2019 Report on Financial Condition and Economic Experience Study

PREPARED FOR THE PENSION FUNDING COUNCIL • AUGUST 2019

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Letter of Introduction
2019 Report on Financial Condition and Economic Experience Study

August 2019

As required under *RCW 41.45.030*, this report documents the results of a study on the financial condition and long-term economic experience for the Washington State retirement systems performed by the Office of the State Actuary (OSA).

The primary purpose of this report is to assist the Pension Funding Council (PFC) in evaluating whether to adopt changes to the long-term economic assumptions identified in *RCW 41.45.035*. We do not recommend using this report for other purposes.

The focus of the **Report on Financial Condition (RFC)** is on the financial health of the retirement systems, whereas the **Economic Experience Study (EES)** involves comparing actual economic experience with the assumptions made and considering future expectations for these assumptions. Pursuant to statute, the EES also includes a set of recommended long-term economic assumptions made by the State Actuary.

We encourage you to submit any questions you might have concerning this report to our regular address or our e-mail address at *state.actuary@leg.wa.gov*. We also invite you to visit our web-site (*leg.wa.gov/osa*) for further information regarding the actuarial funding of the Washington State retirement systems.

Sincerely,

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SECTION ONE: Report on Financial Condition

Report on Financial Condition

The RFC brings together key findings and themes from pension reports produced by OSA as required under *RCW 41.45.030*. We present this report and the EES to assist the PFC in evaluating whether to adopt changes to the long-term economic assumptions identified in *RCW 41.45.035*.

We use both affordability and solvency measures to report on the financial condition (or health) of the Washington State retirement systems. For this report, we define the following:

- ❖ Affordability is the ability to provide adequate funding to the pension plans.
- ❖ Solvency is the ability of the pension plans to pay for member benefits.

This report presents our assessment of the affordability and solvency of Washington State pension plans by reviewing both current and projected actuarial measures. The RFC is broken into the following sections:

- ❖ *Current Status of Retirement Systems.*
- ❖ *Where the Retirement Systems are Headed.*
- ❖ *How the Future Can Look Different.*
- ❖ *Planning for the Future.*

We advise the reader to take into consideration affordability and solvency measures outlined in all four sections of this report before making a determination on the financial condition of the retirement systems. It is important to consider this report in its entirety because the overall health of the Washington State retirement systems is dependent on various components and historical trends may not match future projections.

Current Status of Retirement Systems

Adequate funding improves the health of the Washington State retirement systems. The adequate (or required) contributions represent the contributions necessary to satisfy full funding under current benefit provisions, assumptions, methods, and funding policy defined under *Chapter 41.45, RCW.*

OSA performs actuarial valuations annually on the Washington State retirement systems. OSA calculates the required contribution rates, as a percent of salary, necessary to fully fund the systems based on the adopted funding policy and long-term assumptions disclosed in the Actuarial Valuation Report (AVR). OSA presents the results to the PFC and Law Enforcement Officers' and Fire Fighters' Retirement System (LEOFF) Plan 2 Board. The PFC and LEOFF Plan 2 Board adopt contribution rates on a bi-annual basis, subject to revision by the Legislature. The adopted or enacted contribution rates may differ from the required contribution rates.

The table below displays the adopted employee and employer contribution rates for the 2019-21 Biennium. These contribution rates remain some of the highest rates in plan history[1].

Adopted 2019-21 Contribution Rates[1]				
	Employee	Employer[2]		
System	Normal Cost	Normal Cost	UAAL	Total
PERS[3]	7.90%	7.92%	4.76%	**12.68%**
TRS[3]	7.77%	8.15%	7.18%	**15.33%**
SERS[3]	8.25%	8.25%	4.76%	**13.01%**
PSERS	7.20%	7.20%	4.76%	**11.96%**
LEOFF[4]	8.59%	8.59%	0.00%	**8.59%**
WSPRS	8.45%	22.13%[5]	N/A	**22.13%[5]**

[1] Does not include supplemental rate impacts from 2019 Legislative Session.

[2] Excludes DRS administrative expense fee.

[3] Plan 1 members' contribution rate is statutorily set at 6.0%. Members in Plan 3 do not make contributions to their defined benefit.

[4] No member or employer contributions are required for LEOFF Plan 1 when the plan is fully funded.

*[5] The Legislature modified the 2019-21 WSPRS employer rate adopted by the Pension Funding Council. The employer rate collected during 2019-21 will be 17.50%. For more information, please see the **Where the Retirement Systems are Headed** section.*

Contribution rates have been increasing for most plans since the 2009-11 Biennium but the 2019-21 Biennium showed slowing growth and even decreases for some systems. Naturally, contribution rate increases can worsen affordability measures since the ability to provide adequate funding is constrained. The following table summarizes the change in total employer (normal cost plus Unfunded Actuarial Accrued Liability [UAAL]) contribution rates over the last three biennia.

[1] WSPRS employers contributed higher contribution rates from plan inception through 1963 and again from 1979 through 1987.

Total Employer Contribution Rates[1]			
	2015-17 Biennium	2017-19 Biennium	2019-21 Biennium
System	*Collected*	*Collected*	*Adopted*[2]
PERS[3]	11.00%	12.52%	12.68%
TRS[3]	12.95%	15.02%	15.33%
SERS[3]	11.40%	13.30%	13.01%
PSERS[3]	11.36%	11.76%	11.96%
LEOFF[4]	8.41%	8.75%	8.59%
WSPRS[5]	8.01%	12.81%	22.13%[5]

[1] Excludes DRS administrative expense fee.

[2] Does not include supplemental rate impacts from the 2019 Legislative Session.

[3] Includes the Plan 1 UAAL rate.

[4] No member or employer contributions are required for LEOFF 1 when the plan is fully funded.

[5] The Legislature modified the 2019-21 WSPRS employer rate adopted by the Pension Funding Council. The employer rate collected during 2019-21 will be 17.50%. For more information, please see the ***Where the Retirement Systems are Headed*** *section.*

There are three main reasons why the contribution rates have been increasing for the Washington State retirement systems:

1. Past periods of underfunding due to adopted contribution rates that were less than the required contribution rates. In the long-term, retirement plans become more expensive when they experience periods of underfunding because the plans require additional contributions to cover "missed" required contributions and their investment returns. The linked report, *2016 Risk Assessment Assumptions Study*, summarizes the adopted versus required contribution rates from 1990–2015.

2. Plan members continue to experience longer life spans. As a result, in 2013, we made a change and now assume annuitants will receive more pension payments than our prior assumptions for member longevity. The increased cost from this change was phased-in over three biennia, with the 2019-21 contribution rates being the last step of the phase-in. We review the longevity assumption every six years. For additional information, please see our most recently published Demographic Experience Study (*2007-12 Demographic Experience Study*).

3. The expectations for future return on investments have decreased. In general, employee/employer contributions funded approximately 25-30 percent of the cost of the Washington State retirement systems over the past 20 years. Investment returns generated on contributions funded approximately 70-75 percent of the cost. Contribution rates have increased to offset the expected decrease in future investment returns. We analyze our investment return recommendation as part of the Economic Experience Study every two years.

Other measures to assess the affordability of the Washington State retirement systems are contributions as a percent of budget and plan maturity measures.

The table below summarizes the estimated General Fund-State (GF-S) pension contributions as a percent of the GF-S Budget.

Estimated Pension Contributions as a Percent of GF-S Budget							
(Dollars in Millions)	1990	1994	2000	2005	2010	2015	2018
Estimated GF-S Contributions*	$222	$323	$265	$81	$384	$639	$1,055
GF-S Budget**	$6,505	$8,013	$11,068	$13,036	$13,571	$17,283	$21,712
Percent of GF-S Budget	3.4%	4.0%	2.4%	0.6%	2.8%	3.7%	4.9%

**Actual total employer contributions found in the 1995, 2005, 2009, and 2014 OFM CAFRs. The estimated GF-S contributions is the product of actual employer contributions and assumed GF-S fund splits (found on OSA's website).*

***GF-S budgets prior to 1997 found in June 2008 ERFC Annual Forecast. All other GF-S budgets found in June 2019 ERFC Annual Forecast.*

The highest estimated GF-S pension contributions as a percent of GF-S budget occurred in Fiscal Year (FY) 2018 (4.9 percent), coinciding with the highest collected contribution rates for most systems. The recent growth trend is primarily due to the factors noted earlier in this section. The *2010 Risk Assessment Study* contains additional information on historical periods of underfunding which help explain the pattern shown above.

The previous table provides information on what the state contributed in the past but we also consider who pays for these pension contributions. Active employees and their employers contribute to the Washington State retirement systems. The contributions and investment returns fund the expected benefits of the systems. As the retirement systems mature, the ratio of active members to retirees decline, indicating more potential pressure on contributing members and their employers to cover pension costs. The proportion of retired to active members alone is not an indication of a retirement system's current financial condition but it can illustrate a risk to the retirement systems. For example, when we updated our mortality assumption to reflect longer lifespans, it required a significant increase to member and employer rates, in part, to fund current retiree benefits that we expect will be paid for longer than previously assumed. The following table shows the maturity measures of the Washington State retirement systems.

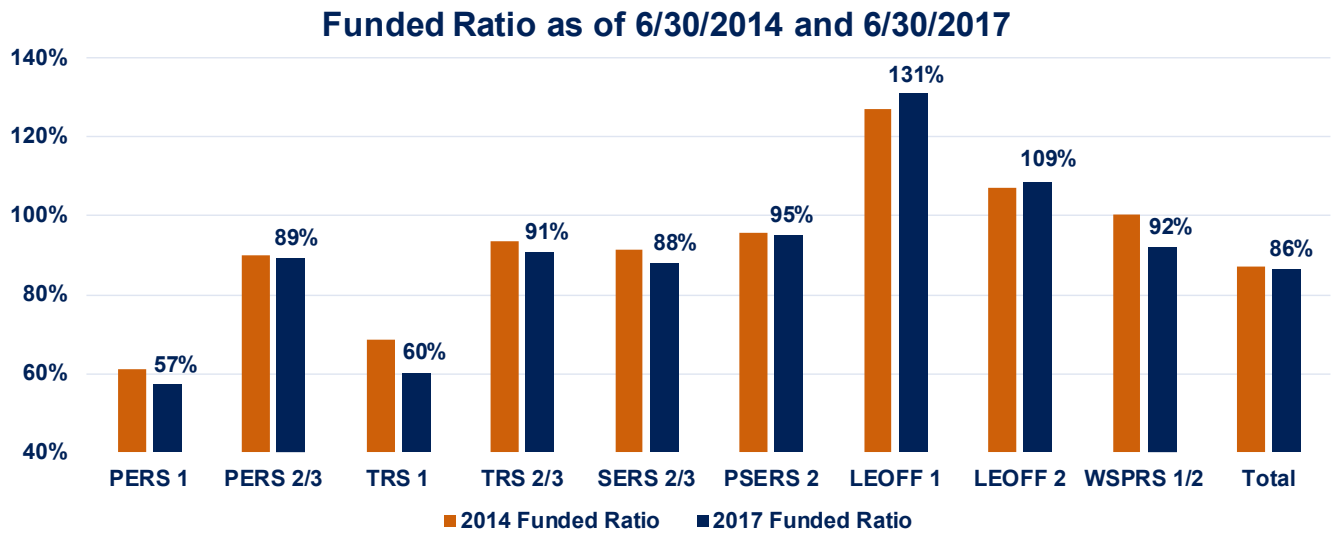
Select Plan Maturity Measures (All Plans Combined)				
	2006	2010	2014	2017
Ratio of Actives to Retirees	2.4	2.2	1.9	1.8
Liability Ratio: Retiree/Total	0.4	0.4	0.4	0.5

The ratio of actives to retirees has trended downward since FY 2006. We observed approximately 0.60 fewer actives per retirees over a ten-year period. Retirees have also become a larger portion of total liabilities. These trends have emerged because Plan 1 systems are now primarily comprised of annuitants and retirees are beginning to emerge from Plans 2/3.

The funded ratio, as a consistent measurement over time, also provides insight into the impact of past funding.

OSA uses the funded ratio as a solvency measure in this report. The ratio helps answer the question "has the plan accumulated sufficient assets to pay the expected benefits that have been earned to date by its members?" It equals the plan assets divided by the present value of all accrued (or earned) benefits. For example, if the funded ratio of a plan is 103 percent, then we assume there is $1.03 in assets for every $1.00 of present value of accrued (or earned) benefits. For these calculations, we use the long-term expected rate of return consistent with the state's funding policy to determine the present value of accrued benefits.

