



Office of the State Actuary

"Securing tomorrow's pensions today."

August 31, 2011

To: Pension Funding Council Members
Senator Ed Murray, Chair,
Senate Ways and Means Committee
Senator Joseph Zarelli, Ranking Minority Member,
Senate Ways and Means Committee
Representative Ross Hunter, Chair,
House Ways and Means Committee
Representative Gary Alexander, Ranking Minority Member,
House Ways and Means Committee
Steve Hill, Director,
Department of Retirement Systems
Marty Brown, Director,
Office of Financial Management

Dear Pension Funding Council Members:

In accordance with RCW 41.45.030, the Office of the State Actuary prepared reports on the financial condition and long-term economic assumptions of the state retirement systems. The report on long-term economic assumptions includes my recommended assumptions. I attached both reports to this letter.

I provide this information to assist you in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035.

Executive Summary

On August 31, 2009, I reported all plans of the retirement systems experienced a gradual decline in health as a result of past funding shortfalls and certain unfunded benefit improvements. I also reported the plans further suffered a drop in funded status as a result of asset losses during the Great Recession of 2008-2009. This decline in health and funded status added pressure to already rising contribution rates. Since then, the funded status for all plans improved due to subsequent investment performance, funding, and benefit changes during the 2011 Legislative Session. However, looking forward, we still expect contribution requirements to increase as the plans fully recover from the effects of past funding shortfalls and the 2008-2009 drop in funded status. In addition, current and potential litigation would change the financial condition of the affected retirement systems should the court order reinstatement of recently repealed benefits.



On August 31, 2009, I recommended a change in the current long-term economic assumptions, but concluded the assumptions at that time, while not my best estimate, were reasonable. After completing this economic experience study, I conclude the current assumptions remain reasonable, but not representative of my best estimate.

Adopting my recommended economic assumptions will improve the long-term health and lessen some financial risks of the retirement systems, but increase short-term budget impacts. To manage the short-term budget impacts, I recommend phasing in the recommended change to the assumed rate of return over the next five biennia.

Summary of Financial Condition

Financial Condition Improved Since Last Report

As reported two years ago, nearly all public pension plans experienced large investment losses during 2008-2009, including Washington's. Investment returns for Washington's Commingled Retirement Trust Fund (CTF) for the fiscal years ending June 30, 2008, and June 30, 2009, were -1.2 percent and -22.8 percent, respectively. The assumed annual rate of investment return, set in state law, is 8.0 percent. In terms of actuarial funding, this meant the plans, at that point in time, experienced a 30-40 percent drop in expected funded status.

Since our last report, investment returns for the CTF for the fiscal years ending June 30, 2010, and June 30, 2011, were 13.2 percent and 21.1 percent, respectively. At this point in time, the plans recovered 18 percent of the 30-40 percent drop in expected funded status reported two years ago.

We present the funded status measured at both June 30, 2009, and June 30, 2010, in the table below.

Funded Status on an Actuarial Value Basis		
Plan	2009 Funded Status	2010 Funded Status*
PERS 1	70%	74%
PERS 2/3	116%	113%
TRS 1	75%	84%
TRS 2/3	118%	116%
SERS 2/3	116%	113%
PSERS 2	128%	129%
LEOFF 1	125%	127%
WSPRS 1/2	119%	118%

** Based on preliminary 2010 Actuarial Valuation results, includes 2011 legislation.*

As noted above, with the above-expected investment returns of the past two fiscal years, we expect future funded status to fall about 10-20 percent instead of the 30-40 percent



reported two years ago. The actual decline in future funded status will depend on actual investment performance, future contribution and benefit levels.

Benefit Changes Lowered Contribution Requirements; Future Increases Expected

With the passage of Chapter 362, Laws of 2011, the Legislature lowered the unfunded actuarial accrued liability (UAAL) in PERS 1 and TRS 1 and lowered the required employer contributions to the Plan 1 UAAL. However, since the plans have not fully recovered from the 2008-2009 drop in funded status, we expect increases in future contribution requirements to make a full recovery. We are currently preparing updated contribution projections to reflect asset returns through June 30, 2011, and all benefit changes resulting from the 2011 Legislative Session.

