2023 Economic Experience Study

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August 2023

As required under the Revised Code of Washington (RCW) 41.45.030, our office (the Office of the State Actuary [OSA]) performed a study on the financial condition and long-term economic experience for the Washington State retirement plans administered by the Department of Retirement Systems (DRS). This report documents the results of our study of the long-term economic assumptions (referred to as the Economic Experience Study [EES]).

We provided a summary of the report on financial condition to the Pension Funding Council (PFC) via email in August 2023. We will present our supporting analysis to the PFC in the fall of 2023, and we will post this presentation to our website (leg.wa.gov/osa) when available.

This EES involves comparing actual economic experience with the assumption made and considering future expectations for these assumptions. Pursuant to statute, the study also includes a set of recommendations for these assumptions, made by the state actuary. The primary purpose of this study is to assist the PFC in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035. This study may not be appropriate for other purposes. Please replace this publication with our next EES when available.

We encourage you to submit any questions you might have concerning this EES to our mailing address or our e-mail address at state.actuary@leg.wa.gov. We also invite you to visit our website (leg.wa.gov/osa) for further information regarding the actuarial funding of the DRS plans.

Sincerely,

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SECTION ONE:
Summary

Executive Summary

Pursuant to RCW 41.45.030 (2), the PFC may adopt changes to the long-term economic assumptions every two years by October 31. Any assumptions adopted by October 31, 2023, will impact contribution rates set for the 2025-27 Biennium. Please note that any changes adopted by the PFC are subject to revision by the Legislature.

Guided by applicable Actuarial Standards of Practice, OSA performed this 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.

The following table summarizes the state actuary's recommendations for the long-term economic assumptions. These recommendations are unchanged from the prior EES and are consistent with the assumptions currently set in statute.

Summary of Economic Assumption Recommendations	
Inflation	2.75%
General Salary Growth	3.25%
Investment Rate of Return	7.00%
Membership Growth for Plan 1 Funding*	1.00%

Applies to the amortization of PERS 1 and TRS 1 UAAL.

For context, we summarized the economic assumptions amongst our "peer" retirement systems as well as the historically prescribed economic assumptions for the Washington State retirement systems. Please see **Appendices E and F** for additional details.

General Approach to Setting Economic Assumptions

Actuarial Standard of Practice No. 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;

❖ Select a reasonable assumption; and

❖ Review the set of economic assumptions for consistency and make appropriate adjustments if necessary.

This process reflects the general approach we took to studying the economic assumptions. Below are some of the key factors we considered as part of this process:

❖ **Time Horizon** – We considered the time horizon of the liabilities or salaries to which these assumptions apply. We did this by examining the actuarial duration of the relevant measurement as described in **Appendix D**. As a result of this analysis, we generally focused our assumptions on longer-term time horizons.

❖ **Relevance of the Data** – When evaluating relevant data, we considered whether historical experience may be an indicator of future trends. We also considered forecasts and applicable external resources. We used our judgment to select assumptions based on our expectations for the future that reflected an appropriate level of precision.

❖ **Short-Term Volatility** – For purposes of this study, we recommend long-term economic assumptions that reflect average annual expectations over the applicable time horizon. We note our past practice of adjusting certain assumptions as part of our annual actuarial valuation report, which allows us to reflect short-term expectations that differ from the prescribed long-term assumptions when warranted. Ultimately, plan costs will be determined by actual experience.

❖ **Consistency** – We developed the recommended economic assumptions as a collective set, and we recommend considering them as such. Assumptions that are adopted individually may result in an inconsistent assumption set.

Experience Study and Recommended Assumptions

Below is a high-level summary for each assumption we studied. These summaries address the following topics:

❖ 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 recommendation.

For additional details on the development of these recommendations, please see the **Appendices**. Note that there is no corresponding Appendix for the Membership Growth for Plan 1 Funding assumption.

Inflation

What Is the Inflation Assumption and How Do We Use It?

The Inflation assumption represents the annual expected increase in the general price of goods in the Seattle-Tacoma-Bellevue (STB) region. We use this assumption to inform our expectations for future post-retirement Cost-of-Living Adjustments (COLAs) that members of certain DRS plans are eligible to receive. We also use the Inflation assumption as a component for other assumptions, such as General Salary Growth.

High-Level Takeaways

We expect national inflation to remain elevated in the short-term but trend closer to 2.3 percent to 2.5 percent in the long-term. Our expectation for this trend is in part due to actions by the Federal Reserve, aimed at bringing down national inflation levels. Our expectations are similar to those of the external forecasts we reviewed for this study.

Based on historical data and our expectations for the future, we expect future inflation in the STB region will continue to outpace that of the national average, by an annual average margin of 0.2 percent to 0.5 percent, over the expected time horizon we apply this assumption.

With these considerations in mind, and using our professional judgment, we determined the current Inflation assumption of 2.75 percent remains reasonable.

Data and Assumptions

We relied on historical inflation data from the Bureau of Labor Statistics (BLS) and on historical funds and treasury rates from the Federal Reserve. We also analyzed inflation forecasts from several sources including, but not limited to, the Congressional Budget Office (CBO), the Social Security Administration (SSA), the Economic and Revenue Forecast Council (ERFC), and the Washington State Investment Board (WSIB).

General Methodology

We developed our assumption by identifying and analyzing the components of inflation, namely national inflation, and a regional adjustment for the difference between inflation in the STB region and national inflation. For each of these components, we considered historical data, current events, external inflation forecasts, and our expectations for the future. We then considered the relationship between the identified inflation components and applied our professional judgment to determine our Inflation recommendation. Please see **Appendix A** for the supporting analysis and additional details surrounding this assumption.

Recommendation

We recommend no change to the current Inflation assumption of 2.75 percent for all plans.

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 benefits and calculating contribution rates for the retirement plans.

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, which we study as part of our Washington State public retirement systems' *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). **This analysis focuses on salary growth related to economic factors**.

High-Level Takeaways

The salary growth of the retirement systems can be volatile on a year-to-year basis, in part, due to inflation. In particular, the General Salary Growth assumption can be influenced by economic or business cycles and more localized forces (such as employee recruitment and retention policies, budgetary priorities, and collective bargaining agreements).

In studying this assumption, we reviewed historical data and how national forecasts have changed since the last study. Over the last 15 years, average annual salary growth ranged from 1 percent to 7 percent. On average, we observed salary trending in general with the overall economy, such as a decline in salary growth and recovery following the Great Recession. National forecasts, with a focus on real wage growth, had minimal changes since the prior study and differed on whether real wage growth would be higher or lower than previously forecasted.

We also considered the application of this assumption and the time horizon over which it will be applied. With these considerations in mind, and using our professional judgment, we determined the current General Salary Growth assumption of 3.25 percent remains reasonable.

Data and Assumptions

In developing this assumption, we relied on historical data or forecasts from the following sources: DRS, BLS, SSA, the Bureau of Economic Analysis (BEA), and CBO to help inform our recommendation.

General Methodology

We developed our General Salary Growth assumption by identifying and studying two components: (1) inflation and (2) real wage growth. These components were reviewed both combined and independent of each other. We analyzed inflation and formed a recommendation for this assumption in the **Inflation** section of this study.

We reviewed average annual salary growth over various historical periods. The methodology for studying general salary growth is designed to isolate salary increases due to economic factors. Service-based salary increases are studied and determined during demographic experience studies.

We evaluate historical real wage growth as the calculated annual salary growth less inflation measured using the Consumer Price Index (CPI). In addition to historical growth, we reviewed expectations for future real wage growth over the next ten years consistent with the duration of future salaries for active members in the DRS pension plans.

To finalize the recommended assumptions, we relied on our professional judgment. Please see **Appendix B** for the supporting analysis and additional details surrounding this assumption.

Recommendation

We recommend no change to the current General Salary Growth assumption of 3.25 percent for all plans.

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 help pay pension benefits. Consistent with current state funding policy, we also use the assumption to determine the present value of future benefit payments and salaries for members of the retirement systems. We then compute contribution rates using current assets, the present value of future benefit payments, and the present value of future salaries.

High-Level Takeaways

We observed an increase in WSIB's simulated returns for the Retirement Commingled Trust Fund (CTF) since our last EES (August 2021). This increase was primarily due to WSIB's updated target asset allocation (October 2021), which occurred shortly after the publication of our 2021 EES. A change to WSIB's Capital Market Assumptions (CMAs) in 2023 also impacted simulated returns. Overall, WSIB's median simulated 15-year annul return for the CTF increased from 6.9 percent to 7.0 percent since our last study.

We recognize that the CMAs will not perfectly match actual future investment experience, so we performed sensitivity analysis around the expected returns for certain asset classes. We estimate that a 1 percent decrease/increase in assumed annual returns for the Global or Private Equity asset classes would decrease/increase the median simulated 15-year annual return for the CTF in the range of 0.2 percent to 0.3 percent. Applied to the most recent simulations, we estimate this outcome would decrease the 15-year median return to 6.7 percent or increase the median return to 7.3 percent.