While we show a funded ratio both by individual plan and on a combined basis, keep in mind absent a qualified merger or plan termination, a plan cannot use another plan's assets to pay its benefits. The following graph provides the funded ratio as of our most recently published AVR and June 30, 2014. Most plans experienced a drop in funded status since June 30, 2014. This is largely due to the decrease in the assumed return on investments and short-term underfunding that occurred from the phase-in of the contribution rate increases from the mortality assumption change.



The actuarial community has not agreed on a funded ratio threshold that determines a plan as "healthy"; however, we consider all open plans as well as LEOFF Plan 1 on target for full funding. As of the latest measurements, the Public Employees' Retirement System (PERS) Plan 1 and Teachers' Retirement System (TRS) Plan 1 are less well-funded compared to their open plan counterparts, and most of their members have already retired. For this reason, PERS 1 and TRS 1 require additional contributions in order to get their funding levels back on track for full funding. As defined under *RCW 41.45.060*, only employers make the additional contributions to PERS 1 and TRS 1.

Please note, prior to 2014, the funded ratio reflected liabilities calculated under the Projected Unit Credit (PUC) actuarial cost method. Since then, the funded ratio is calculated using the Entry Age Normal (EAN) actuarial cost method, consistent with Governmental Accounting Standards Board (GASB) requirements. While this change in cost method did not impact contribution rates, the change did reduce the funded ratio for all plans. For more information, please see our *2014 AVR*. This report also includes a long history of funded ratios by plan.

In summation, we observe the selected affordability and solvency measures worsening over the historical period. Reasons for this include:

- The plan affordability has trended downward partially due to an increase in contribution rates. Contribution rate increases are largely due to assumption changes, including lowering the expected investment return and assuming longer lifespans.
- Pension costs have become a larger part of the budget. The estimated GF-S pension contributions as a percent of GF-S budget has increased each year since 2005.
- The retirement systems are maturing, which means that when pension costs increase, a greater burden is often placed on members and employers than in the past.
- Even though the funded status has trended downward, we believe all open plans and LEOFF 1 remain on target for full funding. Consistent with current funding policy, the closed PERS 1 and TRS 1 require additional contributions in order to achieve full funding. The following section of this report looks ahead and details when we project those plans to reach full funding in the future.

While the affordability and solvency measures have worsened, the recent adoption of adequate contribution rates to cover the increasing longevity of members and the lower assumed rate of investment return has put the retirement systems in a better position for the future.

Where the Retirement Systems are Headed

Looking ahead, and assuming no changes to assumptions or benefit provisions, we observe the following projected trend in contribution rates for the Washington State retirement systems following the 2019-21 Biennium. The following table summarizes the projected total employer (normal cost plus UAAL) contribution rates over four biennia. The projected employee contribution rates are expected to follow a similar directional trend as employer rates.

Total Employer Contribution Rates[1]				
	2019-21 Biennium	2021-23 Biennium	2023-25 Biennium	2025-27 Biennium
System	*Adopted*[2]	*Projected*	*Projected*	*Projected*
PERS[3]	12.68%	10.20%	8.90%	8.20%
TRS[3]	15.33%	12.82%	12.01%	11.63%
SERS[3]	13.01%	10.50%	9.17%	8.48%
PSERS[3]	11.96%	10.21%	9.87%	9.72%
LEOFF[4]	8.59%	8.59%	8.60%	8.65%
WSPRS[5]	22.13%[5]	17.61%[5]	11.38%[5]	8.08%[5]

[1] Excludes DRS administrative expense fee.

[2] Does not include supplemental rate impacts from 2019 Legislative Session.

[3] Includes the Plan 1 UAAL rate.

[4] No member or employer contributions are required for LEOFF 1 when the plan is fully funded.

[5] The Legislature modified the 2019-21 WSPRS employer rate adopted by the Pension Funding Council. The employer rate collected during 2019-21 will be 17.50%. For more information, please see the ***Where the Retirement Systems are Headed*** *section.*

The projected contribution rates begin a downward trend due to three main reasons:

1. The Legislature adopted new assumptions for longer life spans but elected to phase into the contribution rates needed to fund the higher costs over three biennia. The 2019-21 Biennium represents the final step of this phase in.

2. We expect the cost of new hires for most plans will be less than current members. For example, PERS, TRS, and the School Employees' Retirement System (SERS) 2/3 employees, hired after May 1, 2013, receive less subsidized early retirement benefits than members hired prior to that date.

3. Both the PERS 1 and TRS 1 UAAL rates decline towards the plan 1 UAAL rate floor. As of the most recent AVR, TRS 1 UAAL rates are expected to reach the 5.75 percent[2] rate floor during the 2021-23 Biennium and PERS 1 UAAL rates reach the 3.75 percent[2] rate floor during the 2021-23 Biennium. Once there, the rate floor is collected until full funding occurs.

As noted in the table, the Legislature reduced the Washington State Patrol Retirement System (WSPRS) contribution rate to be collected during the 2019-21 Biennium. WSPRS is a relatively small retirement system which can lead to volatile contribution rates. The recent longevity assumption change and large salary increases provided to WSPRS members led to a sharply increasing employer rate followed by a projected similar steep decline.[3] To manage that short-term volatility, the Legislature elected to phase-in the employer rate increase from the 2017-19 Biennium to the 2019-21 Biennium over three successive biennia. The intent of the phase-in is to help stabilize rates, and to ensure no expected funding shortfall will occur at the end of the three biennia phase-in. By June 30, 2020, our office will report to the PFC the expected change to

[2]Excludes supplemental rates for benefit improvements.

[3]WSPRS members currently contribute at the maximum rate allowed under statute. The maximum employee rate can only increase when a benefit improvement is enacted.

WSPRS employer rates to complete this phase-in.

On an expected basis, pensions contributions as a percent of the budget are expected to increase slightly in the short-term before becoming a smaller percent of the budget as the contribution rates decline. Furthermore, the expected full-funding dates for the Plans 1 UAAL occur in FY 2026 for TRS 1 and in FY 2028 for PERS 1. The table below displays the projected GF-S pension contributions as a percent of GF-S budget. Currently, the state contributes more than double the long-term expected percent of GF-S budget (2.2 percent).

Estimated Pension Contributions as a Percent of GF-S Budget

(Dollars in Millions)	2020	2025	2030	2035	2040	2045	2050
Estimated GF-S Contributions*	$1,297	$1,234	$839	$1,047	$1,311	$1,623	$2,010
Estimated GF-S Budget**	$23,691	$29,078	$36,411	$45,592	$57,088	$71,483	$89,508
Percent of GF-S Budget	5.5%	4.2%	2.3%	2.3%	2.3%	2.3%	2.2%

**The GF-S contributions based on projected payroll and contribution rates by OSA. We assume GF-S fund splits consistent with our website.*
***GF-S budget grown by assumptions on OSA website.*

While contribution rates and GF-S pension contributions as a percent of GF-S budget measures are expected to decline, we expect the retirement systems to continue to mature. The ratio of actives to retirees is expected to continue the downward trend we observed in the prior section and reach a long-term ratio of actives to retirees of approximately 1.4, which is approximately one active member less per retiree than observed in FY 2006. Additionally, in the long-term we estimate retirees to remain approximately half of the total liabilities.

The estimated reduction in the ratio of active members to retirees could place more pressure on contributing members and their employers, particularly if the future is different than assumed. The table below shows the estimated maturity measures of the Washington State retirement systems.

Estimated Select Plan Maturity Measures (All Plans Combined)*

	2020	2025	2030	2035	2040	2045	2050
Estimated Ratio of Actives to Retirees	1.5	1.4	1.3	1.3	1.3	1.4	1.4
Estimated Liability Ratio: Retiree/Total	0.5	0.5	0.5	0.5	0.5	0.5	0.5

**Based on projected headcounts and liabilities by OSA.*

We anticipate the solvency measures to improve because we assume plans will collect the contributions necessary to fully fund the pension system moving forward. This includes the projected PERS 1 and TRS 1 pay-off dates mentioned earlier as well as the non-LEOFF plans trending towards a funded ratio of 100 percent. As of the publication date of this report, the *AVR* and *OSA Projection Disclosures* detail the projection assumptions used to develop our projection analysis.

In summation, we expect our selected affordability and solvency measures to generally improve going forward.

- We expect both the contribution rates and the estimated GF-S pension contributions as a percent of GF-S will improve affordability since we expect contribution rates to decline to long-term levels.
- We expect employer contributions will decline once PERS 1 and TRS 1 reach a fully funded status, which is projected to occur in FY 2026 for TRS 1 and in FY 2028 for PERS 1.
- Affordability can worsen because there are fewer contribution sources, relative to the overall plan liability, to fund the retirement plan costs.
- We also expect the funded ratios to improve because we assume adequate contribution rates will be adopted to fully fund all plans.

How the Future Can Look Different

The forecasting measures contained in the prior section provide information based on "best estimate" assumptions made regarding the future. These projections are sometimes referred to as being made on an expected basis. We also consider how the future may look different than expected, and what factors have the biggest impact on our projections.

Three main factors that can materially influence our projections are:

- **Investment Experience** – Volatility of actual investment experience along with consistent experience above or below our assumption can significantly impact results.
- **Choices Made by Policy Makers** - The Legislature and other policy makers could adopt contribution rates above or below the required rate to fund the plans and/or adopt benefit improvements. Either of these will influence our projected results as we assumed full funding and no benefit improvements in the prior section.
- **Demographic Experience** - The salaries, ages, and number of new plan members may not match our demographic assumptions.

We developed a risk assessment model to estimate the impact of unexpected events due to differing investment returns and/or actions by policy makers. Our model starts by summarizing the results of 2,000 scenarios with randomly simulated economic outlooks. This helps us assign probabilities, or likelihoods, to certain outcomes. Please see the *2016 Risk Assessment Assumptions Study* for additional information.

The model also allows for two funding options: "Current Law" and "Past Practices". Current Law assumes no future benefit improvements and the recent trend of no funding shortfalls to continue indefinitely. This funding option allows us to compare how the expected results

(presented in the prior section) change when actual investment returns do not match our assumed investment return. Past Practices assumes funding shortfalls and the enactment of future benefit improvements, both consistent with actual history.

The Select Measures of Pension Risk table summarizes three different affordability and solvency metrics of the risk assessment model:

1. Chance the GF-S pension budget is either half (or double) current share of GF-S budget (affordability).
2. Chance of a plan going into pay-go status, i.e., running out of assets before the last benefit is paid (solvency).
3. Chance of plan funded status falling below 60 percent (solvency).

These measures estimate the likelihood of these events occurring at some point in the future. For example, an 8 percent likelihood of pay-go reflects that in any given year during the noted projection periods, the highest likelihood that pay-go will occur is approximately 8 percent.

The select measures in the following table reflect the Current Law funding option.

Select Measures of Pension Risk as of June 30, 2017		
	Current Law	
Projection Period	Next 20 Years (FY 2018-37)	20-50 Years (FY 2038-67)
Affordability Measures		
Chance of Pensions Double their Current Share of GF-S[1]	5%	4%
Chance of Pensions Half their Current Share of GF-S[1]	55%	67%
Solvency Measures		
Chance of PERS 1, TRS 1 in Pay-Go[2]	0%	1%
Chance of Open Plan in Pay-Go[2]	0%	0%
Chance of PERS 1, TRS 1 Total Funded Status Below 60%	15%	6%
Chance of Open Plans Total Funded Status Below 60%	8%	9%

[1] *Pensions approximately 5.5% of current GF-S budget; does not include higher education.*

[2] *When today's value of annual pay-go cost exceeds $50 million.*

While the future is unknown, we use these measures to better understand risk and risk management, particularly through looking at how the measures change.

For instance, under the Past Practices funding option, the solvency measures and one affordability measure worsen when compared to the Current Law funding option. This is due to assuming funding shortfalls and benefit improvements consistent with past practices. Under this funding scenario, the plans become more expensive and receive less funding. For additional information, our website (*Pension Funding Risk Assessment*) summarizes the annual "Past Practices" graphs of each metric as of the most recently published AVR.

Select Measures of Pension Risk as of June 30, 2017		
	Past Practices	
Projection Period	Next 20 Years (FY 2018-37)	20-50 Years (FY 2038-67)
Affordability Measures		
Chance of Pensions Double their Current Share of GF-S[1]	1%	3%
Chance of Pensions Half their Current Share of GF-S[1]	47%	46%
Solvency Measures		
Chance of PERS 1, TRS 1 in Pay-Go[2]	15%	18%
Chance of Open Plan in Pay-Go[2]	1%	8%
Chance of PERS 1, TRS 1 Total Funded Status Below 60%	29%	27%
Chance of Open Plans Total Funded Status Below 60%	24%	36%

[1] *Pensions approximately 5.5% of current GF-S budget; does not include higher education.*

[2] *When today's value of annual pay-go cost exceeds $50 million.*

The reason for the "Chance of Pensions Double their Current Share of GF-S" improving from Current Law to Past Practices is due to assumed maximum employer rates that will be collected. Current Law assumes all calculated rates will be collected no matter how costly that might be. Past Practices places a limit on how high the collected contribution rates will be in the future. The underfunding from the contribution rate limit leads to a slightly smaller likelihood of this measure occurring. However, it also plays a primary role in the large difference in the "Chance of Open Plans Total Funded Status Below 60%" measure between the two funding options.

