below, you can see the productivity rates between the Washington retirement systems.

2013 Economic Experience Study						
	Data Time					
	Period	PERS	TRS	SERS	LEOFF	WSPRS
Productivity	1984-2009	0.89%	0.97%	0.57%	0.36%	0.92%
Inflation	1984-2009	3.13%	3.13%	3.13%	3.13%	3.13%
Observed GSX		4.02%	4.10%	3.70%	3.49%	4.05%

For this study, we re-calculated a new productivity rate based on an approach we referred to as the “90 percent approach.” Under this approach, we multiplied the old LEOFF SBS assumptions by 90 percent and then calculated a new productivity based on our 2013 Economic Experience Study approach. As a result, we calculated a new LEOFF actual productivity of 0.61 percent. We will refer to this as the “adjusted” actual productivity.

Alternative Methods

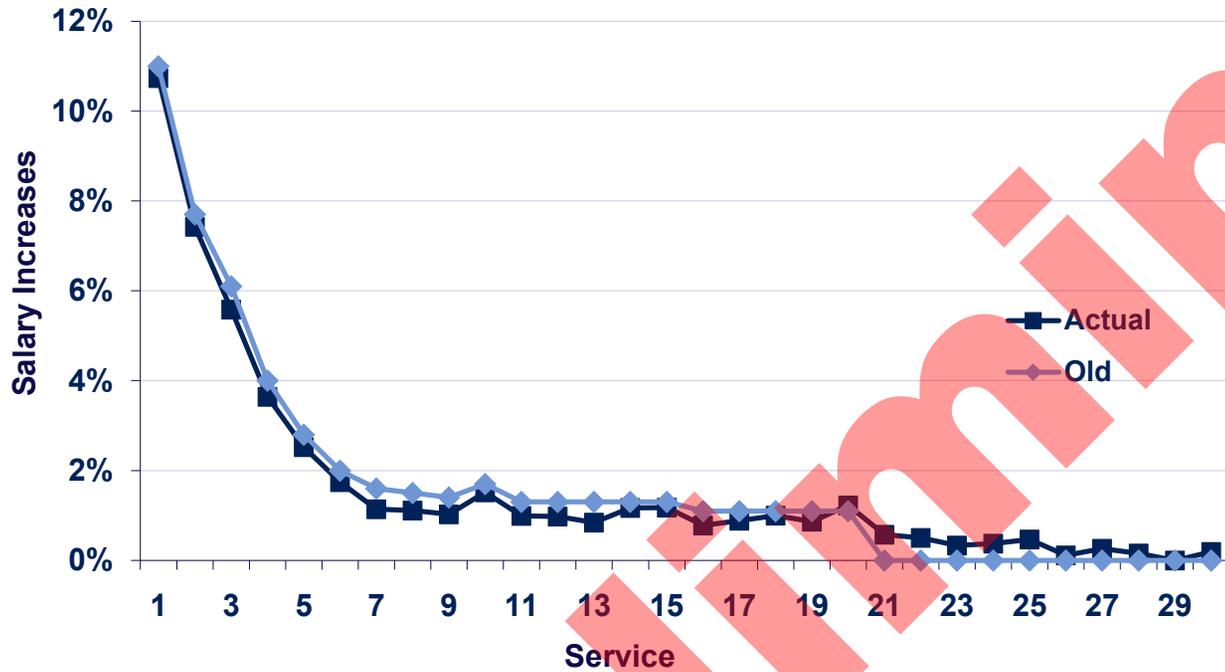
Since LEOFF is primarily male (approximately 90 percent), we did not consider studying this assumption by gender.

Otherwise, for the LEOFF plans, where applicable, we considered the same alternatives, and made the same relative changes as in PERS. Please see the **PERS – Methods and Format of Assumptions** section above for more information.

Best Estimate Service-Based Salary Rate

The following chart shows a comparison of actual SBS increase based on the 90 percent approach and expected SBS increases under old assumptions.

LEOFF Service-Based Salary Increases



*For display purposes only, we assumed service-based salary increases would not fall below zero

The LEOFF actual increases are approximately 10 to 30 basis points lower than the old SBS increases.

Our new SBS increase rates rely on historical experience. We expect future SBS increases to follow past experience. We then used our professional judgment to set the new SBS increases.

The table on the right shows the Actual (1984-2009), Old, and New SBS increases for LEOFF. We also display the Rate Change from old assumptions.