Simulated CTF returns developed for asset allocation purposes are helpful when studying this assumption but require careful consideration before recommending an assumption for pension funding. When assumptions are prepared by different professionals and for different purposes

and time horizons, they may require adjustments to remain reasonable for pension funding purposes and to remain consistent with other assumptions used for pension funding. After taking these considerations into account and applying our expectations for the future, we found that OSA adjustments to WSIB simulated CTF returns were generally offsetting or unnecessary at this time. We therefore determined the current Investment Rate of Return assumption of 7.0 percent remains reasonable.

We also considered, but do not recommend at this time, separate Investment Rate of Return assumptions for the open and closed plans.

Data and Assumptions

In developing this assumption, we consulted with and relied on investment data provided by WSIB.

General Methodology

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 asset allocations, and simulated investment returns. We also examined how our application of this information may differ from that of WSIB and the impact that would have on our assumption-setting. Please see **Appendix C** for the supporting analysis and additional details surrounding this assumption.

Recommendation

We recommend no change to the current Investment Rate of Return assumption of 7.0 percent for all plans.

Membership Growth for Plan 1 Funding

What Is the Membership Growth for Plan 1 Funding Assumption and How Do We Use It?

The Membership Growth for Plan 1 Funding assumption is used to project growth in the Public Employees' Retirement System (PERS) and the Teachers' Retirement System (TRS)[1] in order to estimate ten years of future payroll. The payroll estimate is used to calculate PERS and TRS Plan 1 "base" Unfunded Actuarial Accrued Liability (UAAL)[2] and benefit improvements contribution rates as a percentage of system salary under current funding policy.

We do not expect this assumption to impact future base UAAL contribution rates given recent changes to Plan 1 funding policy that were enacted in the 2023 Legislative Session. Engrossed Substitute Senate Bill (ESSB) 5294 (Chapter 396, Laws of 2023) prescribes the base UAAL contribution rates for the 2023-25 and 2025-27 Biennia and sets statutory minimum rates starting in the 2027-29 Biennium. The statutory minimum rates are used in the event of a positive UAAL and remain independent of the Membership Growth assumption. As displayed on page 5 in our fiscal note for ESSB 5294, those minimum rates are expected to exceed and remain above the calculated rate from the ten-year amortization that relies on the Membership Growth assumption. When these minimum rates are in effect, this Membership Growth assumption is not expected to impact the calculated base UAAL contribution rate.

This assumption could impact the additional contribution rates charged for a future Plan 1 benefit improvement. Any existing benefit improvement contribution rates are fixed for the ten-year period applicable to each benefit improvement.

This assumption is separate from our open plans' System Growth assumption. That assumption, which we do not use to determine contribution requirements under an Actuarial Valuation Report (AVR), was last updated during the *2022 Projection and Risk Assumptions Study* and estimates growth of the individual retirement plans over a period of time exceeding ten years.

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[1] *Employers of PERS, the School Employees' Retirement Systems (SERS), and the Public Safety Employees' Retirement System (PSERS) members pay contributions towards the PERS 1 UAAL. We use the term "PERS" in reference to the combined membership growth of PERS, SERS, and PSERS. The Teachers' Retirement System Plan 1 UAAL is funded by TRS employers.*

[2] *"Base" UAAL contribution rates exclude the unfunded cost of any Plan 1 benefit improvements. Contribution rates for Plan 1 benefit improvements are collected in addition to the base UAAL contribution rates.*

Analysis and Recommendation

As noted above, we do not expect this assumption to impact future base UAAL contribution rates given recent changes to Plan 1 funding policy. However, a base UAAL contribution rate exceeding the 50 basis point minimum rate in the 2027-29 Biennium, or later, could emerge under adverse plan experience. To understand the potential impact of membership growth experience, we reviewed the sensitivity of the base UAAL contribution rates from the 2021 AVR to a range of Membership Growth assumptions.

When changing the current assumption by 25 basis points (from 1.00 percent to 0.75 percent or 1.25 percent), we observed a UAAL contribution rate change of two and three basis points in PERS and TRS, respectively. For purposes of this sensitivity analysis, we ignored the recent changes to the Plan 1 funding policy. In addition, we expect future UAAL amounts to be less than the 2021 AVR and therefore result in even smaller UAAL contribution rate changes from different membership growth assumptions.

We expect any contribution rate for future benefit improvements will be smaller than the 2021 AVR UAAL contribution rate and thus the impact of changing this assumption will be less than the sensitivity described above.

After considering the expected impact of current law funding policy (that this assumption is not expected to impact future base UAAL contribution rates) and the above sensitivity analysis, we did not study this assumption further and recommend no change to the current assumption of 1.00 percent for both PERS and TRS.

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Actuarial Certification Letter
Economic Experience Study

August 2023

This communication documents the results of an Economic Experience Study (EES) of the retirement plans defined under Chapters 41.26, 41.32, 41.35, 41.37, 41.40, and 43.43 of the Revised Code of Washington (RCW). The primary purpose of this study 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. This study may not be appropriate for other purposes. Please replace this publication with our next EES when available.

We relied on participant data from our Actuarial Valuation Reports (AVRs) previously provided by the Department of Retirement Systems (DRS). We checked the data for reasonableness as appropriate based on the purpose of this experience study, but we did not audit the data. We relied on all data as complete and accurate. In our opinion, this data is substantially complete for purposes of this experience study.

We relied on target asset allocations, Capital Market Assumptions (CMAs), and return simulations from the Washington State Investment Board (WSIB) to help formulate expectations for future rates of annual investment return. We reviewed the information provided by WSIB for reasonableness and engaged with them about their methods and sensitivities of their model, as appropriate based on the purpose of this experience study.
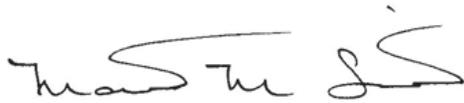
Unless noted otherwise, this EES reflects the most recently available plan provisions and participant data. As part of our analysis, we also examined the most recently available historical and forecasted economic data, as of the time of our analysis (early 2023), from a variety of experts in the field. For more information on this data, please see the assumption **Appendices**.

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 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 study is intended to be complete, we are available to offer extra advice and explanation as needed.

Sincerely,

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State Actuary

Kyle Stineman, ASA, MAAA
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SECTION TWO:
APPENDICES

2023 ECONOMIC EXPERIENCE STUDY

APPENDIX A
INFLATION ASSUMPTION

Methodology

We developed the Inflation assumption by identifying and analyzing two components of inflation – (1) national inflation and (2) a "regional adjustment" (i.e., the difference in inflation between the STB region and the national average).

As part of our analysis, we examined historical inflation data, Federal Reserve monetary policy, Treasury Inflation Protected Securities (TIPS) data, and inflation forecasts from external experts in the field. We analyzed each component with an 8-year horizon in mind for the closed plans and a 20-year horizon in mind for the open plans, consistent with the average liability plan durations found in **Appendix D**.

We then considered the relationship between the two components and combined this information with our expectations for the future and our professional judgment to arrive at a recommendation for the Inflation assumption.

National Inflation Component

Historical Data

We began our analysis of the national inflation component by considering historical data. Specifically, we examined CPI data provided by the BLS. The CPI measures the change in price of a fixed basket of goods over time. This data is available for specific regions of the country and for various populations. For our national inflation analysis, we focused on the U.S. City average CPI for Urban Wage Earners and Clerical Workers (CPI-W) since the CPI-W serves as the index for calculating DRS plan COLAs.

The tables below summarize the geometric average inflation, based on the CPI-W, over various time periods. For comparison purposes, we also provide this data as of our last EES, which was conducted in 2021. For readers interested in the annual historical fiscal year CPI-W data, please see our Inflation Data webpage.

National CPI-W Geometric Averages		
	2023 EES*	2021 EES**
Last 25 years	2.44%	2.11%
Last 20 years	2.50%	2.03%
Last 15 years	2.37%	1.87%
Last 10 years	2.44%	1.66%
Last 5 years	3.79%	1.70%

*Data extends through 2022.
**Data extends through 2020.

As of this 2023 study, we observed geometric average annual inflation in the range of 2.3 percent to 2.5 percent over the past 10, 15, 20, and 25 years. This represents a marked increase from the averages we observed in the 2021 study, and it illustrates the degree to which the elevated inflation in 2021 (5.26 percent) and 2022 (8.46 percent) impacted these averages. For reference, 2022 experienced the highest inflation of the last 40 years.

It should be noted though that average historical inflation levels by themselves are not strong predictors of future inflation. That is, we can't simply expect average inflation over the next 25 years to mirror inflation over the past 25 years. However, we can identify historical trends, apply our knowledge of the economic climates and government actions in place at the time, and use this information to gain insight into how inflation may react under similar conditions in the future. One such factor is the role that the Federal Reserve plays in managing inflation.