This section discussed the impact of investment return volatility and choices made by policy makers on affordability and solvency measures. The results show the retirement systems are most affordable and solvent when experience matches our long-term economic assumptions. The affordability and solvency measures will worsen when we randomly simulate economic outlooks because actual investment returns are more volatile and the returns can be either below (or above) our assumption (Current Law). The measures also generally worsen if we assume future benefit improvements and funding shortfalls (Past Practices).

Planning for the Future

The Legislature and other policy makers cannot control some elements which impact plan health such as membership demographics or the actual return on investments. However, adopting adequate contribution rates, based on best estimate assumptions, and enacting benefit enhancements are within the purview of policy makers.

Providing adequate funding in a timely manner improves the long-term outlook of the Washington State retirement systems and provides an opportunity to maximize the investment return on those contributions. Adequate funding requires contribution rates based on the best estimate of future experience, which OSA reviews regularly and makes recommendations like the ones contained in the attached Economic Experience Study.

Adopting sustainable and affordable benefit improvements will also help maintain affordable pension costs.

We view affordability and solvency as measures that typically move in opposite directions. As an example, if the Legislature determines that pension contributions are not affordable then they may not adopt the required (or adequate) contribution levels. This decision can put the funding levels and plan health at risk of declining. Similar to what we saw when comparing the Past Practices to the Current Law scorecard, in this scenario, affordability improves in the short-term through reduced contributions. In turn, solvency measures worsen due to decreased funded status. It is important to remember that any improvements in affordability through inadequate contributions is temporary. Employees and employers would need to contribute more in the future to make up for the prior inadequate contributions and missed investment earnings on those contributions.

Fully funding our pension systems can serve the systems well in the long term and puts the retirement plans in a better financial position to endure tougher economic environments that will inevitably return in the future.

Affordability and solvency are a delicate balance. Constant monitoring, readjusting, and understanding the risks involved will put decision makers, and hopefully the retirement systems, in the best position going forward.

SECTION TWO: Economic Experience Study

Economic Experience Study

Executive Summary

According to *RCW 41.45.030 (2)*, the Pension Funding Council (PFC) may adopt changes to the long-term economic assumptions every two years by October 31. As an example, any assumptions adopted by October 31, 2019, will be effective July 1, 2021, for contribution rate-setting purposes. Any changes adopted by the PFC are subject to revision by the Legislature.

Guided by applicable actuarial standards of practice, the Office of the State Actuary (OSA) performed an Economic Experience Study (EES) to develop a recommendation for each long-term economic assumption. We developed the recommended assumptions as a consistent set of economic assumptions, and we recommend reviewing them as a whole, as opposed to individual recommendations.

Our recommendations remain unchanged for assumed inflation, general salary growth, and investment rate of return. For the growth in system membership assumption, we recommend a decrease to the TRS assumption and no change to the assumption for other systems. The table below summarizes the recommendations for the long-term economic assumptions in the prior and current EES.

Summary of Economic Recommendations		
Assumption	**2017 EES**	**2019 EES**
Total Inflation	2.75%	2.75%
General Salary Growth	3.50%	3.50%
Investment Rate of Return*	7.40%	7.40%
Growth in System Membership**	1.25% (TRS), 0.95% (Others)	0.95%

**Currently set in statute at 7.50% for all plans except LEOFF 2, which is set at 7.40%.*
***Excludes LEOFF 2.*

General Approach to Setting Economic Assumptions

Actuarial Standard of Practice Number 27 (ASOP 27), titled Selection of Economic Assumptions for Measuring Pension Obligations, identifies the following process for selecting economic assumptions:

- ❖ Identify components, if any, of the assumption;
- ❖ Evaluate relevant data;
- ❖ Consider factors specific to the measurement;
- ❖ Consider other general factors; and
- ❖ Select a reasonable assumption.

With the exception of the annual growth in system membership assumption, we used the "building-block" method to develop each assumption in the 2019 EES. Using this method, the actuary determines the individual components for each economic assumption. Then the actuary may combine estimates for each applicable component to arrive at a best estimate for the given economic assumptions. Further, when setting each building-block assumption, we considered the actuarial duration of the corresponding measurement. The duration helps us understand the time horizon of the liabilities to which these assumptions apply. Please see **Appendix A** for a description of duration in this context.

We developed the recommended economic assumptions as a consistent set, and we recommend reviewing them as a whole. The adoption of one or more assumption changes, but not all assumption changes, could lead to inconsistencies. For example, inflation is a building block for both our general salary growth and investment return assumptions. Thus, lowering the inflation assumption and general salary growth assumption without lowering the investment return assumption could lead to internal inconsistencies between assumptions. An inconsistent set of assumptions could be less accurate than a consistent set of assumptions and lead to future cost increases or decreases.

Experience Study and Recommended Assumptions

For each assumption studied, we provide a high-level summary containing the following:

- ❖ What the assumption is and how we use it in our funding model.
- ❖ High-level takeaways from the study of the assumption.
- ❖ The data we studied and the assumptions we made.
- ❖ How we developed the assumption.
- ❖ Our single best estimate recommendation.

The **Economic Experience Study Appendices** provide additional details on the development of these recommendations.

Total Inflation

What is the Total Inflation Assumption and How Do We Use It?

Total inflation, in the context of this report, represents the increase in the general price of goods in the Seattle-Tacoma-Bellevue (STB) region. For funding purposes, we primarily use this assumption to model post-retirement Cost-Of-Living-Adjustments (COLAs). Retired members[1] who currently receive a pension from the Washington State retirement systems receive a COLA based on changes in the STB Consumer Price Index (CPI). We also use total inflation and a component of total inflation—national inflation—in the development of the general salary growth and investment return assumptions, respectively.

High-Level Takeaways

The average STB inflation has been declining steadily over the past few decades and is anticipated to remain low in the future relative to long-term historical averages. This relatively consistent decline may be partially due to a monetary policy by the Federal Reserve and their successful maintenance of an annual inflation target of about 2 percent. Based on third-party inflation forecasts, we believe lower levels of inflation will continue into the future as well.

Data and Assumptions

We relied on 1950 to 2018 historical inflation data from the Bureau of Labor Statistics (BLS) and consulted with both the Washington State Investment Board (WSIB) and the Economic and Revenue Forecast Council (ERFC). We also took into consideration estimates on future inflation from Global Insight (GI), the Social Security Administration (SSA), and the Congressional Budget Office (CBO).

[1] *For PERS 1 and TRS 1, this applies only to members who elected the optional COLA payment form at retirement.*

General Methodology

Our total inflation assumption is developed using a building-block method, which requires the actuary to determine the components of each assumption and make an estimate for each. We then combine the estimated components to arrive at a best estimate for the assumption.

For the total inflation assumption, we used two building-block components: (1) national inflation and (2) an STB inflation adjustment - i.e., a regional price inflation differential. We make a recommendation on total inflation only; however, we analyzed both of the inflation components and the relationship between them. (Please see **Appendix B** for this analysis and for additional details surrounding this assumption.)

Recommendation

We recommend a total inflation assumption of 2.75 percent, comprised of a 2.35 percent national inflation component and a 0.40 percent regional price inflation differential component. While we adjusted the individual components, this results in no change to our recommended total inflation assumption.

Inflation Assumption		
	Old	New
All Plans	2.75%	2.75%

General Salary Growth

What is the General Salary Growth Assumption and How Do We Use It?

The General Salary Growth assumption is used to project wages for the purposes of determining future retirement benefits and contribution rates as a percent of payroll. We also use it to determine employer contributions to the (UAAL) for the Public Employees' Retirement System (PERS) and the Teachers' Retirement System (TRS) as a level percentage of future system payrolls.

General salary growth is one of two building blocks used to develop the assumption for total salary growth. The other building-block is service-based salary growth (or longevity), which we study as part of our *Demographic Experience Study*. Generally, a participant's salary will grow over the long term in accordance with economic factors such as inflation and real wage growth (or productivity), and with demographic factors such as service-based salary growth (including promotions).

High-Level Takeaways

General salary growth has displayed a downward trend over the past few decades, and we expect these lower levels of general salary growth to persist in the future. The decline in general salary growth is consistent with our observations for inflation. We believe the decrease in general salary growth was attributable to changes in inflation and not to changes in real wage growth. More

recently, we observed higher wage growth in the state retirement system following the Great Recession; we have also observed a corresponding increase in inflation, and thus no significant increase in observed real wage growth.

Data and Assumptions

In studying this assumption, we examined national and Washington State annual average salaries for different subsets of workers. Where available, we collected and analyzed up to 40 years of historical data from several sources. To set the assumption, we generally rely upon historical data to approximate a reasonable real wage growth range and to identify any trends. We also considered 10-year national projections consistent with the duration of future salaries for active members in our open pension plans.

We relied on salary data from SSA, the Bureau of Economic Analysis (BEA), and the Washington State Department of Retirement Systems (DRS). We also relied on national and regional inflation data from BLS. To inform our expectations for the future, we used real wage growth projections from SSA and the Congressional Budget Office (CBO), as well as a variety of other information cited in the appendix.

General Methodology

We developed our general salary growth assumption using two building-block components: (1) total inflation and (2) real wage growth (net of assumed service-based salary increases). We analyzed total inflation and formed a best estimate for this assumption in the **Total Inflation** section of this report. We evaluated real wage growth as the average of wage growth, net of assumed service-based salary increases, less inflation. Please see **Appendix C** for this analysis and for additional details surrounding this assumption.

Recommendation

We recommend a general salary growth assumption of 3.50 percent, comprised of a 2.75 percent total inflation component and a 0.75 percent real wage growth component. This results in no change to our recommended general salary growth assumption.

General Salary Growth Assumption		
	Old	New
All Plans	3.50%	3.50%

Investment Rate of Return

What is the Investment Rate of Return Assumption and How Do We Use It?

The investment rate of return assumption represents the assumed annual return on assets used to pay pension benefits. Consistent with current state funding policy, we use the assumption to discount future benefit payments and salaries for members of the retirement systems to today's value. We then compare current assets with the present value of benefit payments and salaries to determine contribution rates.

High-Level Takeaways

Actual average returns have generally performed at or above the current assumed rate, however, this performance depends on the historical timeframe. For instance, over the last 20 years the actual average return fell below the current assumed rate. Based on new Capital Market Assumptions (CMAs) and asset allocation, WSIB expects slightly higher returns for the next 15 years than expected using the 2017 CMAs. We applied our professional judgment to extend the expectations beyond 15 years and to maintain consistency with our other economic assumptions. We also considered but do not recommend a separate investment return assumption for the closed Plans 1.

Data and Assumptions

In developing this assumption, we consulted with and relied on data provided by WSIB. We also relied on the American Academy of Actuaries February 2019 practice note on forecasting investment returns for pension actuaries. Please see the practice note on the Academy's *website* for more information.

General Methodology

While historical returns were considered, we primarily relied on WSIB's expectations for the future and our professional judgment when setting this assumption. We reviewed WSIB's most recent CMAs, target and actual asset allocation, and simulated returns over various periods. We also considered how the returns could change under different CMAs and asset allocations. (Please see **Appendix D** for this analysis and for additional details surrounding this assumption.)

Recommendation

We recommend an investment rate of return assumption of 7.40 percent. While the result is consistent with our recommendation from our prior study, we did make changes to our methodology to develop the recommendation.

The PFC adopted the currently prescribed assumption of 7.50 percent for the 2019-21 Biennium and that assumption would continue for all future biennia under current law.

Investment Return Assumption		
	Old	New
All Plans	7.40%	7.40%

Growth in System Membership

What is the Growth in System Membership Assumption and How Do We Use It?

We use the growth in system membership assumption to estimate retirement system payroll over the next ten years.

Consistent with current law, PERS and TRS Plans 1 UAAL is amortized over ten years of future system payroll. Employers of PERS, School Employees' Retirement Systems (SERS), and Public Safety Employees' Retirement System (PSERS) members pay contributions towards the PERS 1 UAAL. For this reason, the projected payroll for amortizing the PERS 1 UAAL includes pay from current and future members of these three systems. We will use the term "PERS" in reference to the combined system growth of PERS, SERS, and PSERS. The projected payroll for the TRS 1 UAAL includes pay from current and future TRS members.