LEOFF Service Based Salary				
Service	Actual*	Old	New	Change
1	10.74%	11.00%	10.70%	(0.30%)
2	7.42%	7.70%	7.50%	(0.20%)
3	5.58%	6.10%	5.90%	(0.20%)
4	3.64%	4.00%	3.70%	(0.30%)
5	2.52%	2.80%	2.60%	(0.20%)
6	1.74%	2.00%	1.80%	(0.20%)
7	1.14%	1.60%	1.40%	(0.20%)
8	1.11%	1.50%	1.30%	(0.20%)
9	1.03%	1.40%	1.20%	(0.20%)
10	1.51%	1.70%	1.70%	0.00%
11	0.99%	1.30%	1.20%	(0.10%)
12	0.98%	1.30%	1.20%	(0.10%)
13	0.85%	1.30%	1.20%	(0.10%)
14	1.17%	1.30%	1.20%	(0.10%)
15	1.18%	1.30%	1.20%	(0.10%)
16	0.78%	1.10%	1.00%	(0.10%)
17	0.89%	1.10%	1.00%	(0.10%)
18	1.00%	1.10%	1.00%	(0.10%)
19	0.87%	1.10%	1.00%	(0.10%)
20	1.22%	1.10%	1.00%	(0.10%)
21	0.57%	0.00%	0.50%	0.50%
22	0.50%	0.00%	0.50%	0.50%
23	0.34%	0.00%	0.50%	0.50%
24	0.38%	0.00%	0.50%	0.50%
25	0.47%	0.00%	0.50%	0.50%
26	0.11%	0.00%	0.00%	0.00%
27	0.26%	0.00%	0.00%	0.00%
28	0.15%	0.00%	0.00%	0.00%
29	(0.73%)	0.00%	0.00%	0.00%
30	0.19%	0.00%	0.00%	0.00%

*Actual reflects Total Salary Growth divided by actual inflation and adjusted actual productivity. Actual inflation=3.13% and adjusted actual productivity =0.61%.

The table to the right shows the Actual and Expected total salary increases for LEOFF, by service, using the new assumptions for experience from 1984-2009.

LEOFF A/E Total Salary Increases			
Service	Actual	Expected*	Ratio
1	14.90%	14.84%	1.00
2	11.47%	11.52%	0.99
3	9.56%	9.86%	0.97
4	7.54%	7.58%	0.99
5	6.38%	6.44%	0.99
6-10	5.13%	5.28%	0.97
11-15	4.83%	4.99%	0.97
16-20	4.74%	4.78%	0.99
21+	4.03%	4.07%	0.99
Total	5.91%	6.02%	0.98

**Expected reflects (1+ new service based salary scale) *(1+ adjusted actual GSX) -1. Actual inflation = 3.13% and adjusted actual productivity = 0.61%.*

WSPRS

Past Experience

Over the 26-year study period (excluding 2010-2012), we observed higher than expected salary increases in the first service year, but generally lower than expected salary increases later in the Washington State Patrol Retirement System (WSPRS) member's career.

The table displayed on the right shows, by service, the A/E ratios for WSPRS total salary increases.

WSPRS A/E Total Salary Increases			
Service	Actual	Expected	Ratio
1	13.57%	12.90%	1.05
2	10.72%	10.30%	1.04
3	9.54%	9.26%	1.03
4	9.01%	9.26%	0.97
5	8.91%	9.26%	0.96
6-10	5.22%	5.31%	0.98
11-15	4.22%	4.51%	0.94
16-20	4.54%	4.47%	1.02
21+	4.68%	4.41%	1.06
Total	5.68%	5.68%	1.00

**Expected reflects (1+new service based salary scale) *(1+actual GSX) -1. Actual inflation = 3.13% and actual productivity = 0.92%.*

Methods and Format of Assumptions

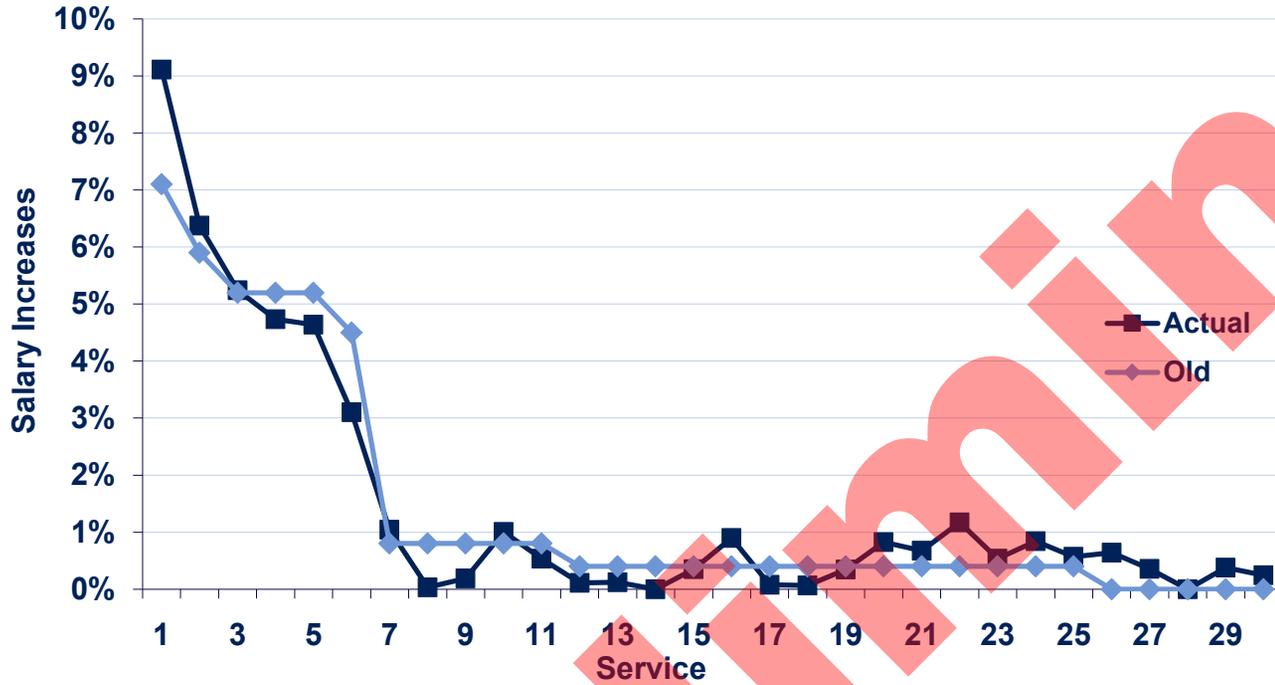
We considered studying Plans 1/2 individually, but chose not to due to the lack of Plan 2 data. As with the LEOFF plans, WSPRS is primarily male (90 percent), so we did not study this assumption by gender.