Federal Reserve Actions

The Federal Reserve attempts to manage inflation through the Federal Funds Rate (FFR), which represents the rate at which banks can borrow money. By adjusting this rate, the Federal Reserve can increase or decrease the amount of money in the economy, which in turn, can impact the level of inflation.

As of January 2012, the Federal Reserve adopted a "medium-term" inflation target of 2 percent per year, and up until the COVID-19 pandemic, inflation had generally been hovering around this target. However, the pandemic contributed to an economic period of great market uncertainty with global supply chain issues, robust government intervention, and high inflation. In response to this, the Federal Reserve reiterated their commitment to a medium-term 2 percent inflation target and steadily increased the FFR from near zero percent in early 2022 to 5.25 percent as of May 2023 in an attempt to curb high inflation, per the monthly Federal Open Market Committee statements.

Given these actions by the Federal Reserve, we examined historical data to get a sense for how effective adjustments to the FFR have previously been in managing national inflation. The following graph compares the FFR and national inflation over the past 40 years, through June 2023.[3]

This graph suggests a strong relationship between the FFR and national inflation. We observe periods of high inflation being followed by increases in the FFR which help decrease inflation.

As an example of inflation control in practice, the 1990s featured a strong economy which typically leads to higher levels of inflation. We observed an increase in the FFR during that decade which helped maintain inflation around the 3 percent level.

Most recently, we've seen the recovery from the COVID-19 pandemic bring with it the highest levels of national inflation experienced since the 1980's. To address this, the Federal Reserve

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[3]*Inflation in the preceding table is measured based on CPI-W. However, the Federal Reserve tends to rely more heavily on the Personal Consumption Expenditures (PCE) index prepared by the BEA. The PCE index is a more business-focused metric that excludes inflation associated with food and energy. It generally yields inflation values that are lower, but of a similar shape, as those produced by the CPI-W. For example, over the past 15 to 25 years, the annual geometric average inflation using PCE has been approximately 0.20 percent to 0.40 percent lower than that produced using the CPI-W.*

Federal Funds Rate vs. National Inflation
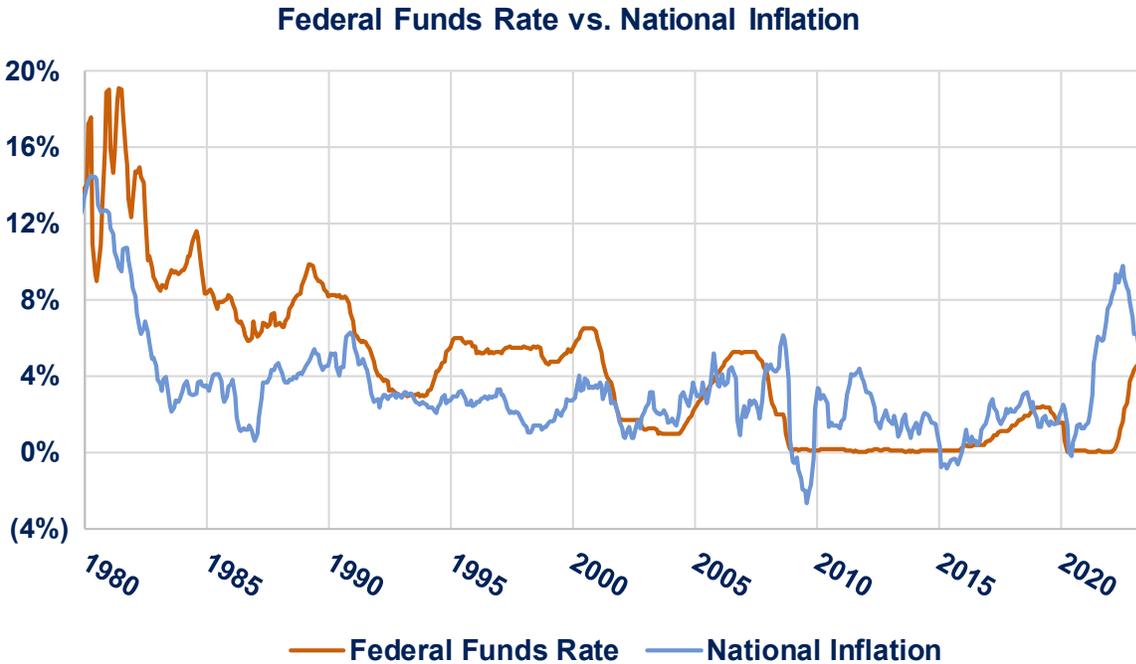
once again raised the FFR. As of the time of this experience study, these actions appear to have contributed to a decrease in the rate of inflation, as the relationship between FFR and inflation suggested it would. However, it should be noted that this decline in inflation is based on less than a year of data. We expect inflation will continue to decrease in the near-term, but the speed with which inflation will return to the Federal Reserve's 2 percent target level remains to be seen. To gain more insight into this, we examined inflation projections.

Breakeven Inflation (TIPS) and Forward Rates

TIPS are Treasury-issued bonds that are intended to mute the influence of inflation on the bond's maturity value by allowing the maturity value to fluctuate with changes in the CPI. As such, TIPS can be used to approximate annual inflation by subtracting 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 rate", which is the level of inflation that causes the TIPS and nominal bonds to yield the same value. The following table compares these breakeven rates over a 10- and 30-year time horizon.

TIPS Breakeven Inflation Rate*		
Year	10-Year Rate	30-Year Rate
2020	1.49%	1.66%
2021	2.36%	2.25%
2022	2.52%	2.35%

Note: Totals may not agree due to rounding.
**Difference between nominal and TIPS bonds with the
  same maturity.*

The TIPS breakeven inflation rates increased significantly from 2020 to 2022, over both a 10- and 30-year time horizon, which corresponds to the high inflation experienced during this period. This data also suggests a difference of roughly 0.1 percent to 0.2 percent between 10- and 30-year average annual inflation projections, with short-term inflation expectations being higher than longer-term expectations beginning in 2021.

However, it should be noted that there are questions surrounding the accuracy of using a TIPS breakeven inflation rate to gauge future inflation. As noted by WSIB in their 2023 Capital Market Assumptions (CMAs) White Paper, the market mechanism that determines breakeven inflation can skew under dire economic scenarios in which investors prefer the safety of Treasuries over the illiquidity of TIPS. The TIPS breakeven rate can also experience large fluctuations due to the small size of the TIPS market relative to the bond market. Because of these limitations, we did not rely heavily on TIPS breakeven inflation rates in our assumption-setting, but we did consider them as an additional data point.

We also examined "5-year, 5-year forward" inflation rates, which conveys inflation expectations over a five-year time horizon, beginning five years from now (i.e., average annual inflation six through ten years from now). This measure gives us another perspective on inflation by removing the noise associated with the immediate economic conditions. This measure increased from approximately 1.7 percent in 2020 to approximately 2.3 percent in 2022.

Inflation Forecasts

We then considered national inflation forecasts from experts in the field. We examined forecasts that were both short-term (i.e., five to ten years) and long-term (i.e., 15 to 20 years) in nature. The sources we used were the CBO[4] , the SSA[5] , the ERFC[6] , IHS Markit[7] , and the Federal Reserve Bank of Cleveland[8]. The following graph summarizes these inflation forecasts, with our key takeaways summarized below the graph. Please note that we gathered the most recently available forecasts as of the time of our analysis (early 2023).

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[4]*CBO, "The Budget and Economic Outlook: 2023 to 2033," as of February 2023.*
[5]*SSA, "The 2022 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds (OASDI)," as of June 2022.*
[6]*ERFC, "Washington State Economic and Revenue Forecast," as of March 2023.*
[7]*IHS Markit, CPI Forecast, as of June 2023.*
[8]*Federal Reserve Bank of Cleveland, "Inflation Expectations," as of March 2023.*