The Plans 1 UAAL contribution rates described above are also subject to statutory minimums. Based on our current projections, we expect that the statutory minimum UAAL contribution rates will exceed the rates required from the ten-year amortization starting in the 2021-23 Biennium. When these minimum rates are in effect, the growth in system membership assumption does not impact the adopted UAAL contribution rate. **Therefore, under the current contribution rate-adoption process, we do not expect this assumption or our recommendation in this study to impact UAAL contribution rates in the 2021-23 Biennium, or subsequent biennia.**

High-Level Takeaways

We observed lower than expected system growth for PERS and TRS after the Great Recession followed by higher than expected growth rates beginning in 2014. Moving forward, we expect annual PERS system growth rates to stabilize, and the TRS system growth rates to trend toward historical long-term rates. We base the reduction in the currently assumed TRS growth rate on our understanding that the state largely completed the hiring of additional teachers from recent increases in state funding for basic education.

Data and Assumptions

In developing this assumption, we relied on historical system membership data from DRS and historical Washington State population data and forecasts from the Office of Financial Management (OFM). OFM also provided contextual information regarding the funding for new teaching positions for the 2019-21 Budget. Based on observed historical correlations, we assumed a relationship exists between future PERS system membership and the Washington State total population as well as between future TRS membership and the Washington State school age population.

General Methodology

We reviewed the growth rates of the retirement systems over various historical periods, along with OFM's most recent state population forecasts. We considered expectations for the future and applied our professional judgment to finalize the recommended assumptions. (Please see **Appendix E** for this analysis and for additional details surrounding this assumption.)

Recommendation

We recommend a growth in system membership assumption of 0.95 percent for both PERS and TRS. This recommendation represents no change to the PERS assumption and a reduction to the TRS assumption from 1.25 to 0.95 percent.

Growth In System Membership Assumption		
	Old	New
PERS	0.95%	0.95%
TRS	1.25%	0.95%

Actuarial Certification Letter
Economic Experience Study

August 2019

This report documents the results of an economic experience study of the retirement plans defined under Chapters 41.26 (excluding Plan 2), 41.32, 41.35, 41.37, 41.40, and 43.43 of the Revised Code of Washington (RCW). The primary purpose of this report is to assist the Pension Funding Council in evaluating whether to adopt changes to the long-term economic assumptions identified in *RCW 41.45.035*. This report should not be used for other purposes.

An economic experience study involves comparing actual economic experience with the assumptions we made for applicable experience study periods. We also review other relevant data to form expectations for the future. The analysis concludes with the selection of a recommended set of economic assumptions. We use Actuarial Standard of Practice Number 27 (ASOP 27), titled *Selection of Economic Assumptions for Measuring Pension Obligations*, to guide our work in this area.

Unless noted otherwise in this report, this economic experience study includes the most recently available plan provisions, participant data, and asset data.

The Department of Retirement Systems provided member and beneficiary data to us. We checked the data for reasonableness as appropriate based on the purpose of this experience study. The Washington State Investment Board (WSIB) provided asset information as of June 30, 2019. An audit of the financial and participant data was not performed. We relied on all the information provided as complete and accurate. In our opinion, this information is substantially complete for purposes of this experience study.

We relied on the Capital Market Assumptions (CMAs) and return simulations from WSIB to help formulate expectations for future rates of annual investment return. We reviewed the CMAs and return simulations for reasonableness as appropriate based on the purpose of this experience study.

The recommendations in this experience study involve the interpretation of many factors and the application of professional judgment. We believe that the data, assumptions,

and methods used in the underlying experience study are reasonable and appropriate for the primary purpose stated above. The use of another set of data, assumptions, and methods, however, could also be reasonable and could produce materially different results. Another actuary may review the results of this analysis and reach different conclusions.

In our opinion, all methods, assumptions, and calculations are reasonable and are in conformity with generally accepted actuarial principles and applicable standards of practice as of the date of this publication.

The undersigned, with actuarial credentials, meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. While this report is intended to be complete, we are available to offer extra advice and explanation as needed.

Sincerely,

Matthew M. Smith, FCA, EA, MAAA
State Actuary

Luke Masselink, ASA, EA, MAAA
Senior Actuary

SECTION THREE: Economic Experience Study Appendices

APPENDIX A – Retirement Plan Duration

Selecting appropriate economic assumptions requires consideration of the period that the assumptions will be applied over. For example, in setting a salary growth assumption we may consider the expected future working lifetime of an active member. Whereas, when setting an assumption for the expected rate of investment return, we may consider both the future working lifetime and the life expectancy once a member retires.

"Duration," in an actuarial sense, is one such measure. Duration represents an average length of plan liabilities or salaries measured in today's dollars. As an example, consider a plan with a liability duration of 15 years. This means we would expect half of the plan's liability, measured in today's dollars, to be paid as benefit payments before 15 years and the other half after 15 years. Put differently, the average length of plan liabilities when we weight future benefit payments by their present value would be 15 years under this example. The same concept applies to a salary duration of five years: half of future salaries received before five years and half after. We use duration in this context as a relevant time period to consider when setting our assumptions.

Duration by Open and Closed Plans										
	Historical Duration					Projected Duration				
Duration of Liabilities										
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Open Plans	21.9	21.4	21.3	21.0	20.8	20.5	20.3	20.1	19.9	19.7
Closed Plans	8.9	8.9	8.8	8.7	8.6	8.4	8.2	8.1	7.9	7.7
Duration of Salaries										
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Open Plans	7.6	7.7	7.8	7.9	7.9	8.0	8.1	8.2	8.3	8.3
Closed Plans	2.8	2.8	2.7	2.7	2.7	2.7	2.7	2.6	2.6	2.5

The table above contains plan duration estimates over time. We estimate liability duration by dividing the Present Value of Future Benefits (PVFB) measured at different discount rates. We perform the same calculation with the present value of salaries to determine the duration of salaries.

$$Duration = \left(\frac{PVFB\ discounted\ by\ 6.5\%\ per\ year}{PVFB\ discounted\ by\ 7.5\%\ (Statutory\ Rate)\ per\ year} - 1\right) \times 100$$

We considered duration by retirement plan, based upon whether the plan is open or closed to new hires. For purposes of this analysis, the closed plans consist of PERS, TRS, and LEOFF Plans 1, which closed to new hires in 1977. The open plans consist of all the other DRS administered plans (Plans 2/3)[1]. We observed a difference in duration between the closed and open plans where opens plans have over twice the duration of closed plans. This results from different member demographics within open and closed plans. We also see a difference between liability and salary duration because the liability corresponds to life expectancy of all plan members, while salary only corresponds to the future working lifetime of the active group.

[1] *We include Washington State Patrol Retirement Systems (WSPRS) Plans 1 and 2 in our analysis of open retirement plan durations. WSPRS Plan 1 closed to new hires in 2002; however, the plans are funded jointly.*

We also considered results from our projection system to get a sense of how duration may change as the plans continue to mature and assumed new hires join the open plans. Ultimately, we focused on the duration from our *2017 AVR* after observing that the open plan duration remains relatively stable on a projected basis.

APPENDIX B – Total Inflation Assumption

Methodology

We developed the total inflation assumption using a building-block method with two components—national inflation and a regional price inflation differential. We set these assumptions with a 10- to 25-year projection period in mind, consistent with the closed and open retirement plan liability durations. We use inflation as a component of projected salary growth and for post-retirement COLAs. Please see the **Appendix A - Retirement Plan Duration** for more information on this measure.

Consumer Price Index (CPI) measures the change in price for a fixed basket of goods and is a measurement of price inflation. Our analysis for the two building-block components considered historical inflation measured by Urban Wage Earners and Clerical Workers CPI for National CPI-W and STB CPI-W. BLS produced the historical CPIs that we studied. We also considered current Federal Reserve monetary policy, recent data on Treasury Protected Inflation Securities (TIPS), and inflation projections from other experts.

Analysis

We took the following steps to develop our best estimate recommendation:

1. **Set assumption for national inflation component.**

   Historical National Inflation

   We first considered historical national inflation data from the BLS back to 1950. We applied geometric averages over various ranges to determine if a trend exists. Average inflation showed a relatively consistent trend of decreasing inflation over time. One reason for the observed decrease in annual percentage changes in CPI stems from the U.S. economy evolving from farming to a service- and knowledge-based economy over the last 50+ years. More specifically, the U.S. economy experienced globalization and technological advancements during that evolution, which generally lead to lower inflation.

   Recent history (last ten years) was heavily influenced by low inflation during the recession. We don't believe this short-term history will serve as a good predictor of future inflation. Long-term averages over 25 to 30 years yields a more stable inflation history and provides a range between about 2.20 and 2.50 percent.

National CPI-W Geometric Averages	
1950-2018	3.46%
Last 30 years	2.50%
Last 25 years	2.21%
Last 20 years	2.17%
Last 15 years	2.09%
Last 10 years	1.51%
Last 5 years	1.34%

   TIPS Inflation Analysis

   We also examined inflation projections using TIPS and nominal bonds. TIPS bonds are Treasury issued bonds intended to mute the influence of inflation on the bond's maturity value by allowing the maturity value to fluctuate with

changes in the National CPI. As such, TIPS can be used to approximate annual national inflation by subtracting off the TIPS yield from the yield of a non-inflation adjusted Treasury security with the same maturity. The resulting inflation estimate is the "TIPS breakeven inflation", which is the level of inflation that causes the TIPS and nominal bonds to yield the same value.

However, there are questions about the accuracy of using the difference in TIPS and nominal bonds to estimate future inflation. For example, as WSIB notes in their 2019 Capital Markets White Paper, because the size of the TIPS market is much smaller than nominal Treasury bonds, the yield of TIPS can become distorted due to an implicit "illiquidity premium" which has nothing to do with inflation. While TIPS may not provide the most reliable measure of inflation expectations, it still provides additional data on inflation estimates over various periods.

Market Expected Inflation

Year	(A) 10-Year TIPS Breakeven Inflation*	(B) 30-Year TIPS Breakeven Inflation*	(A) - (B)
2014	2.10%	2.23%	0.13%
2015	1.69%	1.84%	0.15%
2016	1.57%	1.74%	0.17%
2017	1.87%	1.97%	0.10%
2018	2.08%	2.10%	0.03%
Average	1.86%	1.98%	0.11%

Note: Totals may not agree due to rounding.

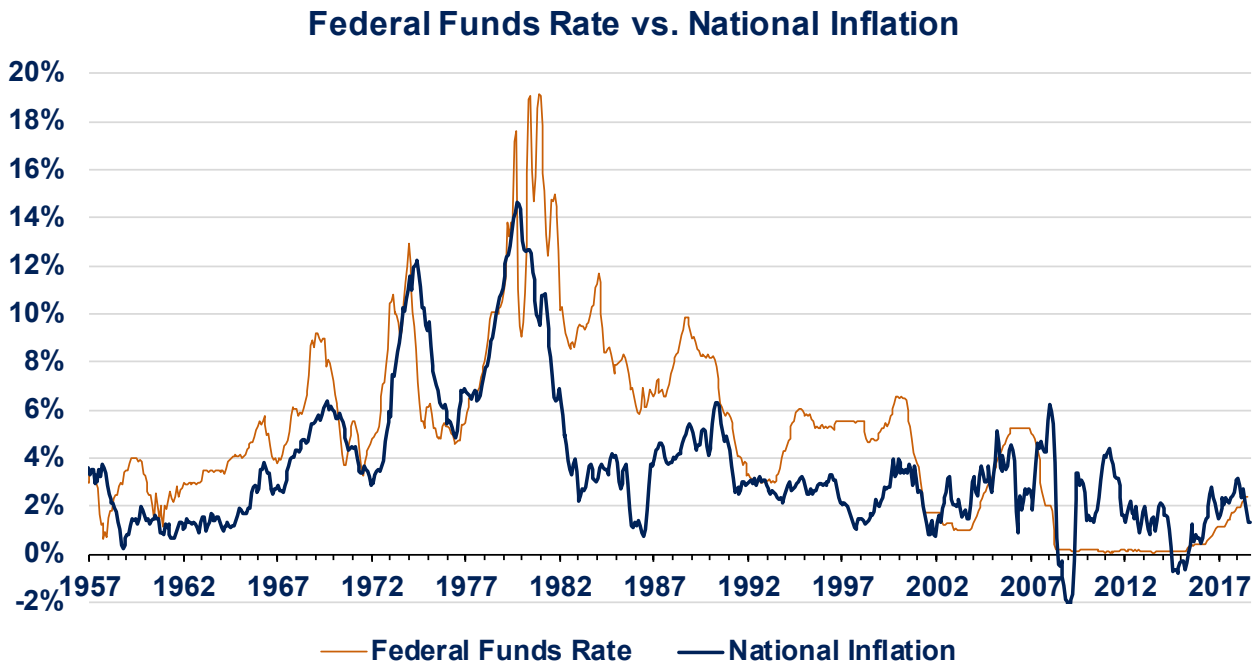
**Difference in nominal and TIPS bond with the same maturity.*

We also compared this implicit inflation projected by short-term (ten-year) and long-term (30-year) TIPS and nominal bonds to determine how market expectations for inflation change over different time periods. Comparing the short- and long-term inflation predicted by TIPS and nominal bonds over the last five years provided insight into how recent market expectations for inflation have evolved. This analysis provided comparison points to historical inflation and projections from other experts. In general, we observed a modest average difference of about 0.11 percent in short- and long-term inflation expectations based on bonds. We noted that the difference in expectations shrunk to 0.03 percent in 2018. This could be market reaction to the Federal Reserve raising interest rates to manage inflation to their target.