Otherwise, for the WSPRS plans, we considered the same alternatives and made the same relative changes as in PERS. Please see the **PERS – Methods and Format of Assumptions** section above for more information.

Best Estimate Service-Based Salary Rates

The following chart shows a comparison of actual SBS increases and expected SBS increases under old assumptions.

WSPRS Service-Based Salary Increases*



*For display purposes only, we assumed service-based salary increases would not fall below zero.

WSPRS actual increases are significantly higher in the first service year, but generally lower than the old assumptions in the service years following service year one.

Our new SBS increase rates rely on historical experience. We expect future SBS increases to follow past experience. We then used our professional judgment to set the new SBS increases.

The table to the right shows the Actual (1984-2009), Old, and New SBS increases for WSPRS. We also display the Rate Change from old assumptions.

WSPRS Service Based Salary Increase				
Service	Actual*	Old	New	Rate Change
1	9.11%	7.10%	8.50%	1.40%
2	6.38%	5.90%	6.00%	0.10%
3	5.24%	5.20%	5.00%	(0.20%)
4	4.74%	5.20%	5.00%	(0.20%)
5	4.64%	5.20%	5.00%	(0.20%)
6	3.11%	4.50%	3.50%	(1.00%)
7	1.04%	0.80%	0.60%	(0.20%)
8	0.03%	0.80%	0.60%	(0.20%)
9	0.19%	0.80%	0.60%	(0.20%)
10	1.00%	0.80%	0.60%	(0.20%)
11	0.53%	0.80%	0.60%	(0.20%)
12	0.11%	0.40%	0.40%	0.00%
13	0.12%	0.40%	0.40%	0.00%
14	(0.46%)	0.40%	0.40%	0.00%
15	0.35%	0.40%	0.40%	0.00%
16	0.90%	0.40%	0.40%	0.00%
17	0.07%	0.40%	0.40%	0.00%
18	0.07%	0.40%	0.40%	0.00%
19	0.35%	0.40%	0.40%	0.00%
20	0.83%	0.40%	0.40%	0.00%
21	0.67%	0.40%	0.40%	0.00%
22	1.17%	0.40%	0.40%	0.00%
23	0.54%	0.40%	0.40%	0.00%
24	0.84%	0.40%	0.40%	0.00%
25	0.57%	0.40%	0.40%	0.00%
26	0.64%	0.00%	0.40%	0.40%
27	0.36%	0.00%	0.40%	0.40%
28	(0.54%)	0.00%	0.00%	0.00%
29	0.38%	0.00%	0.00%	0.00%
30	0.24%	0.00%	0.00%	0.00%

*Actual reflects Total Salary Growth divided by actual inflation and actual productivity. Actual inflation = 3.13% and actual productivity = 0.92%.

The table displayed on this page shows the Actual and Expected total salary increases for WSPRS, by service, using the new assumptions for experience from 1984-2009.

WSPRS A/E Total Salary Increases			
Service	Actual	Expected	Ratio
1	13.57%	12.90%	1.05
2	10.72%	10.30%	1.04
3	9.54%	9.26%	1.03
4	9.01%	9.26%	0.97
5	8.91%	9.26%	0.96
6-10	5.22%	5.31%	0.98
11-15	4.22%	4.51%	0.94
16-20	4.54%	4.47%	1.02
21+	4.68%	4.41%	1.06
Total	5.68%	5.68%	1.00

**Expected reflects (1+new service based salary scale) *(1+actual GSX) -1. Actual inflation = 3.13% and actual productivity = 0.92%.*