National Inflation Forecasts

Legend:
- CBO
- ERFC
- SSA (Intermediate)
- Cleveland Federal Reserve
- IHS Markit
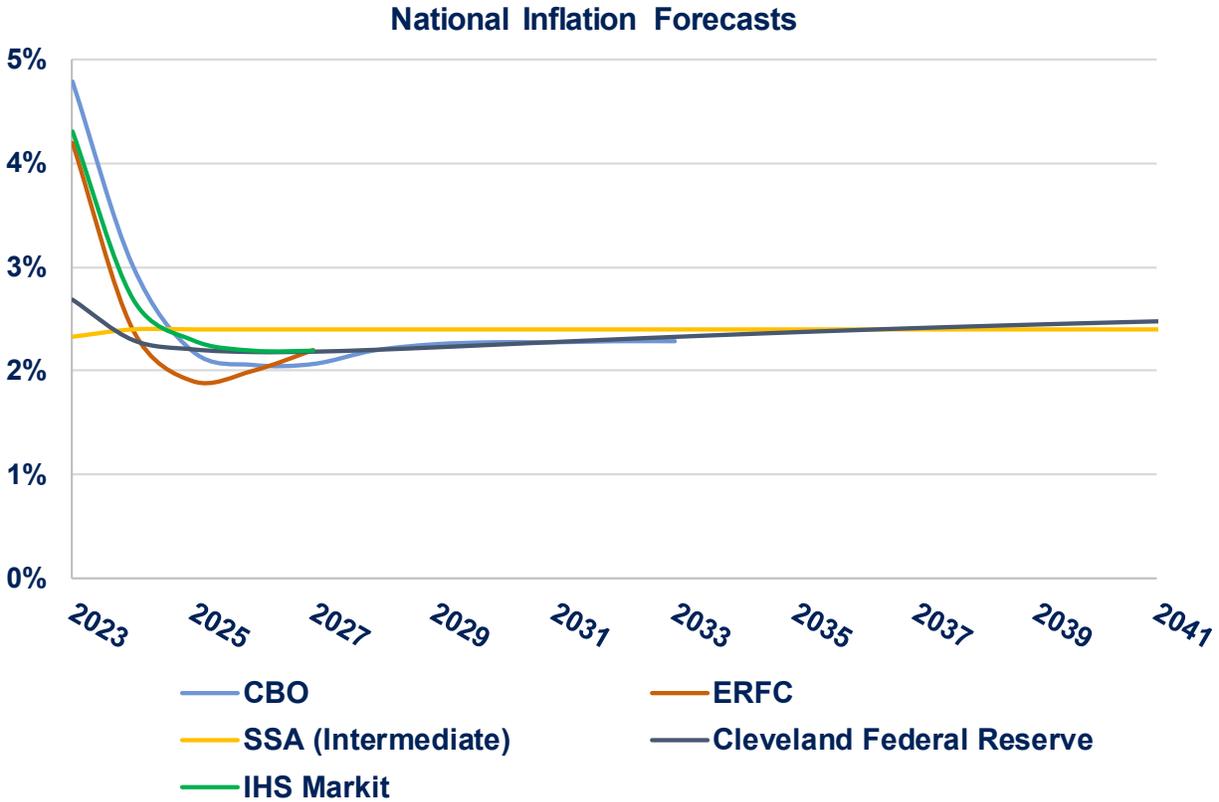
❖ Many of the forecasts expect inflation to remain elevated in the immediate future but to decline quickly in the next few years. The average annual inflation of these forecasts is roughly 2.5 percent over the next five years and roughly 2.4 percent over the next 10 to 20 years. The ultimate inflation rate for all forecasts range between 2.2 percent and 2.5 percent.

❖ Compared to their forecasts from two years ago, many of the experts significantly increased their inflation projections for 2023 and 2024. However, looking out further, we mostly noticed only small changes to the experts' longer-term inflation forecasts.

❖ We also considered inflation expectations from WSIB. Per their 2023 CMAs White Paper, WSIB increased their 15-year annual average inflation assumption from 2.2 percent to 2.5 percent since our 2021 EES.

❖ Not all forecasters measure inflation using the same index. For example, the SSA uses CPI-W, while the CBO uses CPI-U (which is for All Urban Consumers). Each index measures inflation differently. However, in our opinion, it is acceptable to consider these various forecasts together, given the purpose for which we are using this data (i.e., to get a sense for future inflation).

❖ We were also mindful of the delay periods that exist when studying these forecasts. These forecasts were compiled between mid-2022 and early 2023, and since that time, we have experienced a decline in inflation. For example, annual national inflation decreased to 3 percent as of June 2023, per The Associated Press.

The historical data, Federal Reserve actions, and forecasts summarized above are all consideration items in our recommendation of an Inflation assumption. However, this analysis has been focused on national inflation – the first of two components of our Inflation assumption. We must also account for STB regional adjustments for inflation – the second component of our Inflation assumption.

Regional Adjustment Component

Historical Data

Similar to our approach for national inflation, we began our analysis of the regional adjustment component by looking at historical data. Specifically, we were interested in the annual difference between STB regional inflation and the U.S. City average inflation, as measured by the CPI-W.

The following graphs summarize this CPI-W data over the past 40 years. Based on this data, over the past 10, 20, and 25 years, we observed annual regional inflation outpacing national inflation by an average of 0.60 percent, 0.26 percent, and 0.36 percent, respectively. For readers interested in seeing the underlying annual inflation data, please see our Inflation Data webpage.

National vs. STB Regional Inflation

STB Less National Inflation
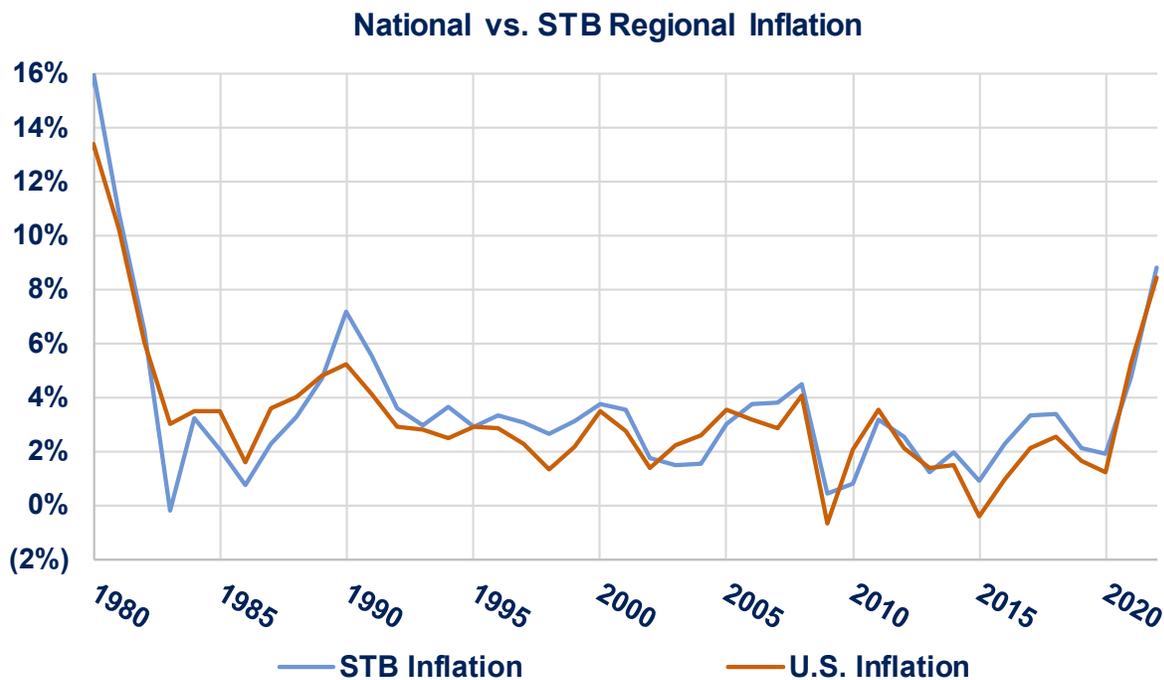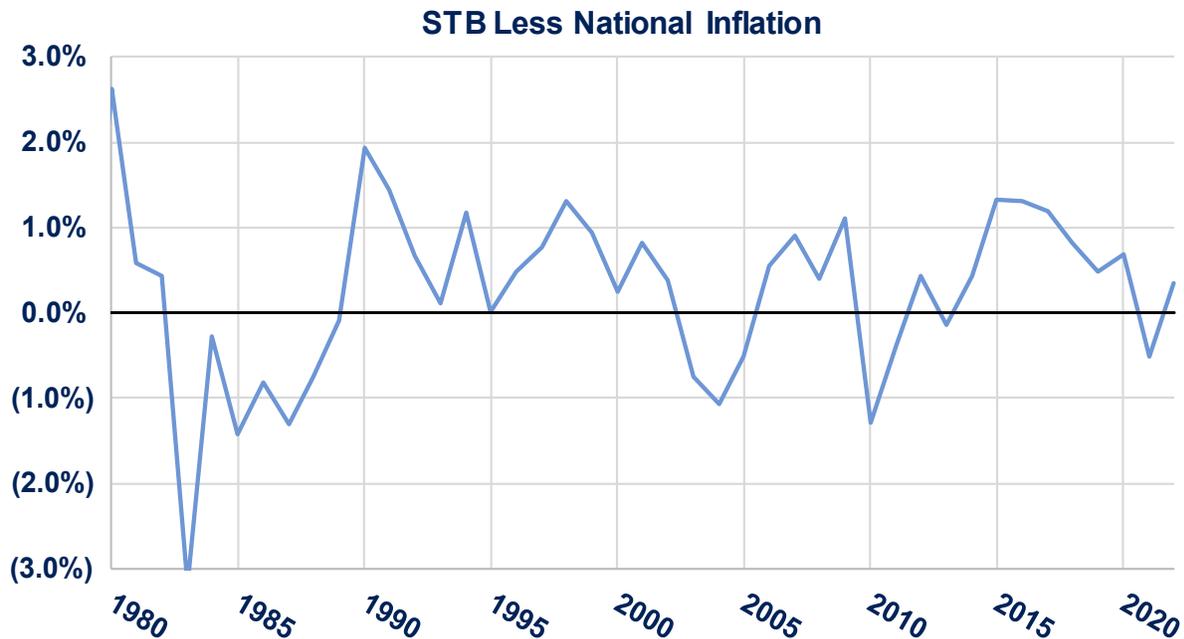
Just as we noted for our analysis of national inflation, historical regional inflation levels are products of their economic climates and by themselves are not strong predictors of future inflation. However, in our opinion, the relationship between national and regional inflation serves as a useful data point since much of the volatility and uncertainty in regional inflation can be explained by national inflation.