Federal Reserve Inflation Target

The Federal Reserve has taken a larger role managing national inflation in recent years. As of January 2012, the Federal Reserve adopted an explicit inflation target of 2 percent per year. Historically the Federal Reserve has managed inflation without a stated target, but these practices have been in place for several decades. By adjusting the "Federal Funds Rate," the rate at which banks can borrow money, the Federal Reserve can increase or decrease the amount of money in the economy. Changes to the availability of money in the

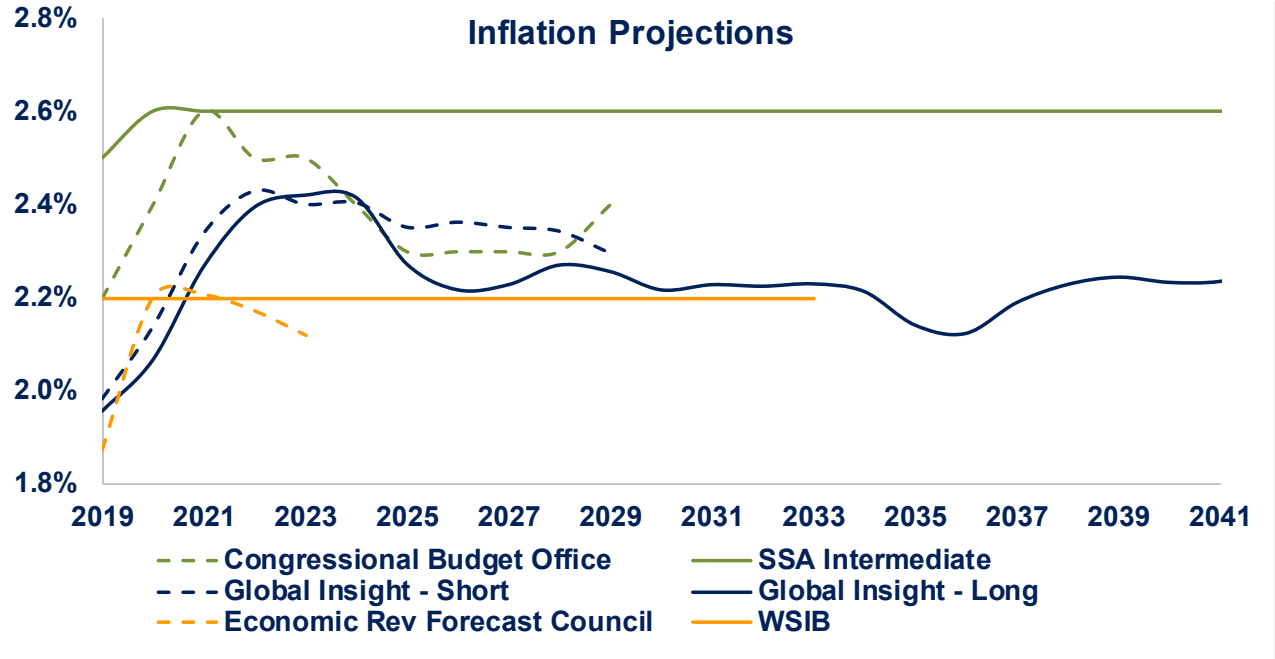
economy has a corresponding impact to the level of inflation. The Federal Reserve clarified the 2 percent inflation target is not short-term in nature. Rather, inflation would reach 2 percent over the "medium term" in absence of unpredictable changes in the economy. We compared the historical Federal Funds Rate and national inflation in the following graph.



The graph above shows a strong correlation between the Federal Funds Rate and national inflation. We observe periods of inflation spikes followed by increases in the fund rate and corresponding decreases in inflation. As an example of inflation control in practice, the 1990's featured a strong economy that typically leads to higher levels of inflation. We observed an increase in the fund rate during this decade which maintained inflation around the 3 percent level. Looking to the future, as the economy moves further from the Great Recession and continues to grow, we believe the Federal Reserve can influence inflation and the target of 2 percent inflation should be considered when setting our assumptions.

Other Expert Inflation Projections

We also reviewed short- and long-term forecasts to get a sense for what other experts in the field expect moving forward. In this context, short-term forecasts are typically 5 to 15 years while long-term forecasts are greater than 15 years. We considered forecasts from the CBO, SSA, ERFC, GI, and WSIB. We observed short-term forecasts (CBO, ERFC, GI-Short, and WSIB) with an average inflation of 2.25 percent and long-term forecasts (SSA Intermediate and GI-Long) with an average of 2.42 percent.



Short-Term vs. Long-Term Inflation

We set the inflation assumption considering the duration of liabilities for each retirement plan. The Plans 1, closed to new hires in 1977, will pay the majority of benefits much earlier than the open Plans 2/3 as indicated in the table below.

Average Plan Duration*		
	Closed Plans 1	Open Plans 2/3
Years	8.9	20.9

**Duration based on OSA's 2017 AVR.*

We considered the average difference in long- and short-term inflation projections using TIPS and nominal bonds (1.98% - 1.86% = 0.11%, rounded) and other expert projections (2.42% - 2.25% = 0.17%). Finally, we also considered the long-term 2 percent inflation target of the Federal Reserve. Given the relatively small difference in long- and short-term inflation expectations and the inherent uncertainty, and variability, in forecasting future inflation over any period, we believe a single inflation assumption for all plans remains reasonable.

National Inflation Recommendation

Considering the 25 and 30 year average historical national inflation of 2.20 to 2.50 percent, the Federal Reserve annual target inflation of 2 percent, and the range of 2.25 to 2.42 percent between average short- and long-term forecasts from other experts, we recommend lowering the long-term national inflation assumption from 2.45 to 2.35 percent. For context, we observed two significant changes that influenced our assumption since the last study. The Federal Reserve continued raising interest rates during

2017 and 2018. This signals the Federal Reserve is actively managing inflation toward their target of 2 percent as the economy continues to grow. In addition, average short- and long-term inflation forecasts from other experts declined since the last study.

2. Reviewed the regional price inflation differential.

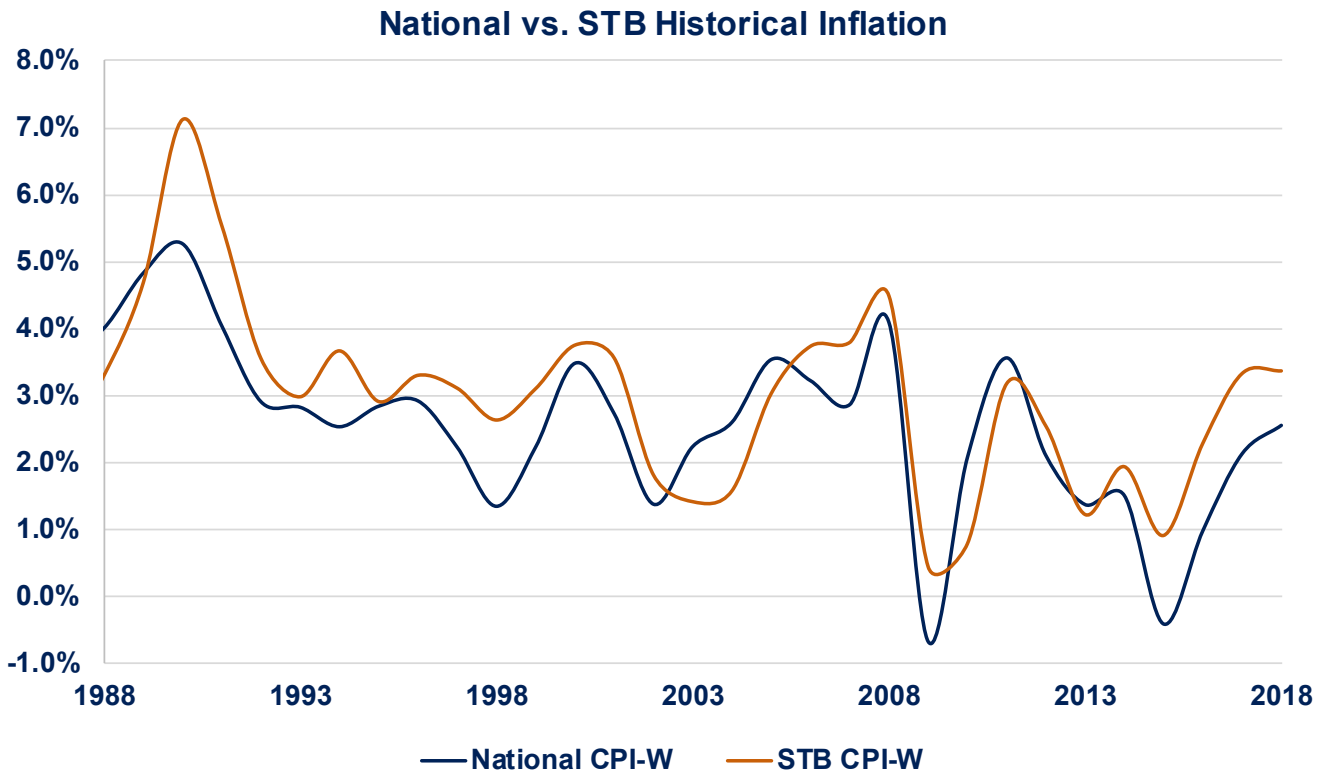
We based our assumption for the regional price inflation differential on the average difference between the STB CPI-W and the National CPI-W over a range of historical time periods. The BLS modified the STB index in 2018 by removing prices for Island, Kitsap, and Thurston counties. Going forward, the index will only include costs for Pierce, King, and Snohomish counties. This means the 2018 index increase from 2017 includes the shift in counties in addition to changes in prices. We removed the 2018 difference in National and STB CPI-W when setting the regional differential assumption due to this change.

Geometric Averages*			
	CPI-W	National CPI-W	Difference
1950-2018	3.63%	3.48%	0.16%
Last 30 years	2.96%	2.50%	0.47%
Last 25 years	2.59%	2.19%	0.40%
Last 20 years	2.46%	2.15%	0.31%
Last 15 years	2.36%	2.05%	0.31%
Last 10 years	1.84%	1.39%	0.45%
Last 5 years	2.11%	1.04%	1.06%

**Averages exclude 2018 inflation because of changes to STB CPI-W calculation.*

The average difference in inflation over the last 20, 25, and 30 years has consistently hovered between 0.30 percent and 0.50 percent. We observe higher inflation in the STB region because we suspect the local economy operates differently than the national economy. The STB region features some of the world's largest companies such as Boeing, Microsoft, and Amazon. Thus, we anticipate the presence of well-paying jobs combined with new residents from other states means that Washington prices tend to rise faster.

Future levels of inflation measured by the STB index will include a different set of counties as noted above. We believe removing the generally lower cost counties (Island, Kitsap, and Thurston) may lead to higher levels of inflation because the STB index will more heavily rely on what we anticipate are faster price growth counties (Pierce, King, and Snohomish). After reviewing the relationship between National CPI-W and STB CPI-W (as shown in the following graph) and considering our expectations for future STB inflation, we selected a 0.40 percent regional price inflation differential.



We will continue to monitor this trend and will consider adjusting or potentially removing this component if the historical regional price inflation differential shows signs of significant change over longer-term experience periods.

3. Recommendation.

We built our total inflation assumption by adding our best estimate for the national inflation assumption (2.35 percent) to our best estimate for the regional price inflation differential (0.40 percent). As a result, our best estimate assumption for total inflation is 2.75 percent per year, which falls between the STB inflation average over the past 25 to 30 years (approximately 2.59 to 2.96 percent).