Litigation May Change Financial Condition

The potential reinstatement of gain sharing benefits or the Plan 1 Uniform COLA would change the results of this financial condition report. The tables below demonstrate how current funded status and budget impacts would change should the court reinstate benefits recently repealed by the Legislature. As of the date of this letter, no lawsuit has been filed on the repeal of the Plan 1 Uniform COLA.

Funded Status on an Actuarial Value Basis				
	2010 Funded Status¹	Funding Status After Restoration of Gain sharing²	Funding Status After Restoration of UCOLA³	Funding Status After Restoration of Gain sharing and UCOLA⁴
PERS 1	74%	72%	66%	63%
PERS 2/3	113%	112%	N/A	112%
TRS 1	84%	82%	72%	70%
TRS 2/3	116%	109%	N/A	109%
SERS 2/3	113%	105%	N/A	105%
PSERS 2	129%	N/A	N/A	N/A
LEOFF 1	127%	N/A	N/A	N/A
WSPRS 1/2	118%	N/A	N/A	N/A

¹Based on preliminary 2010 Actuarial Valuation results (preliminary AVR).

²Based on preliminary AVR results after restoration of gain sharing and continuation of replacement benefits.

³Based on preliminary AVR results after restoration of UCOLA.

⁴Based on preliminary AVR results after restoration of gain sharing and UCOLA.



2013-15 Employer Contributions From The State General Fund				
<i>(Dollars in Millions)</i>	Expected Contributions¹	Increase in Contributions After Restoration of Gain sharing²	Increase in Contributions After Restoration of UCOLA³	Increase in Contributions After Restoration of Gain sharing and UCOLA⁴
PERS	296.7	26.1	73.7	104.1
TRS	583.3	142.1	300.8	459.4
SERS	122.9	36.5	28.5	66.7
PSERS	36.2	1.8	7.4	9.6
Total	1,039.2	206.5	410.5	639.7

2013-15 Total Employer Contributions				
<i>(Dollars in Millions)</i>	Expected Contributions¹	Increase in Contributions After Restoration of Gain sharing²	Increase in Contributions After Restoration of UCOLA³	Increase in Contributions After Restoration of Gain sharing and UCOLA⁴
PERS	1,489.5	131.1	370.1	522.4
TRS	879.8	214.3	453.6	692.9
SERS	275.8	81.8	64.0	149.5
PSERS	51.0	2.5	10.5	13.6
Total	2,696.1	429.8	898.2	1,378.4

¹Based on preliminary 2010 Actuarial Valuation results (preliminary AVR).

²Based on preliminary AVR results after restoration of gain sharing and continuation of replacement benefits.

³Based on preliminary AVR results after restoration of UCOLA.

⁴Based on preliminary AVR results after restoration of gain sharing and UCOLA.

Since our *2009 Report on Financial Condition*, the financial status of the pension systems has improved. Better than expected asset returns helped partially offset the asset losses from the Great Recession. In addition, the funded status of PERS 1 and TRS 1, the two lowest funded plans, improved due to a 2011 legislative reduction in benefits.

While the financial condition of the pension systems improved, I advise the Council to consider three outstanding issues when contemplating future pension action:

1. We expect contribution rates to increase, as remaining asset losses from 2008-2009 are recognized, before approaching expected long-term levels.
2. A court reinstatement of recently repealed benefits would negatively impact the financial condition of the pension systems.
3. Increased volatility in financial markets can weaken or improve the financial condition of a pension system over a short period of time. Continued full funding and the maintenance of affordable/sustainable plan designs will help the systems weather increased volatility.



Please see the attached Report on Financial Condition for details and supporting data.