We observe higher inflation in the STB region because the local economy grows differently than the overall national economy. The STB region features some of the world's largest companies (e.g., Boeing, Microsoft, and Amazon) and has historically experienced considerable residential growth, which has contributed toward price inflation in Washington State.

Diving into these regional differences further, we looked at the individual categories that make up the overall CPI-W data to get a sense for each category's weight and inflation, as well as how these metrics compare on a national versus regional basis. What we found was that over the last 20 years, one of the primary categories where regional inflation has outpaced national inflation was housing, and this category is also assigned the greatest weight in the CPI-W calculation (over 40 percent). The table below compares the change in CPI-W due to housing on both a national and regional level.

Change in CPI-W from Housing			
Year	National Change (A)	Regional Change (B)	(B) - (A)
2000-18 Average	2.48%	3.25%	0.77%
2019	2.86%	3.56%	0.71%
2020	2.32%	3.91%	1.59%
2021	3.28%	2.41%	(0.87%)
2022	7.37%	7.42%	0.05%

Note: Totals may not agree due to rounding.

Looking at the data from this perspective, we see that the difference between housing inflation in the STB region versus the national average was smaller in 2021 and 2022 relative to the historical averages. This could be due to several factors that emerged over the past few years, such as the increased prevalence of remote working which could result in people moving out of (or not moving into) the STB area. However, the extent to which these factors will play a role in the future is uncertain.

We also looked at the categories that account for the next greatest weight in the CPI-W calculation — transportation (roughly 20 percent) and food/beverage (roughly 15 percent). Both categories have also experienced historical regional inflation that has outpaced the national average, though to a lesser degree than we saw with the housing category. When looking at more recent data though, we saw that regional transportation inflation was less than the national average from 2019 to 2021 then surged in 2022. As for the food/beverage category, regional inflation has outpaced national inflation by an annual average of approximately 0.8 percent.

Inflation Projections

To gain additional insights as to how regional inflation might unfold moving forward, we looked at inflation forecasts from local agencies. The ERFC, Seattle's Office of Economic and Revenue Forecasts ("Seattle"), and King County's Office of Economic and Financial Analysis ("King County") provide both regional and national inflation forecasts. The ERFC's forecast[9] is focused on regional inflation in the STB region, while Seattle's forecast[10] is focused on the Seattle metropolitan area and King County's forecast[11] is focused on their county, which includes the Seattle metropolitan area.

All forecasts expect a high 2023 regional adjustment (approximately 1.7 percent for the ERFC, 2.0 percent for Seattle, and 0.5 percent for King County), but they expect this adjustment to decline quickly thereafter. By 2025, the ERFC, Seattle, and King County forecast regional adjustments of roughly 0.0, 0.4, and 0.0 percent, respectively.

It should be noted though that there are limitations in our ability to draw conclusions from this data. The regional scope of Seattle and King County's forecasts is narrower than the STB region

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[9]*ERFC, "Washington State Economic and Revenue Forecast," as of March 2023.*
[10]*Seattle's Office of Economic and Revenue Forecasts, "Reports," as of November 2022.*
[11]*King County's Office of Economic and Financial Analysis, "Current Forecast," as of March 2023.*

for which we are focused. We also have much fewer forecasts, and shorter projection periods, to examine here than we did when looking at inflation on a national scale. Because of these limitations, we did not heavily rely on these regional forecasts in our assumption-setting process but were mindful of the high-level trends they suggested.

Recommendation

We recommend an Inflation assumption of 2.75 percent for all plans, which is consistent with the current assumption. We make this recommendation after considering the national inflation and regional adjustment information above, the relationship between these components, our expectations for the future, and our professional judgment. More specifically, below are the key takeaways that led us to this recommendation.

❖ **National Inflation** – We expect national inflation to remain elevated in the short-term but to trend closer to 2.3 percent to 2.5 percent in the long-term. This trend is in part due to the actions that the Federal Reserve has taken aimed at bringing national inflation down, consistent with their 2 percent medium-term target. History suggests that Federal Reserve policy can be effective in lowering inflation, but how quickly inflation reaches the Federal Reserve's target and how long it stays at this target remains to be seen.

❖ **Regional Adjustment** – Over the past 10-, 20-, and 25-year periods, we observed annual STB regional inflation outpacing national inflation by an average of 0.60, 0.26, and 0.36 percent, respectively. We expect this positive differential to continue over the horizon we apply our Inflation assumption, but we could see the magnitude of the differential begin to shrink.

❖ **Uncertainty and Precision** – Uncertainty exists when setting our future Inflation assumption, and especially in the current volatile economic climate. This uncertainty extends to both the national inflation and regional adjustment components, and as such, we are cognizant of the precision of our Inflation recommendation.

❖ **Short-Term Volatility** – For purposes of this study, we recommend a long-term Inflation assumption that reflects average annual expectations over the applicable time horizon. If actual, short-term inflation experience significantly differs from the prescribed long-term assumption, we can modify our one-year valuation assumptions to account for that experience if warranted.

❖ **Time Horizon** – We aim to set our Inflation recommendation consistent with the time horizon over which this assumption will be applied, which is represented by the plan liability durations (see **Appendix D**). The average duration is approximately eight years for the closed plans and 20 years for the open plans. We considered separate Inflation assumptions for the closed and open plans, but we did not observe significant differences in the inflation forecasts over these plan durations. Additionally, given PERS 1 and TRS 1 are almost entirely comprised of annuitants without a CPI-based COLA, the Inflation assumption does not significantly impact our valuation measurements for those closed plans. Therefore, we recommend a single Inflation assumption for all plans.

APPENDIX B
GENERAL SALARY GROWTH ASSUMPTION

Methodology

We developed the General Salary Growth assumption by identifying and studying two components—inflation and real wage growth. 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 salary growth, inflation, and real wage growth over various historical periods to estimate historical national and Washington State ranges and trends. We also examined any changes in national real wage growth forecasts since our prior study.

We considered the population and time horizon over which we apply the General Salary Growth assumption. We target this assumption to be consistent with the duration of salaries for our open pension plans—approximately ten years. The General Salary Growth assumption is used across all plans, but we used the duration of open plan salaries because the vast majority of the active employee population exists in these open plans. Please see **Appendix D** for more information on the duration measure.

Analysis

We took the following steps to develop our general salary growth recommendation:

1. Review of historical general salary growth.

We began our analysis by reviewing the historical trend in average annual salary growth for members in the DRS administered open pension plans. Overall, we have observed general salary growth to be variable over the last 30 years. There was a notable decline following the Great Recession followed by a peak in 2019. The peak in 2019 was mainly driven by increases to teachers' salaries and likely attributable to the McCleary Supreme Court decision. On average, salary growth over the last 10 years has been lower than the preceding 20-year period.

General Salary Growth of Open Plans

The following table summarizes the above graph over various time horizons.

Estimated General Salary Growth			
Employees of DRS-Administered Open Plans			
Geometric Averages	Observed Growth of Average Salary (A)	Observed Inflation (B)	Estimated Real Wage Growth (A - B)
Last 10 years (2012-2021)	3.23%	2.44%	0.79%
Last 20 years (2002-2021)	3.41%	2.43%	0.98%
Last 30 years (1992-2021)	3.43%	2.71%	0.73%

The previous table is meant to summarize how general salary growth is trending, but we also reviewed its components (inflation and real wage growth) separately.

2. Review of inflation.

We studied inflation in depth and developed a recommendation of 2.75 percent for this assumption. As noted in the **Inflation** section, we apply that assumption to plan liabilities that have durations that range from approximately 10 to 25 years. When examining inflation as a component in general salary growth we consider that open plan salaries have a duration closer to a 10-year period. In our opinion, a 2.75 percent Inflation assumption is reasonable for both purposes based on the differences we observed between current 10 and 20-year inflation forecasts. Please see the **Inflation** section of this study for details regarding the development of this assumption.

3. Review of historical real wage growth.

To evaluate a range for the real wage growth component and identify any historical trends, we examined DRS (Washington State) wage growth for the Plans 2/3 employees. We also considered national salary data, for state and local government, from BEA as a comparison point.