Exhibits B

Historical Inflation Data									
			Annual % Change					Annual % Change	
Year	STB CPI-W	National CPI-W	STB CPI-W	National CPI-W	Year	STB CPI-W	National CPI-W	STB CPI-W	National CPI-W
1987	318.6	335.0	2.35%	3.59%	**2003**	553.6	535.6	1.41%	2.23%
1988	329.1	348.4	3.30%	4.00%	**2004**	562.3	549.5	1.57%	2.60%
1989	344.5	365.2	4.68%	4.82%	**2005**	579.3	568.9	3.02%	3.53%
1990	369.0	384.4	7.11%	5.26%	**2006**	600.9	587.2	3.73%	3.22%
1991	389.4	399.9	5.53%	4.03%	**2007**	623.7	604.0	3.79%	2.86%
1992	403.2	411.5	3.54%	2.90%	**2008**	651.6	628.7	4.48%	4.09%
1993	415.2	423.1	2.98%	2.82%	**2009**	654.5	624.4	0.44%	(0.67%)
1994	430.4	433.8	3.66%	2.53%	**2010**	659.6	637.3	0.78%	2.07%
1995	442.9	446.1	2.90%	2.84%	**2011**	680.5	660.0	3.17%	3.56%
1996	457.5	459.1	3.30%	2.91%	**2012**	697.8	673.9	2.54%	2.10%
1997	471.7	469.3	3.10%	2.22%	**2013**	706.3	683.1	1.22%	1.37%
1998	484.1	475.6	2.63%	1.34%	**2014**	719.9	693.4	1.93%	1.50%
1999	499.1	486.2	3.10%	2.23%	**2015**	726.5	690.5	0.91%	(0.41%)
2000	517.8	503.1	3.75%	3.48%	**2016**	743.1	697.2	2.28%	0.98%
2001	536.2	516.8	3.55%	2.72%	**2017**	767.7	712.1	3.32%	2.13%
2002	545.9	523.9	1.81%	1.37%	**2018**	793.6	730.2	3.36%	2.55%

Data source: Department of Labor, Bureau of Labor Statistics (BLS).

National CPI Projections									
	CBO	ERFC	GI - Short	GI - Long	SSA Int	WSIB		GI - Long	SSA Int
2019	2.20%	1.87%	1.99%	1.96%	2.50%	2.20%	**2035**	2.14%	2.60%
2020	2.40%	2.20%	2.14%	2.07%	2.60%	2.20%	**2036**	2.12%	2.60%
2021	2.60%	2.21%	2.34%	2.27%	2.60%	2.20%	**2037**	2.19%	2.60%
2022	2.50%	2.17%	2.43%	2.40%	2.60%	2.20%	**2038**	2.23%	2.60%
2023	2.50%	2.12%	2.40%	2.42%	2.60%	2.20%	**2039**	2.24%	2.60%
2024	2.40%		2.40%	2.42%	2.60%	2.20%	**2040**	2.23%	2.60%
2025	2.30%		2.35%	2.27%	2.60%	2.20%	**2041**	2.24%	2.60%
2026	2.30%		2.36%	2.22%	2.60%	2.20%	**2042**	2.26%	2.60%
2027	2.30%		2.35%	2.23%	2.60%	2.20%	**2043**	2.27%	2.60%
2028	2.30%		2.34%	2.27%	2.60%	2.20%	**2044**	2.25%	2.60%
2029	2.40%		2.30%	2.26%	2.60%	2.20%	**2045**	2.22%	2.60%
2030				2.22%	2.60%	2.20%	**2046**	2.23%	2.60%
2031				2.23%	2.60%	2.20%	**2047**	2.28%	2.60%
2032				2.23%	2.60%	2.20%	**2048**	2.30%	2.60%
2033				2.23%	2.60%	2.20%	**2049**	2.24%	2.60%
2034				2.21%	2.60%				

The National SSA intermediate forecast is produced using a different basket of goods from the CBO, ERFC, and GI national projections. The SSA uses Urban Wage Earners and Clerical Workers while the other forecasts use All Urban Consumers. However, we do not believe an adjustment is required given the minor differences in the averages over the last 25 years.

APPENDIX C – General Salary Growth Assumption

Methodology

We developed the general salary growth assumption using a building-block method with two components—total inflation and real wage growth (net of assumed service-based salary increases). In studies prior to the 2017 EES, we referred to real wage growth as "productivity". ASOP 27 defines inflation as "price changes over the whole of the economy," and real wage growth (productivity) is defined as "the rates of change in a group's compensation attributable to the change in real value of goods or services per unit of work." We observed annual wage growth, inflation, and real wage growth over various historical periods to estimate historical national and Washington State ranges and trends.

In setting the inflation and real wage growth assumptions, we considered the population and time period we apply the general salary growth assumption. We target these assumptions to be consistent with the duration of salaries for our open pension plans – approximately ten years. We used the duration of open plan salaries, as opposed to our closed plans, because the vast majority of the active employee population exists in these open plans. Please see **Appendix A - Retirement Plan Duration** for more information on this measure.

Analysis

We took the following steps to develop our best estimate recommendation:

1. **Reviewed total inflation.**

   We studied total inflation in depth and developed a best estimate of 2.75 percent for this assumption, which we also rely upon for the general salary growth assumption. The duration of the general salary growth assumption, approximately ten years, is on the shorter end of the duration range for the total inflation assumption, which focused on a 10- to 25-year period. While the components of total inflation—national inflation and the regional price differential—may be different in the short-term, we believe a total inflation assumption of 2.75 percent is still reasonable for this assumption. Please see the **Total Inflation** section of this report for details regarding the development of this assumption.

2. **Reviewed real wage growth across national, "state and local government," and Washington Retirement Systems.**

   To evaluate a range for the assumption and identify any trends, we first examined the SSA's and the BEA's national salary data across employees from all industries over the past 40 years (1978-2017). We also focused on BEA's state and local government wage growth and DRS (Washington State) wage growth for Plans 2/3 state employees. With these data, we estimated annual real wage growth by deducting observed annual CPI growth (annual observed inflation) from average wage growth corresponding to each data source. We relied

on relevant CPI depending on whether the data was national or local.

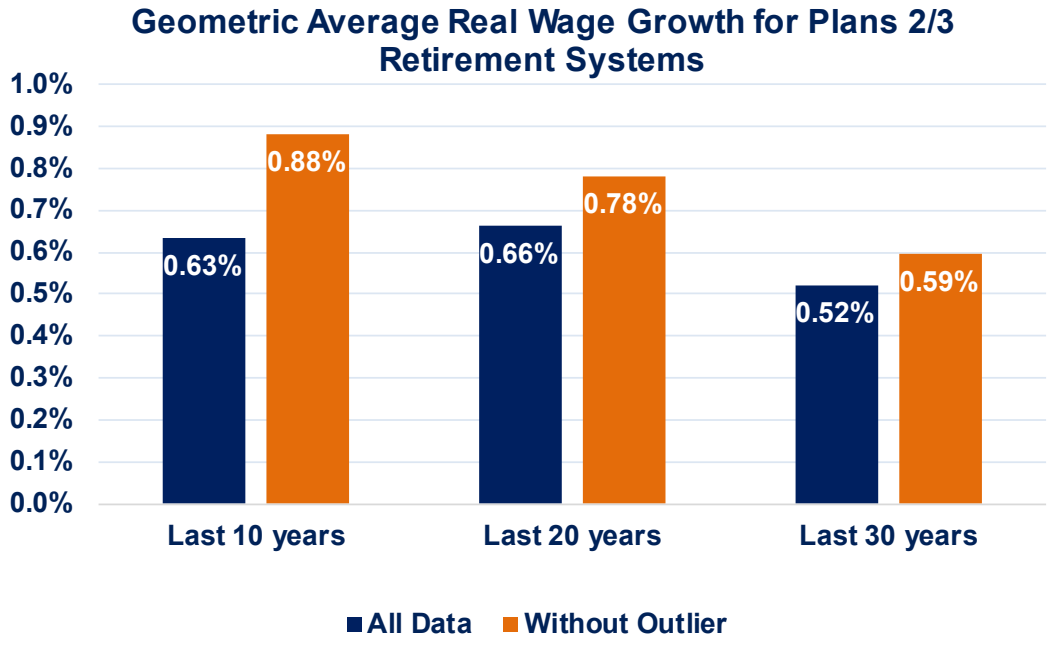
- National average wage data from SSA and BEA.
  - National inflation – U.S. city average Urban Wage Earners and Clerical Workers CPI (National CPI-W).
- Local average wage data from DRS.
  - Local inflation – STB CPI-W.

The measurements for national real wage growth were consistent between the SSA and the BEA. Looking back, the average real wage growth generally ranged between 0.50 percent and 1.00 percent across each data source. The ten-year historical period appears the most consistent across all data sources.

Real Wage Growth				
		National Measures		Washington State
Geometric Averages	SSA	BEA - All Industries	BEA - State and Local Government	DRS - State Employees
Last 10 years (2008-2017)	0.55%	0.64%	0.61%	0.63%
Last 20 years (1998-2017)	0.97%	1.03%	0.90%	0.66%
Last 30 years (1988-2017)	0.85%	0.82%	0.73%	0.52%
Last 40 years (1978-2017)*	0.68%	0.64%	0.65%	1.12%

**Last 37 years for DRS - WA State Employees (1981-2017).*

Results held relatively steady with historical data in DRS data for Plans 2/3. Note that if we exclude one of the two years following the Great Recession as an outlier because of its rarity as an economic event, historical real wage growth increases, especially over the last ten years. We see the following results in real wage growth with and without the removal of an outlier.



Based on this data, we believe 0.50 percent to 1.00 percent represents a reasonable range for this assumption. We note a decline in the real wage growth over the past 20 years at the national level. However, as noted above for the state retirement system data, this could be due to the impacts of the Great Recession. If so, we do not expect another similar recession over the next ten years.

3. Expectations for the future.

The last item we considered when studying real wage growth was our expectations for the future. We reviewed various national real wage growth forecasts and analyses to inform this expectation and considered it in the context of the duration of salaries for the open plans. Please note, the national forecasts include demographic sources of salary increases that we apply as a separate assumption in our valuation model.

While we define general salary growth as inflation plus real wage growth, national measures often view it differently. As an example, consider an early career teacher who receives a 9 percent salary increase over a given year. Based on the design of our assumptions, we would attribute 2.75 percent to assumed inflation, 5 percent to an assumed service-based salary increase, for example, and the remaining 1.03 percent to real wage growth.

The same example, under a national measure, would attribute 2.75 percent to inflation and the remaining 6.08 percent to real wage growth (or wage growth beyond inflation).

Both measures can be accurate, but provide different levels of information. For our state retirement systems, we consider the Service-Based Salary Increase to be the demographic component of total salary growth and assume lower real wage growth than national measures.

Due to the inclusion of these demographic sources of salary increases in the national forecasts, we do not rely on these forecasts to set an assumption. Rather, we compare forecasts from national sources to evaluate assumption consistency and whether the forecasts have significantly changed from our last study.

According to the CBO Budget and Economic Outlook: 2019 to 2029[2] report, wage growth is expected to increase along with inflation, followed by lower projected wage growth and inflation out to year 2029. The gap between the two measures—real wage growth—remains relatively stable over the period. Furthermore, we see steady projected growth in the non-farm business sector between the 2016 CBO report and the 2019 report.

We also considered analysis from the SSA. In the 2019 OASDI Trustees Report[3], the real wage differential (real wage growth) over a projected 10-year period begins near 2.2 percent and trends down to 1.4 percent. This pattern is similar to the 2016 OASDI Trustees Report.

[2] *"Budget and Economic Outlook: 2019 to 2029." Congressional Budget Office (CBO), January 28, 2019.*
[3] *"The 2019 OASDI Trustees Report." Social Security Administration (SSA), April 25, 2019.*

Projected 10-Year Real Wage Growth		
	2016	2019
CBO	1.10%-1.40%	1.10%
SSA	1.33% - 2.17%	1.41% - 2.19%

Note: National forecasts include demographic sources of salary increases that we apply as a separate assumption in our valuation model.

Additionally, we noted that the projected 75-year real wage differential as assumed in the 2019 OASDI Trustees Report rose by 0.01 percent from the 2016 report to 1.21 percent.[4] Moving forward, we expect future real wage growth (productivity) to remain relatively steady.

Lastly, we considered the future economic environment without explicit projections of wage growth or inflation. Specifically, we considered the extensive impact Artificial Intelligence (AI) and automation might have on the economy. We relied on analysis from experts in innovation and technology, which include MIT and the consulting firm McKinsey & Company. Analyses suggest that extreme productivity growth from AI, while expected, may not take effect quickly. Industries may take years to incorporate new technology and thus productivity gains will likely be a delayed result of current investment.[5] Furthermore, AI and automation may expand productive output, but have disparate impacts on various sectors of the economy and income levels. Some experts claim it may increase the wages for high and low earners but have a net decrease on wages for middle income earners.[6] For these reasons, we did not make an explicit adjustment for the impacts of AI and automation when selecting a best-estimate assumption.