Summary of Long-Term Economic Assumptions

According to RCW 41.45.030(2), by October 31, 2007, and every two years thereafter, the Pension Funding Council (PFC) may adopt changes to the long-term economic assumptions (effective July 1, 2013, 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, we performed an economic experience study to develop a best-estimate range for each long-term economic assumption. The recommended assumptions represent my best estimate from within each range. We developed them as a consistent set of economic assumptions and I advise you to review them as a set of assumptions.

Several Changes in Long-Term Economic Assumptions Recommended

The table below summarizes the current and recommended long-term economic assumptions.

Assumption	Current	Recommended*
Inflation	3.50%	3.00%
General salary growth	4.00%	3.75%
Annual investment return	8.00%	7.50%
Growth in system membership	0.90% (TRS), 1.25% (Others)	0.80% (TRS), 0.95% (Others)

**Excludes LEOFF 2.*

I consider all current economic assumptions reasonable, but not representative of my best estimate. I recommend decreasing the current inflation assumption from 3.50 percent to 3.00 percent. I also recommend decreasing the annual investment return assumption from 8.00 percent to 7.50 percent. Three years ago, the PFC lowered the general salary growth assumption from 4.50 percent to 4.25 percent. The 2009 Legislature revised the PFC’s action to lower the general salary growth assumption by another 0.25 percent to 4.00 percent. Based on the results of this experience study, I recommend decreasing the general salary growth assumption from 4.00 percent to 3.75 percent.

Phase-In of Change to Assumed Rate of Return Recommended

Adopting my recommended economic assumptions will improve the long-term health and lessen some financial risks of the retirement systems, but increase short-term budget impacts. To manage the short-term budget impacts, I recommend phasing in the recommended change to the assumed rate of return over the next five biennia.

Specifically, I recommend lowering the rate of return assumption by 10 basis points each biennium over the next ten years starting in 2013-15 as follows.



Recommended Investment Return Phase-In	
Biennium	Investment Return Assumption
2011-13	8.00%
2013-15	7.90%
2015-17	7.80%
2017-19	7.70%
2019-21	7.60%
2021-23	7.50%

Please see the enclosed Report on Long-Term Economic Assumptions for details and supporting data including risk analysis and the budget impacts of this recommendation.

I hope you find this information useful during your deliberations.

Sincerely,

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

Attachments

- Report on Financial Condition
- Report on Long-Term Economic Assumptions

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REPORT ON FINANCIAL CONDITION

Prepared for the Pension Funding Council



Report on Financial Condition

As required under RCW 41.45.030, we present this Report on Financial Condition (Report) to assist the Pension Funding Council in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035. In this report, we focus on the change from the *2009 Report on Financial Condition* and how we expect the financial condition to change in the future. The following sections discuss the financial condition of the plans, the effect of recent legislation, and how litigation risks may change the affected plans' financial condition.

Financial Condition Improved Since Last Report

Investments performed better than expected over the past two fiscal years; returns were 13.2 and 21.1 percent respectively. In general, these returns will help the funded status of the plans over the long-term. However, the asset-smoothing method, which leads to more stable contribution rates over time, only recognizes a portion of the excess/shortfall returns over the next eight years. Therefore, we won't see the full benefit of these excess returns immediately and they may be offset/enhanced by future investment experience losses/gains.

In addition, investment returns for the fiscal years ended 2008 and 2009 were worse than expected. Similar to the excess returns of the last two fiscal years, the 2008-09 losses are smoothed over an eight year period as well. As result, even though investment returns for the past two fiscal years were better than expected, we expect the funded status of the plans to decrease since the remaining unrecognized 2008-09 losses are larger than the remaining unrecognized excess returns from 2009-10.

The table below shows the funded status of the plans as of June 30 in 2008, 2009, and 2010. We show the June 30, 2010, funded status both before and after the repeal of the Plan 1 Uniform COLA (UCOLA). Please see the next section for additional information on the repeal of the UCOLA.