With this data, we estimated annual real wage growth by deducting observed annual CPI growth (annual observed inflation) from average salary growth corresponding to each data source. We selected a CPI consistent with the regional source of the data – national or local. Under this methodology, we make a simplifying assumption that population demographics, e.g., average age and average service, will remain consistent year over year so the analysis remains independent from the service-based salary increase component of annual salary growth. In reality, this does not typically occur, but we expect our method provides a reasonable approximation for purposes of studying this assumption.

Estimated Real Wage Growth		
	Washington State*	**National Measures****
Geometric Averages	**DRS-Plans 2/3 Employees**	**BEA-State and Local Government**
Last 10 years (2012-2021)	0.79%	0.92%
Last 20 years (2002-2021)	0.98%	0.67%
Last 30 years (1992-2021)	0.73%	0.74%

*Local inflation – Seattle-Tacoma-Bellevue Urban Wage Earners and Clerical Workers CPI.
**National inflation – U.S. city average Urban Wage Earners and Clerical Workers CPI.

The historical data above would suggest a reasonable range for the Real Wage Growth component of around 0.50 percent to 1.00 percent, but we are also mindful of how the future may differ from historical trends. We expect a wider range of 0.25 percent to 1.00 percent is reasonable for this component when we also consider the consistency with the service-based salary increase assumptions from the *2013-18 Demographic Experience Study* and our professional judgment.

4. Expectations for future real wage growth.

The last item we considered when studying real wage growth was expectations for the future. Such forecasts are not available for our covered populations. In absence of such information, we reviewed various national forecasts and analyses to inform this expectation and considered it in the context of the duration of salaries for the open plans. Specifically, we rely on reports from the CBO[12] and SSA[13].

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[12]CBO, "The Budget and Economic Outlook: 2021 to 2031" and "The Budget and Economic Outlook: 2023 to 2033." To estimate real wage growth, we calculate the difference between the employment cost index and consumer price index contained within the report.

[13]SSA, "The 2020 OASDI Trustees Report" and "The 2022 OASDI Trustees Report." We estimate real wage growth by averaging the real wage differentials over the first ten-year projection period.

The national forecasts are higher in some cases than what is displayed in the historical tables above because the forecasts have a broader definition of employee compensation which can include items such as employer provided health insurance, paid time off, retirement benefits, etc. Due to the inclusion of additional sources of employee compensation, beyond employee wages, we do not rely on these forecasts to set an assumption.

Rather, we compare forecasts from national sources to evaluate assumption consistency and review whether the forecasts have significantly changed from our last study.

The CBO and SSA forecasts had modest changes in the forecasted ten-year average annual real wage growth. The CBO forecasts slightly lower average annual real wage growth over the next ten years than what they previously forecasted in 2021. The SSA, however, forecasts slightly higher average annual real wage growth than in their 2021 report. The directional difference between these two sources may indicate differing judgments on future economic climates or may reflect differences in covered or modeled wages.

Projected 10-Year Average Annual Real Wage Growth		
2019	**2021**	**2023**
CBO	0.9%	0.8%	0.7%
SSA	1.7%	1.5%	1.6%

Note: National forecasts include additional sources of employee compensation beyond employee wages.

Lastly, we considered the future economic environment without explicit projections of wage growth or inflation. Specifically, we considered national studies that indicate government salaries may be lagging private sector salaries[14]. This divergence in salary growth may create pressure on public sector employers to increase future salaries to retain employees. Additionally, we continue to consider the impact that Artificial Intelligence (AI) and automation might have on the economy. Please see the *2021 Economic Experience Study* for more information on AI. We did not make an explicit adjustment for these factors when selecting a recommendation.

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[14]*Mike Maciag, "Government wage growth lags private sector by largest margin on record," State Fiscal Health, The Pew Charitable Trusts, February 7, 2022,* https://www.pewtrusts.org/en/research-and-analysis/articles/2022/02/07/government-wage-growth-lags-private-sector-by-largest-margin-on-record.

Recommendation

We recommended an Inflation assumption of 2.75 percent as discussed in the **Inflation** section of this study.

To determine a range for the real wage growth component, we considered both historical and future expectations of growth as well as how this assumption is used to develop our other salary assumptions. We determined a range of 0.25 percent to 1.0 percent is reasonable for setting the Real Wage Growth component for our open plans. Updated historical data and national forecasts since our last study support the reasonableness of our range. In particular, we observed no significant change to national forecasts since our last study. We will continue to monitor salary growth assumptions in subsequent demographic and economic experience studies.

In setting our recommendation for the General Salary Growth assumption, we combine our recommendation for inflation (2.75 percent) with our range for real wage growth (0.25 percent to 1.00 percent) and arrive at a **recommended General Salary Growth assumption of 3.25 percent for all plans**, which is consistent with the current assumption.

APPENDIX C
INVESTMENT RATE OF RETURN ASSUMPTION

Capital Market Assumptions and Simulated Future Investment Returns

When studying the Investment Rate of Return assumption, we first review how the assets are invested and how they are expected to perform. The CTF assets are invested in a variety of asset classes, and WSIB sets targets for the percentage of those assets allocated to each class. The CMAs provide a summary of key investment statistics, such as the expected future return and volatility of the various asset classes in a portfolio, as well as the relationship between the asset classes (correlations). When the target asset allocations are combined with the CMAs, future investment returns for a portfolio can be simulated.

For plans whose assets are invested in the CTF, these CMAs, target allocations, and simulated returns fall under the purview of WSIB. The Washington State Investment Board monitors these metrics closely and recommends changes to them as deemed appropriate by their staff. Their research and recommendations are documented in their biennial CMAs White Paper.

The first table below displays WSIB's CTF target asset allocation as of this EES and our prior one (August 2021). The second table summarizes WSIB's expected annual return and standard deviation for the CTF asset classes as of their last two CMAs White Papers (i.e., their 2023 and 2021 White Papers). Beneath the tables, we provide our key takeaways. For more information, including WSIB's asset class correlations, please see their 2023 CMA White Paper.

WSIB CTF Target Asset Allocation			
	2023 EES	**2021 EES***	**Difference**
Global Equity	30%	32%	(2%)
Tangible Assets	8%	7%	1%
Fixed Income	19%	20%	(1%)
Private Equity	25%	23%	2%
Real Estate	18%	18%	0%
Cash	0%	0%	0%
Total	**100%**	**100%**	

*Report published prior to WSIB's October 2021 target asset allocation update.

WSIB Capital Market Assumptions					
	Expected 1-Year Return*			Standard Deviation		
Asset Class	2023	2021	Difference	2023	2021	Difference
Global Equity	8.1%	8.1%	0.0%	19.0%	19.0%	0.0%
Tangible Assets	7.0%	6.9%	0.1%	12.0%	12.0%	0.0%
Fixed Income	4.6%	3.7%	0.9%	6.0%	6.0%	0.0%
Private Equity	11.1%	11.1%	0.0%	25.0%	25.0%	0.0%
Real Estate	7.3%	7.6%	(0.3%)	13.0%	13.0%	0.0%
Cash	2.5%	1.7%	0.8%	2.0%	1.5%	0.5%

Reflects arithmetic returns. Geometric returns are lower but have the same difference between 2023 and 2021.

❖ The target asset allocations have changed slightly since our last EES, with Private Equity and Tangible Assets receiving a small increase to their allocations, and Global Equity and Fixed Income seeing a small corresponding decrease to their allocations. These target asset allocations were updated in October 2021 as part of WSIB's asset allocation review which is conducted every four years.

❖ The one-year expected returns for Fixed Income and Cash are nearly 1 percent higher than expected in the 2021 CMAs White Paper, which reflects WSIB's higher return expectations for cash. All other asset classes display modest to no change in their expected returns.

❖ Except for Cash, the one-year standard deviations have not changed since the 2021 CMAs White Paper.

Using these metrics, WSIB simulates future annual CTF investment returns under varying projection periods. The following table summarizes WSIB's 15-year simulated future annual CTF returns by percentile as of the 2023 and 2021 CMAs White Papers. Fifteen years is the horizon over which WSIB primarily focuses their analysis for asset allocation purposes. Beneath the table, we provide our key takeaways. For more information on these simulations, including WSIB's modeling process, please see their 2023 CMAs White Paper.

15-Year Simulated Annual Investment Returns*			
	2023	2021	Difference
70th Percentile	8.94%	8.81%	0.13%
60th Percentile	7.92%	7.83%	0.09%
Median Return	7.02%	6.89%	0.13%
40th Percentile	6.11%	5.94%	0.17%
30th Percentile	5.15%	4.98%	0.17%

Displayed simulations rely on a downside log-stable distribution, which uses actual historical returns to inform the future distribution (and volatility) of more pessimistic return scenarios.

❖ The combination of target asset allocation and CMA changes mentioned above produced simulated returns that were modestly higher than they were in WSIB's 2021 White Paper. Of particular interest is the median return, which represents the value for which 50 percent of simulated returns exceed and 50 percent of simulated returns undershoot. This median return increased by 13 basis points since WSIB's 2021 White Paper and now hovers close to 7 percent.