4. Recommendation.

Historical data shows that real wage growth from all sources, including our state retirement systems, generally remains in a range of 0.5 percent to 1.0 percent. We also see averages across all data sources trending down slightly over the past 20 years, but that could be due to the impacts of the Great Recession.

In setting this assumption, we reviewed ten-year forecasts from outside experts to be consistent with the duration of salaries in our open plans. Forecasts provided by outside experts indicate that real wage growth remains steady as shown in subsection (3). We see expected increases in wage growth and inflation measures over the next few years followed by a decline. However, the gap between the two measures—the real wage growth—remains relatively steady and consistent with forecasts we reviewed during our last study.

Considering the historical information noted above along with our expectations for the future, we maintained the previous assumption for real wage growth of 0.75 percent.

[4] *"The 2019 OASDI Trustees Report." Social Security Administration (SSA), April 25, 2019.*

[5] *Relihan, Tom. "A calm before the AI productivity storm." Ideas Made to Matter, Productivity. Massachusetts Institute of Technology (MIT), January 2, 2019.*

[6] *"How will automation affect jobs, skills, and wages?" McKinsey Global Institute, March 2018.*

Thus, in setting our recommendation for general salary growth, we combine our best estimate for total inflation (2.75 percent) with our best estimate for real wage growth (0.75 percent) and arrive at a recommended general salary growth assumption of 3.50 percent.

APPENDIX D – Investment Rate Of Return Assumption

Methodology

The recommended rate of investment return assumption represents the anticipated returns on the Commingled Trust Fund's (CTF) current and future assets, net of expenses. We apply this assumption as a single rate to all plans invested in the CTF. We based the assumption on a 10- to 25-year projection period, consistent with the closed and open retirement plan durations. Please see **Appendix A - Retirement Plan Duration** for more information on this measure.

The rate of investment return assumption is coordinated with the WSIB's CMAs, which represents their expected asset performance, and the current asset allocation policy, or targets, for the CTF. Future changes to the CTF asset allocation policy or CMAs may require a new recommendation for the investment rate of return assumption.

We took into consideration the "building-block" method to develop this assumption. Under this method, the actuary determines the individual components for each economic assumption. Then the actuary may combine estimates for each applicable component to arrive at a best estimate for the given economic assumptions.

In setting this assumption, we considered past investment returns. However, we primarily relied on WSIB's expectation for future investment returns. We reviewed the simulated market returns from the current target asset allocation and CMAs provided by WSIB. Where appropriate, we adjusted the CMAs for consistency with our inflation assumption and for a time period consistent with the retirement system's liability duration. Lastly, we considered the sensitivity of the simulated returns to different CMAs and asset allocations.

Analysis

We took the following steps to develop our best estimate recommendation:

1. **Reviewed historical investment returns.**

   The following table summarizes the historical investment returns we observed over the given time periods. See the **Exhibits D** section for historical returns by year.

   We observed that the average investment return is sensitive to the time period. The ten-year average contains large returns as investment markets recovered from the Great Recession while not including the losses of 2008-09. The 20-year average contains returns starting near the beginning of the 2001-07 market cycle and continuing through the current cycle. A complete market cycle includes a bear market,

Historical WSIB Annual Average Returns	
Past 5 Years	7.85%
Past 10 Years	10.49%
Past 15 Years	8.30%
Past 20 Years	7.17%
Past 25 Years	8.94%
Past 30 Years	8.81%

Source: Washington State Investment Board. Returns restated for 1993 and beyond.

recovery, and bull market. Returns over periods beyond 20 years include experience from the strong markets of the 1990's that increase average returns in excess of the current assumed rate of return.

Historical investment returns are not considered a good predictor of future long-term experience. However, past returns may provide estimates for certain statistical components of asset classes such as volatilities and correlations. WSIB includes this history in their CMAs. Past investment returns are a product of the economic conditions of the time they occurred. As we analyze returns further in the past, the economic conditions that produced those returns are usually very different than today.

The following list details a few examples of how economic conditions have changed and the possible impacts on future returns:

- **Stock market returns may revert to historical averages.**
  When the economy is experiencing high growth, stock market valuations as measured by their Price to Earnings (P/E) Ratio tend to increase, meaning investors are willing to pay more for the same amount of earnings, all else held constant. Over the last 30 years, the Standard and Poor's (S&P) 500 P/E Ratio has increased significantly. However, the P/E Ratio for the S&P 500 may revert to lower historical levels. A decrease in the P/E Ratio will have a negative impact on prices, and therefore lower future stock market returns.

- **Increasing Government debt.**
  The amount of U.S. government debt has risen to historic levels. The use of debt (or "leverage") generally improves returns. However, paying down or stabilizing a large debt requires cutting from other programs or raising taxes, both of which hurt prospective economic growth. In the event of another economic downturn, a large amount of debt limits the government's ability to provide economic stimulus.

- **Inflation could be lower in the future.**
  With a low growth forecast and a low interest rate environment, inflation could be lower than what we have historically witnessed. Our analysis and recommendation for inflation in this study also suggests lower future inflation. As investment returns are comprised of real returns plus inflation, lower inflation will have a negative impact on investment returns.

Other examples that could impact future investment rates of return include technological advances, low productivity growth, and population demographic shifts. The list above is not exhaustive, but rather is meant to illustrate how conditions are different now compared to what has been true in the past and how those different conditions could produce lower future returns. However, future economic conditions are difficult to predict and markets may yield larger returns than in the past.

2. Reviewed Expectations for the Future - WSIB's CMAs and simulated future investment returns.

WSIB assigns three pieces of information to each asset class they invest in to form the CMAs:

- Expected annual return.
- Standard deviation of the annual return.
- Correlations between the annual returns of each asset class with every other asset class.

WSIB then uses the CMAs and their target asset allocation under an assumed distribution model to project (or simulate) future investment returns. The following tables display the expected annual return, standard deviation, and target asset allocation for this study and the prior study. Please see WSIB's 2019 White Paper for asset class correlations and modeling applications.

WSIB Target Asset Allocation			
	2019	2017	Difference
Global Equity	32%	37%	(5%)
Tangible Assets	7%	5%	2%
Fixed Income	20%	20%	0%
Private Equity	23%	23%	0%
Real Estate	18%	15%	3%
Cash	0%	0%	0%
Total	100%	100%	

WSIB Portfolio Statistics & Capital Market Assumptions						
	Expected 1-Year Return			Standard Deviation		
Asset Class	2019	2017	Difference	2019	2017	Difference
Global Equity	8.5%	8.5%	0.0%	18.5%	18.0%	0.5%
Tangible Assets	7.3%	7.1%	0.2%	13.0%	13.0%	0.0%
Fixed Income	4.4%	3.9%	0.5%	6.0%	5.5%	0.5%
Private Equity	11.5%	11.5%	0.0%	25.0%	25.0%	0.0%
Real Estate	8.0%	8.0%	0.0%	14.0%	14.0%	0.0%
Cash	2.6%	2.3%	0.3%	1.5%	1.0%	0.5%

Moving from the 2017 to the 2019 CMAs and asset allocation, we see a small increase in the CTF's one-year expected return and a decrease in the standard deviation (or volatility). Together, the change in expected return and volatility will create slightly larger and less dispersed projected returns. Please see the **Exhibits D** section for a comparison of the expected annual return, standard deviation, and target asset allocation for this study and the prior four experience studies.

WSIB provided our office with simulations under varying forecast periods. WSIB creates return simulations by randomizing annual returns using the CMA statistics and target asset allocation. They then calculate an average annual return for the simulation and repeat the process many times. WSIB provided us with the simulated annual investment returns at various percentiles for time horizons ranging from 1 year to 50 years.

The following table displays the annual return from the 25-year simulation for the current study. The 25-year simulation period is a close match to our open plan liability duration of 20-25 years. We compared these to the 30-year simulated returns from the 2017 study, which is the closest simulated timeframe between the two studies.

2017 and 2019 Simulated Future Investment Returns*			
	2019	2017	Difference
75th percentile	9.27%	8.96%	0.31%
60th percentile	8.06%	7.96%	0.10%
55th percentile	7.70%	7.67%	0.03%
Median Return	7.36%	7.36%	0.00%
45th percentile	6.99%	7.06%	(0.07%)
40th percentile	6.63%	6.76%	(0.13%)
25th percentile	5.43%	5.73%	(0.30%)

**Simulated returns over 25- and 30-years for 2019 and 2017, respectively. Returns were provided over different time periods.*

Comparing the results for the 2019 and 2017 studies, the median annual return did not change. We can interpret the median return as the return that splits half of all simulations above and half below that value. Put another way, there is a 50 percent chance returns will exceed the median return and a 50 percent chance they will fall below the median return. In addition to changes in the CMAs and asset allocation, WSIB provided simulations using a different statistical distribution. The 2017 annual returns follow a lognormal distribution while 2019 returns follow a log-stable distribution. We see the impact of this change primarily in the "left tail" or lower percentile returns (0-40th) where the log-stable distribution tends to produce lower returns. In consultation with WSIB staff, we will base our assumption on returns following the log-stable distribution.

The simulated future investment returns represent WSIB's best estimate of future returns for the CTF, but require a number of simplifying assumptions. The simulated returns are calculated assuming the target asset allocation and CMAs will remain constant throughout the projection period. We reviewed quarterly asset allocations since 2015 to understand how the actual allocation compares to the target. We observed certain asset classes exhibiting relatively consistent trends above or below targets, while staying within WSIB's acceptable range. If the variance between actual and target allocation continued or grew over the long-term, then the simulated return profile will look different than above. We estimate the 2019 median return could increase or decrease by five to ten basis points if recent trends persisted.

It is important to note that WSIB sets their CMAs for a 15-year time horizon. We apply the assumptions over a longer period, 20 to 25 years and beyond, for purposes of determining funding requirements consistent with current state funding policy. As noted in the **Recommendation** section, we apply adjustments using our professional judgment to arrive at assumptions consistent with a measurement period longer than 15 years.

3. Considered short-term vs. long-term simulated returns.

We studied simulated returns over time horizons similar to the duration of liabilities for each retirement plan. The Plans 1, closed to new hires in 1977, have a much shorter duration than the Plans 2/3, which remain open to new hires. The table below shows the aggregated average duration for Plans 1 and Plans 2/3.

Average Plan Duration*		
	Closed Plans 1	Open Plans 2/3
Years	8.9	20.9

**Duration based on OSA's 2017 Actuarial Valuation Report.*

We considered the difference in the percentiles of the 10- and 25-year simulated returns. When moving from a 10- to 25-year time horizon, we observed less volatile returns at the upper and lower percentiles due to the longer period. However, we saw only a small decrease in the median return, which is the measure we focus on when setting/recommending our assumption. Given this small difference in the median return, we believe a single assumption based on the 25-year simulations for all plans remains reasonable.

Simulated Investment Returns over 10 and 25 Years*			
	25 Years	10 Years	Difference
75th percentile	9.27%	10.40%	(1.13%)
60th percentile	8.06%	8.49%	(0.43%)
55th percentile	7.70%	7.93%	(0.23%)
Median Return	7.36%	7.38%	(0.02%)
45th percentile	6.99%	6.79%	0.20%
40th percentile	6.63%	6.26%	0.37%
25th percentile	5.43%	4.48%	0.95%

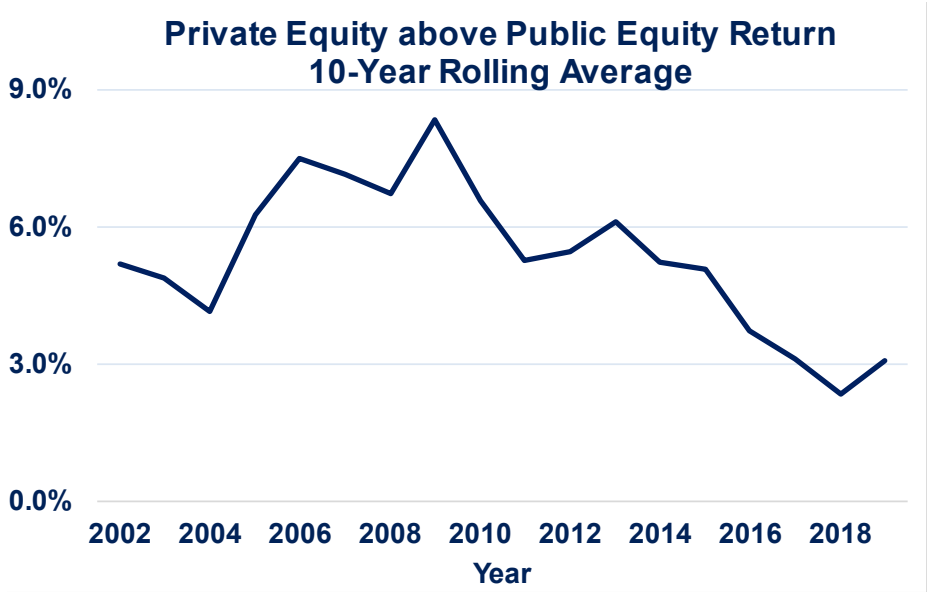
**Simulated returns from 2019 CMAs and asset allocation.*

4. Reviewed sensitivity of the simulated returns to the CMAs.

As with any assumption, we recognize that the CMAs may not match reality so we estimated how the median simulated return may change under a different set of CMAs. To do this, we modeled an increase or decrease in the expected one-year return of global equities and private equities by one percent. We chose these two asset classes because they comprise 55 percent of the target asset allocation and have the greatest amount of uncertainty around their return. The following table displays our estimate of the change in the median simulated return.