Funded Status as of June 30				
Plan	2008	2009	2010	2010
			Before UCOLA Repeal*	After UCOLA Repeal*
PERS 1	71%	70%	66%	74%
PERS 2/3	119%	116%	113%	113%
TRS 1	77%	75%	72%	84%
TRS 2/3	125%	118%	116%	116%
SERS 2/3	121%	116%	113%	113%
PSERS 2	127%	128%	129%	129%
WSPRS 1/2	121%	119%	118%	118%

*Preliminary.

Because we are still recognizing asset losses from 2008-09 and we will smooth the remaining excess asset returns from 2009-10 over the next seven years, we expect the



funded status to continue to decline for about six years and then increase beyond that period.

Benefit Changes Lowered Contribution Requirements; Future Increases Expected

As shown in the previous section, 2011 legislation improved the funded status for PERS and TRS Plans 1, the two lowest funded plans above. Chapter 362, Laws of 2011, repealed future automatic cost of living increases (AKA the “UCOLA”) for PERS and TRS Plans 1. This UCOLA removal resulted in a decrease in the Plan 1 unfunded actuarial accrued liability and a decrease in the required employer contribution rates for the 2011-13 Biennium. As shown in our actuarial fiscal note (SHB 2021, 2011 Session), PERS employer contribution rates decreased by 1.54 percent in 2012 and 2.10 percent in 2013 while TRS decreased by 4.07 percent in 2012 and 4.41 percent in 2013.

However, as we discussed in the previous section, the asset smoothing method currently has more deferred (unrecognized) losses than deferred gains. Consistent with an expected decrease in funded status over the short-term, we expect contribution rates will increase as we recognize the remaining deferred asset losses. After the deferred losses are recognized, we expect contribution rates to return to a more stable long-term level.

Please see the Risk Analysis portion of the Report on Long-Term Economic Assumptions for how future contributions can vary based on unexpected conditions.

Litigation May Change Financial Condition

We assessed the financial condition of the pension systems based on the plan provisions that exist in current law. However, the Legislature recently repealed two benefits, one of which (gain sharing) is currently in litigation and the other (Plan 1 UCOLA) could possibly be litigated in the future. If the court overturns the repeal of these benefits, the financial condition of the affected systems would worsen.

The reinstatement of these benefits poses a unique risk to the pension systems. Generally, when we model risks to the pension systems and show a range of possible outcomes, most of the outcomes occur between the extremes. In other words, a broad spectrum of possibilities exists and the worst-case scenario is highly unlikely to occur. Also, each risk usually occurs many times (e.g., investment returns occur each year), and a bad outcome one year can be offset in the future. However, for purposes of modeling, these litigation risks have only two possible outcomes – either the repeal of the benefits is allowed or the benefits are reinstated (or replaced with benefits of equivalent value). They are also, for purposes of modeling, one-time decisions that are not offset in future years.

The table below shows the funded status, as of June 30, 2010, of the affected plans if the court reinstates Gain Sharing (GS), the UCOLA, or both. For PERS 1 and TRS 1, note the effect of reinstating both benefits is larger than the effect of reinstating each on their own.