❖ Per our request, WSIB also provided us with simulated returns over longer and shorter time horizons using the same target asset allocations, CMAs, and distribution method as described above that WSIB developed for a 15-year time horizon only. The median annual investment return was 7.03 percent over a 10-year horizon and 7.01 percent over a 25-year horizon.

❖ These simulations require a few simplifying assumptions. One such assumption is that the target asset allocation and CMAs will remain constant throughout the projection period.

Given WSIB's extensive research and expertise in this area, we used their median investment return expectation as a starting point for our own investment return analysis. Before doing so however, we took steps to better understand WSIB's target asset allocations, CMAs, and simulated returns. In doing so, we examined the methodology used by WSIB to develop their CMAs, the input provided by WSIB's consultant pool, and how well the CTF's actual asset allocations have matched WSIB's target allocations historically. Based on our findings, we determined the use of WSIB's investment return expectations as a starting point for our own analysis is reasonable.

Sensitivity of the Simulated Returns and Use of Historical Data

As with any assumption, we recognize that the CMAs may not match actual future investment experience. Therefore, we considered the impact of changes to the CMAs on the median simulated CTF return using a first-principles model[15] we developed.

Using this model, we applied a 1 percent change in the expected one-year return of the Private Equity and Global Equity asset classes, while keeping all other asset classes unchanged. We chose these two asset classes because they comprise 55 percent of the target asset allocation and have the greatest amount of uncertainty (i.e., standard deviation) around their expected return. The following table displays our estimated impact on the median simulated return. Note that we made no adjustment to the expected standard deviation of either asset class. We also did not make any adjustment to the correlations between CTF asset classes.

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[15]*This first-principles model takes user-provided CMAs, approximates the CTF return based on them, and then applies a corresponding ratio adjustment to WSIB's median simulated return.*
To assess the general operation of this model, we reviewed the output for reasonableness. This includes comparing the results to model results from prior years and considering how the use of different assumption inputs to the model produce different results. We believe the resulting outputs are reasonable for purposes of this sensitivity analysis, which is to provide a rough sense of the impact on simulated returns from changes to the CMAs. We are not aware of any known weaknesses or limitations of the model that have a material impact on the results. The use of the model for this analysis is appropriate given its intended purpose.

Estimated Median Return Sensitivity				
	Change in Private Equity Expected Return		Change in Global Equity Expected Return	
Base	**-1%**	**+1%**	**-1%**	**+1%**
7.0%	6.8%	7.3%	6.7%	7.3%

In addition to this sensitivity analysis, we also considered gaining insights from the average CTF investment returns that WSIB had been able to achieve over various historical time periods. However, we do not believe historical investment returns are a good predictor of future returns due to the evolving nature of the investment market, WSIB's CMAs, and the CTF target asset allocations. For readers interested in the historical CTF investment returns, please see our Return on Investment webpage.

Application of the Investment Rate of Return

With WSIB's investment statistics and simulations in hand, we next considered how our application of this information may vary from that of WSIB. We believe three main differences arise – the purpose of the analysis, the time horizon, and the need for consistency with other economic assumptions.

Purpose

❖ We use the Investment Rate of Return assumption for purposes of retirement plan funding, per the goals outlined in RCW 41.45.010 which are aimed at "[providing] a dependable and systematic process for funding the benefits provided to [DRS] members and retirees." We apply this assumption in our modeling to project the future annual return on plan assets and to discount future benefit payments and member salaries back to today's value, all of which are then used to compute plan contribution rates.

❖ WSIB analyzes and sets their CMAs and asset allocations consistent with their mission of "maximizing investment return at a prudent level of risk for the exclusive benefit of [CTF] participants and beneficiaries."

Time Horizon

❖ We apply the Investment Rate of Return assumption over time horizons that reflect the liability durations of the DRS plans. This implies an average time horizon of roughly 8 years for the plans that are closed to new hires and roughly 20 years for the plans that are open to new hires. See **Appendix D** for more information on plan duration.

❖ WSIB sets their CMAs, asset allocations, and simulated returns to target a 15-year time horizon.

Consistency

❖ We are mindful of the relationship between the Investment Rate of Return assumption and the other economic assumptions we use for plan funding, namely Inflation.

❖ WSIB bases their investment return analysis on their own economic assumptions, which includes an annual average national inflation assumption of 2.50 percent. As mentioned above, WSIB focuses their assumptions over a different horizon (and in the case of Inflation, over a different geographic area) than we do for pension funding.

To address these differences, we considered making a few adjustments to WSIB's investment return simulations based on our professional judgment.

Adjustments We Considered

There are numerous factors that can influence our Investment Rate of Return assumption. Some of these factors include technological advances, the rate of productivity growth, climate change, a shift in population demographics, and the impact of increasing government debt. We are aware that WSIB has considered many such factors in the development of their CMAs and simulated returns.

The primary adjustments we considered were regarding private equity premium, mean reversion, and inflation. We chose these adjustments in light of the above differences between WSIB's and our application of the Investment Rate of Return. We focused on adjustments to the open plans because they involve applying WSIB's CMAs over a period beyond their intended 15-year time horizon. In our opinion, no adjustments are needed for the closed plans given their liability duration falls within WSIB's 15-year time horizon.
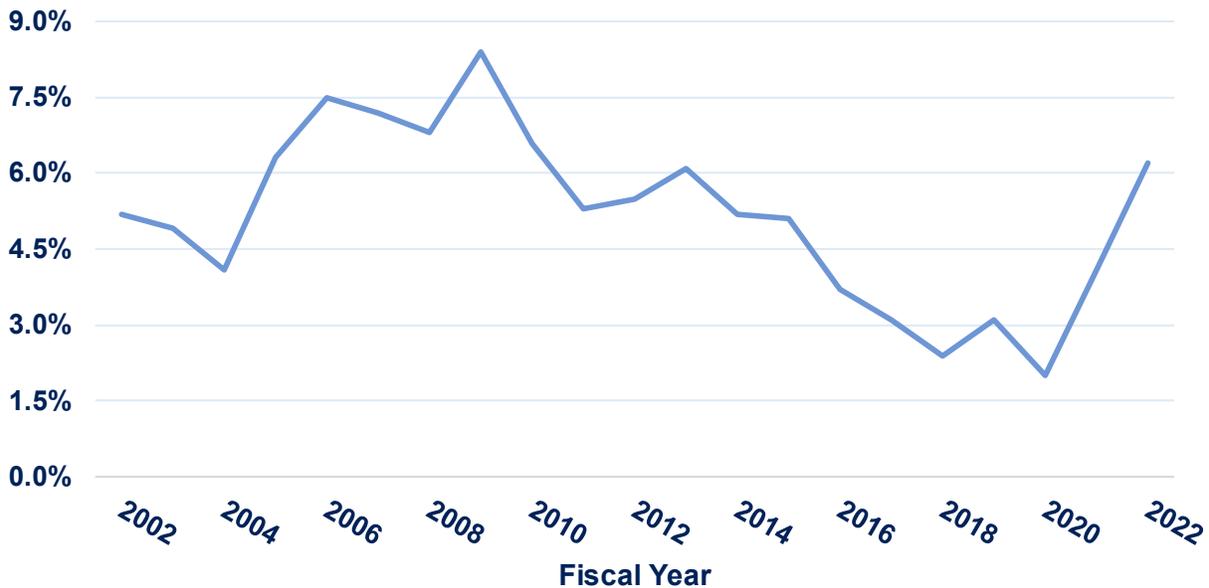
Private Equity Premium

WSIB develops their CMA expected return for Private Equity by taking their expected return for Global Equity and applying a private equity premium. As discussed in WSIB's 2023 CMAs White Paper, this private equity premium can be thought of as the compensation that comes from sacrificing liquidity and from the increased ability to exercise control with private equity investments.

WSIB assumes a private equity premium of 3.00 percent over a 15-year time horizon, but they also recognize that any premium in the range of 0.00 percent to 5.00 percent could also be considered reasonable. Given we are focused on a different time horizon (roughly 8 years for the closed plans and 20 years for the open plans), we considered an adjustment to this private equity premium.

The following graph depicts the historical, realized private equity premium for the CTF on a ten-year rolling average basis.

10-Year Rolling Average of Private Equity Premium

Note: OSA calculated these 10-year rolling geometric averages using historical returns data, from WSIB, for the Private Equity and Global Equity asset classes. Our private equity premium estimate is the difference between the realized returns for these two asset classes. The Private Equity returns used in our estimate may include a quarterly lag.

While the last two years have experienced an uptick in the private equity premium, coinciding with the COVID-19 pandemic, the overall trend since 2009 has mostly been a downward one, suggesting the gap between Private and Global Equity returns was closing. We expect the general downward trend in private equity premium observed from 2009 to 2020 will re-emerge in the long-term as the private equity market continues to mature and evolve. With an increasing number of investors joining the private equity market year over year, competition for and efficiency of private equity investments can be expected to increase further, driving down future private equity returns and private equity premiums.