25-Year Estimated Median Return Sensitivity					
		Private Equity - Expected Return		Global Equity - Expected Return	
	Base	-1%	1%	-1%	1%
Median Return	7.36%	7.1%	7.6%	7.0%	7.7%

The WSIB private equity assumed return is based on a 300 basis point (3.00 percent) premium or increase above the global equity expected return. WSIB's White Paper recognizes a premium of 0 to 500 basis point as a reasonable range. WSIB sets their assumption for a 15-year period only. However, we set our assumption consistent with the retirement plan duration of 20- to 25-years. To better understand the long-term trend of the private equity premium, we compared the historical private over global equity return for the WSIB.



The graph above shows a downward trend in the private equity premium in more recent data. We believe this trend is a result of the maturing and evolving private equity market and, in our opinion, this trend will continue. As more investors have joined the market over the last 20 years, the competition and efficiency of private equity investments has increased, which drives down the resulting return. We believe a 300 basis point private equity premium is appropriate for a 15-year period. However, we believe a lower premium of 200-250 basis points is reasonable for a 25-year period when we assume the continuation of the historical trend.

5. **Recommendation.**
   To inform our assumption, we used our professional judgment to adjust WSIB's CMAs to account for our expectations for the future, consistency with our other economic assumptions, and the longer time horizon of our valuation.

- **Adjust Inflation Assumption** – to reflect the difference between WSIB's and our inflation assumptions. In the CMAs, WSIB assumes 15-year national inflation of 2.20 percent each year. In this study, we recommend a long-term (20- to 25-year) national inflation assumption of 2.35 percent. This means we expect the CTF to return about 15 basis points (0.15 percent) higher each year over a 20- to 25-year period compared with a 15-year period. We believe this adjustment is necessary to retain consistency between the entire set of economic assumptions.

- **Adjust Private Equity (PE) Premium Over Global Equity Assumption** – to reflect assumptions consistent with a longer time horizon. We believe WSIB's CMAs for PE are appropriate for a 15-year time horizon. However, we believe a PE premium of 250 (instead of 300) basis points is reasonable for our longer-term outlook. As this asset class continues to mature and evolve, we expect increased competition for PE investment opportunities and more efficient PE markets. The historical trend of PE over global equity performance has demonstrated a consistent downward trend, especially over the last decade. We estimate the simulated median return to decrease by about ten basis points with this assumption change. We shortened the length of our outlook from the last study based on a method change consistent with evolving actuarial practice. The shorter period means we can rely more on the CMAs and a smaller PE premium adjustment than our last study.

With these adjustments, we arrive at a recommended long-term rate of return of 7.4 percent. The adjustments to the simulated median return are as follows: 7.36 percent simulated median return + 0.15 percent (inflation adjustment) - 0.10 percent (PE premium adjustment) equals approximately 7.4 percent.

Exhibits D

Portfolio Statistics & Capital Market Assumptions					
Target Asset Allocation					
	2019	2017	2015	2013	2011
Global Equity	32%	37%	37%	37%	37%
Tangible Assets	7%	5%	5%	5%	5%
Fixed Income	20%	20%	20%	20%	20%
Private Equity	23%	23%	23%	25%	25%
Real Estate	18%	15%	15%	13%	13%
Cash	0%	0%	0%	0%	0%
Expected 1-Year Returns					
	2019	2017	2015	2013	2011
Global Equity	8.50%	8.50%	8.80%	8.75%	8.65%
Tangible Assets	7.30%	7.10%	6.60%	6.80%	6.50%
Fixed Income	4.40%	3.90%	3.90%	3.50%	4.25%
Private Equity	11.50%	11.50%	11.80%	11.75%	11.50%
Real Estate	8.00%	8.00%	8.00%	8.00%	8.00%
Cash	2.60%	2.30%	2.30%	2.50%	3.00%
Standard Deviation on 1-Year Returns					
	2019	2017	2015	2013	2011
Global Equity	18.50%	18.00%	18.85%	18.50%	17.62%
Tangible Assets	13.00%	13.00%	8.60%	7.30%	8.00%
Fixed Income	6.00%	5.50%	5.25%	5.75%	5.00%
Private Equity	25.00%	25.00%	25.00%	28.00%	27.00%
Real Estate	14.00%	14.00%	15.70%	15.50%	15.00%
Cash	1.50%	1.00%	2.00%	2.00%	2.00%

Historical Plan Performance	
Fiscal Year Ending June 30	Investment Return
1982	2.50%
1983	47.30%
1984	(0.03%)
1985	29.80%
1986	26.90%
1987	16.90%
1988	4.20%
1989	13.50%
1990	8.30%
1991	9.50%
1992	8.20%
1993	13.07%
1994	2.10%
1995	16.24%
1996	16.49%
1997	20.18%
1998	17.12%
1999	11.76%
2000	13.56%
2001	(6.75%)
2002	(5.15%)
2003	3.02%
2004	16.72%
2005	13.05%
2006	16.69%
2007	21.33%
2008	(1.24%)
2009	(22.84%)
2010	13.22%
2011	21.14%
2012	1.40%
2013	12.36%
2014	18.89%
2015	4.93%
2016	2.65%
2017	13.44%
2018	10.20%
2019	8.36%

APPENDIX E – Growth In System Membership Assumption

Methodology

We reviewed historical growth rates for PERS and TRS and considered expectations for the future. Concerning future expectations, we reviewed OFM's most recent state population forecasts and the potential expansion of teaching positions in TRS under the 2019-21 Budget.

Analysis

We took the following steps to develop our best estimate recommendation:

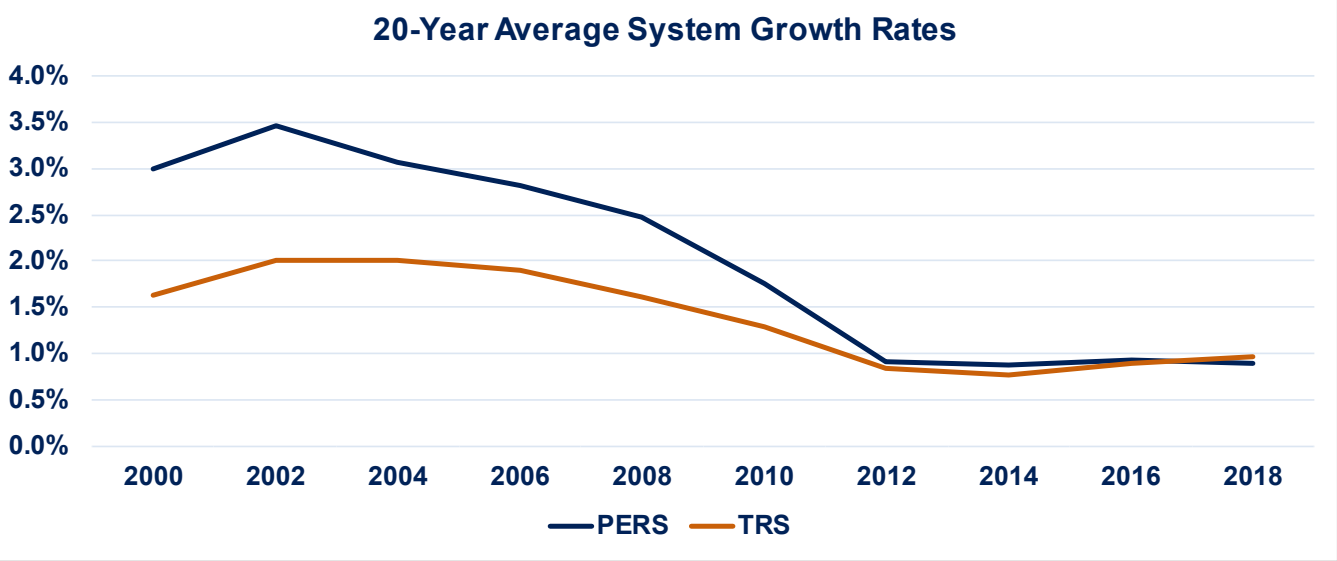
1. **Reviewed historical system growth rates for PERS and TRS.**

   The following table summarizes the historical growth rates we observed in PERS and TRS over the given time periods.

Historical System Growth		
	PERS	TRS
Past 5 Years	2.01%	2.62%
Past 10 Years	0.53%	1.21%
Past 15 Years	0.79%	0.85%
Past 20 Years	0.90%	0.97%

   Over the past 20 years, we observed average system growth of near 0.90 percent per year for PERS and near 0.97 percent per year for TRS. More recently, we observed lower growth rates following the Great Recession and higher growth rates since 2014. We believe the higher recent growth rates are due to (1) recovering levels of government employment following the Great Recession and (2) the addition of teachers due to increased state funding for basic education.

   We also noticed that these historical growth rates appear to converge in recent years. To illustrate, the following graph shows the rolling 20-year average historical growth rates for PERS and TRS.



2. Reviewed state population forecasts.

We reviewed the most recent projections from OFM for the Washington State population. We display those projections below for the next ten years consistent with the period of application for our system growth assumption.

Projected WA State Population Growth		
Year	**All Ages**	**Ages 5-17**
2019	1.51%	1.24%
2020	1.46%	1.46%
2021	1.35%	1.35%
2022	1.25%	1.00%
2023	1.18%	0.67%
2024	1.03%	0.51%
2025	1.00%	0.21%
2026	1.01%	0.16%
2027	1.00%	0.38%
2028	0.99%	0.44%
Geometric Average	**1.18%**	**0.74%**

As indicated in the table, OFM expects the overall state population to grow just under 1.18 percent each year on average for the next ten years and the school-age population to grow just over 0.74 percent each year on average over the next ten years. As a point of comparison, note that ten-year averages corresponding to the 2017 study were 1.20 percent and 0.91 percent indicating that while the overall state population is projected to grow at a similar pace, the school-age population projection has declined.

3. Expectations for the future.

Historically, PERS has grown at a lower annual rate than the state population and TRS has grown at a higher annual rate than the school-age population. Over the last 20 years, PERS experienced growth rates of about 0.90 percent and TRS of about 0.97 percent, while all-age

and school-age children populations grew by 1.35 percent and 0.61 percent, respectively through 2018.

Based on forecasts from OFM, if the retirement systems grow at the same rate as the state population, we would expect annual growth rates of about 1.18 percent and 0.74 percent for PERS and TRS, respectively, for the next ten years.

Since the Great Recession, growth rates recovered to pre-recession levels in PERS. In TRS, growth rates have increased greater than pre-recession levels due largely to increases in funding by the legislature. According to OFM, the 2019-21 Budget includes some funding for new teachers but most of the baseline funding has already been instituted in prior budget cycles. As a result, we expect TRS growth rates to return to more long-term levels over the next ten years.

4. Recommendation.

Historical data show 20-year growth rates at 0.90 percent and 0.97 percent for PERS and TRS, respectively, and a convergence of the growth rates in recent years. We also note that the all-age population growth forecast remained largely unchanged since our prior study, while the school-age population growth forecast declined significantly. Further, the 2019-21 Budget does not appear to suggest a large increase in funding for new teaching positions. While this budget does not provide a large increase similar to that of prior biennia, we may not have experienced the end of funding increases for new teachers or fully experienced the impacts of prior funding increases, and may see smaller increases in the future. As a result, we do not expect the high system growth rates experienced by TRS in the past four years to continue. We will continue to monitor this experience and may make further adjustments in this assumption as the experience materializes.

After considering historical data, OFM forecasts, and expectations for the future, we relied on our professional judgment to set both the PERS and TRS growth in system membership assumptions to 0.95 percent. This recommendation represents no change to the prior PERS assumption and a reduction from 1.25 to 0.95 percent in TRS.

2019 Report on Financial Condition and Economic Experience Study

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