Funded Status on an Actuarial Value Basis					
(Dollars in Millions)	PERS		TRS		SERS
	Plan 1	Plan 2/3	Plan 1	Plan 2/3	Plan 2/3
Accrued Liability	\$12,531	\$17,272	\$9,231	\$5,708	\$2,368
Valuation Assets	\$9,293	\$19,474	\$7,791	\$6,593	\$2,664
Unfunded Liability	\$3,238	(\$2,202)	\$1,439	(\$886)	(\$296)
2010 AVR	74%	113%	84%	116%	113%
Liability Change	\$397	\$105	\$295	\$329	\$163
Accrued Liability	12,928	17,377	9,526	6,037	2,531
Valuation Assets	9,293	19,474	7,791	6,593	2,664
Unfunded Liability	\$3,635	(\$2,097)	\$1,735	(\$556)	(\$133)
w/ Gain sharing (GS)	72%	112%	82%	109%	105%
Liability Change	\$1,635	\$0	\$1,596	\$0	\$0
Accrued Liability	14,166	17,272	10,827	5,708	2,368
Valuation Assets	9,293	19,474	7,791	6,593	2,664
Unfunded Liability	\$4,873	(\$2,202)	\$3,036	(\$886)	(\$296)
w/ UCOLA	66%	113%	72%	116%	113%
Liability Change	\$2,124	\$105	\$1,979	\$329	\$163
Accrued Liability	14,655	17,377	11,210	6,037	2,531
Valuation Assets	9,293	19,474	7,791	6,593	2,664
Unfunded Liability	\$5,362	(\$2,097)	\$3,418	(\$556)	(\$133)
w/ GS & UCOLA	63%	112%	70%	109%	105%

Besides the funded status decreasing, the reinstatement of both benefits would have an immediate impact on employer contribution rates and state and local government budgets. The table below shows the 2013-15 Biennium fiscal impact to give an idea of the relative magnitude of these benefits (dollars in millions).

Reinstatement of Gain-Sharing					
2013-2015	PERS	TERS	SERS	PSERS	Total
General Fund	\$26.1	\$142.1	\$36.5	\$1.8	\$206.5
Non-General Fund	37.2	0.0	0.0	0.2	37.4
Total State	\$63.4	\$142.1	\$36.5	\$2.0	\$243.9
Local Government	67.8	72.2	45.4	0.5	185.9
Total Employer	\$131.1	\$214.3	\$81.8	\$2.5	\$429.8
Total Employee	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0



Reinstatement of UCOLA*					
2013-2015	PERS	TERS	SERS	PSERS	Total
General Fund	\$73.7	\$300.8	\$28.5	\$7.4	\$410.5
Non-General Fund	105.1	0.0	0.0	0.8	105.9
Total State	\$178.8	\$300.8	\$28.5	\$8.2	\$516.4
Local Government	191.3	152.9	35.5	2.2	381.9
Total Employer	\$370.1	\$453.6	\$64.0	\$10.5	\$898.2
Total Employee	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0

* Does not include back-payments or interest on back-payments.

Reinstatement of Gain-Sharing and UCOLA					
2013-2015	PERS	TERS	SERS	PSERS	Total
General Fund	\$104.1	\$459.4	\$66.7	\$9.6	\$639.7
Non-General Fund	148.4	0.0	0.0	1.0	149.4
Total State	\$252.4	\$459.4	\$66.7	\$10.7	\$789.1
Local Government	270.0	233.5	82.9	2.9	589.2
Total Employer	\$522.4	\$692.9	\$149.5	\$13.6	\$1,378.4
Total Employee	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0

For a fuller discussion and modeling of potential risks to the pension systems, please see the 2010 Risk Assessment located on our website:

osa.leg.wa.gov/Actuarial_Services/RiskAssessment/RA.htm.

Summary

Since our 2009 Report on Financial Condition, the financial status of the pension systems has improved. Better than expected asset returns helped partially offset the asset losses from the Great Recession. In addition, the funded status of PERS 1 and TRS 1, the two lowest funded plans, improved due to a 2011 legislative reduction in benefits.

While the financial condition of the pension systems improved, I advise the Council to consider three outstanding issues when contemplating future pension action:

1. We expect contribution rates to increase, as remaining asset losses from 2008-2009 are recognized, before approaching expected long-term levels.
2. A court reinstatement of recently repealed benefits would negatively impact the financial condition of the pension systems.
3. Increased volatility in financial markets can weaken or improve the financial condition of a pension system over a short period of time. Continued full funding and the maintenance of affordable/sustainable plan designs will help the pension systems weather increased volatility.

Data, Assumptions, and Methods Used

We performed this analysis consistent with the June 30, 2010, Actuarial Valuation Report (AVR). We used asset information and participant data as of June 30, 2010.