Therefore, when we extend WSIB's CMAs past their intended 15-year time horizon and closer to the duration of liabilities in our open plans, we expect the CTF will experience lower annual private equity premiums during that time horizon than assumed by WSIB. All else being held equal, the lower the assumed private equity premium, the lower the simulated CTF annual investment return.

Mean Reversion

When developing their CMAs, WSIB considers the impact of asset class returns potentially reverting back to their average historical price-to-earnings/income levels over time. This adjustment is also known as "mean reversion", and it is perhaps most prominent in the equity asset classes.

In WSIB's most recent CMAs White Paper, they noted that both US and non-US equities had elevated price-to-earnings ratios, relative to their historical averages, at the end of 2022. Given this, WSIB assumes in their current CMAs that mean reversion will reduce the annual expected return in the equity asset classes. We analyzed WSIB's mean reversion adjustments and considered how those adjustments could change over different time horizons.

When we extend WSIB's CMAs past their intended 15-year time horizon and closer to the duration of liabilities in our open plans, we expect the CTF will experience a smaller annual mean reversion adjustment than assumed by WSIB in the next 15 years. All else being held equal, the smaller the assumed mean reversion adjustment, the higher the simulated CTF annual investment return.

Inflation

When setting an Investment Rate of Return assumption, we must consider the consistency of common components across our entire set of economic assumptions. For example, we use inflation as a standalone assumption in our post-retirement COLA modeling, but we also use a component of inflation – national inflation – as a factor for other assumptions, like the Investment Rate of Return.

As noted in the **Inflation** section, we recommend an annual Inflation assumption of 2.75 percent for the STB region. However, in the development of their 2023 CMAs, WSIB applied an annual average national inflation assumption of 2.50 percent. Per our analysis in the **Inflation** section, we expect national average inflation to be lower than that of the STB region and to be in the range of 2.3 percent to 2.5 percent in the long-term. Given WSIB's 15-year national inflation assumption of 2.50 percent falls within this range, we determined an inflation adjustment to WSIB's simulated returns was not necessary at this time.

Conclusion

We ultimately determined that no adjustments to WSIB's simulated returns were needed since the adjustments we considered generally offset each other or were unnecessary. The adjustment we considered for private equity premium largely offset the adjustment we considered for mean reversion. We also found that no adjustments to account for differences in assumed inflation (between OSA and WSIB) were necessary at this time to maintain a consistent assumption set.

Recommendation

Based on the analysis and consideration above along with our professional judgment, **we recommend a 7.0 percent Investment Rate of Return assumption for all plans**, which is consistent with the current assumption.

APPENDIX D
RETIREMENT PLAN DURATION

Selecting reasonable economic assumptions requires consideration of the time horizon over which the assumptions will apply. For example, when setting a General Salary Growth assumption, we consider the average expected future working lifetime of active members. And when setting an Investment Rate of Return assumption, we consider both the members' average expected future working lifetimes and their life expectancy post-retirement.

Duration is an actuarial measurement used by our office to determine a relevant time horizon over which to forecast the economic assumptions contained in this study. 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. We would expect about half of this plan's liability, measured in today's dollars, to be paid in benefit payments before 15 years and the other half to be paid after 15 years.

We estimate liability duration by taking the ratio of various Present Value of Future Benefits (PVFB) measured at different discount rates, as shown by the formula below. We perform the same calculation using the Present Value of Future Salaries to determine salary duration.

$$\text{Liability Duration} = \left(\frac{\text{PVFB Discounted 6\% Annually}}{\text{PVFB Discounted 7\% Annually (Statutory Rate)}} - 1 \right) \times 100$$

The table below summarizes our plan duration estimates. We split these estimates based on whether the plan is open or closed to new hires. For purposes of this analysis, the closed plans consist of PERS, TRS, and the Law Enforcement Officers' and Fire Fighters' Retirement System (LEOFF) Plans 1, which all closed to new hires in 1977, and the open plans consist of all other DRS-administered plans found in the AVR. The liability duration is measured across active and inactive members, whereas the salary duration is measured just across active members (i.e., those members earning a salary).

Duration Summary for Open and Closed Plans										
	Historical Duration					Projected Duration				
	2013	2015	2017	2019	2021	2023	2025	2027	2029	2031
Liability Duration										
Open Plans	21.9	21.3	20.8	20.7	21.1	20.7	20.4	20.2	20.0	19.8
Closed Plans	8.9	8.8	8.6	8.1	8.0	7.6	7.3	6.9	6.5	6.2
Salary Duration										
Open Plans	7.6	7.8	7.9	8.2	8.4	8.5	8.5	8.6	8.7	8.7

*Note: Historical duration values are based on their respective AVRs. Projected duration values are based on projections as of our 2021 AVR (see our 2021 Valuation Projections Model **webpage** for more information).*

We observed a difference in duration between the closed and open plans because the membership of closed plans is generally older, and older members have shorter expected future lifetimes than younger members. Duration will also vary by individual plan, as each plan has a distinct demographic make-up. However, after review, we believe grouping the plans into open and closed populations provides a reasonable duration target for each plan.

The open plans have a liability duration of roughly 20 years and a salary duration of roughly eight to nine years. The closed plans have a current liability duration of roughly eight years. We do not provide salary durations for the closed plans, as most of their populations are already retired and their remaining actives are expected to have short future working lifetimes.

APPENDIX E
PEER RETIREMENT SYSTEM ECONOMIC ASSUMPTIONS

Economic Assumptions for Public Plans Outside Washington				
Plan Name	Inflation*	General Salary Growth	Investment Return	Date of Valuation
Washington 2023 EES Recommendations	2.75%	3.25%	7.00%	
Washington Currently Prescribed Assumptions	2.75%	3.25%	7.00%	
Alaska PERS & Teachers	2.50%	2.75%	7.25%	6/30/2022
California PERS	2.30%	2.80%	6.80%	6/30/2021
California Teachers	2.75%	3.50%	7.00%	6/30/2021
Colorado PERA	2.30%	3.00%	7.25%	12/31/2021
Florida Retirement System	2.40%	3.25%	6.70%	7/1/2022
Idaho PERS	2.30%	3.05%	6.30%	6/30/2022
Iowa PERS	2.60%	3.25%	7.00%	6/30/2022
Missouri State Employees	2.25%	2.75%	6.95%	6/30/2021
Ohio PERS	2.35%	2.75%	6.90%	12/31/2021
Oregon PERS	2.40%	3.40%	6.90%	12/31/2021
Wisconsin Retirement System	2.40%	3.00%	5.40%	12/31/2021
Selected Public Plans Outside WA – Average	2.41%	3.05%	6.77%	
Selected Public Plans Outside WA – Minimum	2.25%	2.75%	5.40%	
Selected Public Plans Outside WA – Maximum	2.75%	3.50%	7.25%	

Note: Data gathered from the National Association of State Retirement Administrators (NASRA) as data may change based on the data pull3. This data reflects the assumptions prescribed by each plan, which may not match the actuary's recommended assumption. There may also be a timing lag between the date of valuation and when the assumptions were actually last studied.

*Selected public plans outside Washington primarily use a national inflation assumption rather than a regional assumption. We expect inflation in the Seattle-Tacoma-Bellevue region to be higher than the national average.

APPENDIX F
HISTORICAL ECONOMIC ASSUMPTIONS FOR WASHINGTON STATE PENSION SYSTEMS

Historical Economic Assumptions for Washington State Pension Systems				
Valuation Years	Inflation	General Salary Growth	Investment Return	Membership Growth for Plan 1 Funding
1989 - 1994	5.00%	5.50%	7.50%	0.75% TRS 1.25% PERS
1995 - 1997	4.25%	5.00%	7.50%	0.90% TRS 1.25% PERS
1998 - 1999	3.50%	4.00%	7.50%	0.90% TRS 1.25% PERS
2000 - 2008	3.50%	4.50%	8.00%	0.90% TRS 1.25% PERS
2009 - 2010	3.50%	4.50% LEOFF 2 4.00% Other Plans	8.00%	0.90% TRS 1.25% PERS
2011 - 2012	3.00%	3.75%	7.5% LEOFF 2 7.9% Other Plans	0.80% TRS 0.95% PERS
2013 - 2014	3.00%	3.75%	7.5% LEOFF 2 7.8% Other Plans	0.80% TRS 0.95% PERS
2015	3.00%	3.75%	7.5% LEOFF 2 7.7% Other Plans	0.80% TRS 0.95% PERS
2016	3.00%	3.75%	7.5% LEOFF 2 7.7% Other Plans	1.25% TRS 0.95% PERS
2017 - 2020	2.75%	3.50%	7.4% LEOFF 2 7.5% Other Plans	1.25% TRS 0.95% PERS
2021 - 2022	2.75%	3.25%	7.00%	1.00% TRS/PERS

Note: Values represent prescribed assumptions, which may not necessarily match OSA's recommended assumptions.

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