In calculating the potential cost of litigation, we measured the cost of UCOLA reinstatement as the difference between the cost of the full UCOLA starting immediately and the preliminary AVR (current law with minimum UCOLA benefits only)

In calculating the potential cost of litigation, we assumed reinstatement of gain sharing for employees hired before January 1, 2008, only. The method for calculating the cost of gain sharing is consistent with the method used in our fiscal note for EHB 2391 from the 2007 Legislative session (the repeal of gain sharing). Please see that fiscal note for additional information. For measuring the cost of reinstating gain sharing benefits, we used a reduction in the interest discount rate of 0.40 percent for PERS and TRS Plans 1, 0.04 percent for PERS 2/3, 0.33 percent for TRS 2/3, and 0.44 percent for SERS 2/3.

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Actuarial Certification

Report on Financial Condition

August 31, 2011

This report documents the results of an actuarial assessment of the financial condition 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. The primary purpose of this assessment 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. We understand the report may be used for other purposes, including an identification of risks facing the retirement plans documented above. However, this report does not represent a complete risk analysis of these retirement plans. Please replace this report in the future when the result of a more recent assessment becomes available.

Please see the *2010 Actuarial Valuation Report (AVR)* for the data, assumptions, and methods used in determining the actuarial valuation results for this report. Please see the Actuarial Certification in the 2010 AVR for additional information concerning the development, purpose, and use of the 2010 actuarial valuation results. Participant data reflects retirement system census data through June 30, 2010. Asset data reflects returns through June 30, 2010.

The Department of Retirement Systems provided 2010 member and beneficiary data to us. We checked the data for reasonableness as appropriate based on the purpose of this report. The Washington State Investment Board (WSIB) provided asset information as of June 30, 2010. 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 adequate and substantially complete for purposes of this assessment.

This report involves the interpretation of many factors and the application of professional judgment. We believe that the data, assumptions, and methods used in the underlying report 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.

Sincerely,

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

Troy Dempsey, ASA, EA, MAAA
Actuary

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REPORT ON LONG-TERM ECONOMIC ASSUMPTIONS

Prepared for the Pension Funding Council



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 each assumption and evaluate relevant data.
- ❖ Develop a best-estimate range for each economic assumption.
- ❖ Select a specific point estimate within the best-estimate range.
- ❖ Review the set of economic assumptions for consistency.

For each economic assumption, the best-estimate range is “the narrowest range within which the actuary reasonably anticipates that the actual results, compounded over the measurement period, are more likely than not to fall.” The measurement period is the time period after the valuation date when a particular economic assumption will apply. Pension funding occurs over long time periods; therefore, the measurement period for certain economic assumptions can easily exceed 50 years.

The “building block” method is one acceptable method for setting economic assumptions identified in ASOP 27. 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 range for the given economic assumption. With the exception of annual growth in system membership assumption, we used the building block method to develop each assumption in the 2011 Economic Experience Study.

Experience Study and Recommended Assumptions

We will identify the following for each assumption we studied:

- ❖ How the assumption is used for funding in our actuarial valuation model.
- ❖ The data we studied and how we analyzed the data.
- ❖ How we developed each assumption.
- ❖ The single point best-estimate and its best-estimate range.

Total Inflation Assumption

For funding purposes, we primarily use total inflation to model post-retirement Cost-Of-Living-Adjustments (COLAs). Retired Washington state members from Plans 2/3, WSPRS, and LEOFF Plan 1, who currently receive a pension from the Washington State retirement systems receive a COLA based on changes in the Consumer Price Index (CPI). The CPI used is the Seattle, Tacoma, Bremerton (STB) CPI for Urban Wage Earners and Clerical Workers (CPI-W). We also use total inflation and components of total inflation in the development of the salary growth and investment return assumptions.

In developing this assumption, we relied on data from the Bureau of Labor and Statistics (BLS) for historical inflation. We also considered estimates on future inflation from third party sources. Additionally, we consulted with the Washington State Investment Board (WSIB), the Economic and Revenue Forecast Council (ERFC), and the Office of Financial Management (OFM).

We are recommending a decrease in the total inflation assumption due to a decrease in the average total inflation over the past twenty years and expectations of lower future inflation. We studied future broad economic assumptions and National CPI projections from the ERFC, Global Insight (GI), the Social Security Administration (SSA) and the Congressional Budget Office (CBO). These four entities had varying opinions on future inflation, however they all project lower inflation than the average historical inflation over the past 25 years.

Best-Estimate Range

Total Inflation.
1.50 percent to 4.20 percent.

Recommendation

Total Inflation.
3.00 percent.*

**Includes 2.50 percent broad economic inflation, 0.25 percent national price inflation adjustment, and 0.25 percent regional price inflation adjustment.*

Current Assumption

3.50 percent.

Data

Historical Inflation Data (Appendix A).
Projected GDP Deflator and National CPI (Appendix B).

Methodology

We used the building block method to develop our inflation assumption, nominal investment return assumption and our general salary growth assumption. In the building block approach, the actuary determines components of each assumption and makes an estimate for each component. The estimated components for each assumption are combined to arrive at a best estimate for the assumption. Nominal investment return and general salary growth both use inflation as one of their building block components.

We use three building block components to create our total inflation assumption. The three building block components are broad economic inflation, National CPI–W adjustment and STB CPI-W adjustment. The combination of all three components will be referred to as total inflation in this report. We made a recommendation only on total inflation, however we studied each inflation component individually and how they compare to each other.

Analysis

Broad Economic Inflation

Assumption

2.50 percent.

Best-Estimate Range

1.50 percent to 3.30 percent.

The base for our total inflation assumption is the Gross Domestic Product (GDP) deflator for Personal Consumption Expenditures (PCE). The GDP deflator measures the changes in both price and quantity of the goods produced in a country and provides an indication of whether an economy is growing or shrinking. The GDP deflator was used as our broad economic inflation component because it does not react solely to changes in price like a CPI.

Our annual investment return assumption uses the GDP Deflator as one of its two building block components since GDP Deflator measures an economy's growth. Please see the investment return section for additional details.

We studied the historical GDP deflator produced by the Federal Bureau of Economic Analysis as well as GDP Deflator projections from the ERFC, GI, SSA, and the CBO. Our best-estimate assumption for broad economic inflation, 2.50 percent per year, corresponds with the average GDP Deflator of the data shown in Appendix A over the last 25 years and is equal to the level of inflation assumed by WSIB in their 2011 Capital Market Assumptions (CMAs). Our best-estimate broad economic inflation assumption is higher than SSA's projected intermediate GDP deflator. SSA expects their intermediate GDP deflator to reach an ultimate rate of 2.40 percent in 2019. Given the inherent uncertainty of future inflation, and to retain consistency with WSIB's 2011 CMAs, we believe it is reasonable to select 2.50 percent as our best-estimate.

The low end of the best-estimate range corresponds to SSA's low-cost ultimate GDP Deflator assumption. SSA projects the low-cost GDP Deflator to reach its ultimate rate of 1.50 percent in 2018.

The high end of the best-estimate range corresponds to SSA's high-cost ultimate GDP Deflator assumption. SSA projects the high-cost GDP deflator to reach its ultimate rate of 3.30 percent in 2019.

National CPI-W Adjustment

Assumption

0.25 percent.

Best Estimate Range

0.00 percent to 0.50 percent.

The CPI provides another measure of inflation. It measures changes in price for a fixed basket of goods. A CPI strictly measures price inflation. It does not take into account changes in consumption habits. The Federal Bureau of Labor Statistics (BLS) produced the CPI that we studied. BLS produces different CPIs based on different baskets of goods, for different regions of the country.

We based the national CPI-W adjustment on the average difference between the national CPI-W and the GDP deflator over the last 25 years ($2.81\% - 2.51\% = 0.30\%$). The best-estimate national CPI-W adjustment is lower than the average CBO National CPI-W adjustment, the ERFC projected National CPI-W adjustment, and the SSA national CPI ultimate rate adjustments. The National CPI-W adjustment's best-estimate range includes all National CPI adjustment projections we studied. The GI National CPI-W adjustment and the SSA high cost National CPI ultimate adjustment assumptions represent the low and high ends of the best-estimate range respectively. Please see Appendix B for a table illustrating annually projected National-CPI adjustments from each report.

Seattle, Tacoma, Bremerton (STB) CPI-W Adjustment

Assumption

0.25 percent

Best-Estimate Range

0.00 percent to 0.40 percent

We based the STB CPI-W adjustment on the average difference between STB CPI-W and national CPI-W over the last 25 years ($3.08\% - 2.81\% = 0.27\%$). The lower end of the best-estimate range is consistent with the average STB CPI-W adjustment over the last ten years (rounded down), and the upper end of the best-estimate range is consistent with the average STB CPI-W adjustment over the last 20 years.

Total Inflation

We studied both the National CPI-W and the STB CPI-W and reviewed how they compared to the GDP Deflator. In general, National CPI-W has a higher inflation than the GDP Deflator and the STB CPI-W has a higher inflation than National CPI-W. We built our total inflation assumption by adding National and regional CPI-W adjustments to our broad economic inflation assumption. We assume the GDP Deflator is embedded in CPI so we made “adjustments” to develop our total inflation best estimate.

The best-estimate single-point assumption for total inflation, 3.00 percent per year, is 5 basis points higher than the average STB CPI-W over the last 20 years. The average GDP Deflator has decreased from 5.06 percent during 1980-1989, to 2.42 percent during 1990-1999, and was 2.23 percent during 2000-2009. This may be due to a strict United States monetary policy designed to keep inflation low. The Federal Reserve has no explicit inflation target, but the Federal Reserve appears to be attempting to keep the GDP deflator somewhere between 2.00 percent and 2.50 percent. However the Federal Reserve cannot control inflation on all items. For example, food and energy prices are independent of the Federal Reserve and may fluctuate depending on external forces.

CBO assumes that inflation in the 2017-2021 period will be determined generally by monetary policy and that the Federal Reserve will succeed in maintaining the rate of inflation in consumer prices at about 2.00 percent. While 2.00 percent is within our broad economic inflation best estimate range, we believe it creates too large of a decrease from our currently recommended broad economic inflation assumption. However, we will monitor actual inflation experience and revisit the broad economic inflation assumption again in two years.

Our total inflation assumption will be used in the salary growth section to help determine “productivity growth”. Productivity growth represents the difference between our general salary growth and total inflation. Please see the salary growth section for additional detail.

Recommendation

In recognition of the persistently low inflation over the past 20 years, and the lower projected inflation by several experts in the field of economics, we recommend a reduction in the current total inflation assumption from 3.50 percent to 3.00 percent.

However, the current, legislatively prescribed total inflation assumption of 3.50 percent falls within the best-estimate range and is reasonable.

General Salary Growth

We use this assumption to project salaries to determine future retirement benefits and contribution rates as a percent of payroll. We also use it to determine employer contributions to the Plan 1 UAAL for PERS and TRS as a level percentage of future system payrolls. Generally, a participant's salary will change over the long term in accordance with inflation, productivity growth, merit (or longevity increases), and promotional increases.

In developing this assumption, we relied on data from the Bureau of Labor and Statistics for historical inflation. We also reviewed historical salary data from the Department of Retirement Systems and consulted with OFM.

We are recommending a reduction in the general salary growth assumption due to our recommended reduction in assumed total inflation. Additionally, the economic forecasts we reviewed for our total inflation assumption, and the capital market assumptions from WISB, suggest lower economic growth over the next 15 to 20 years than what occurred in the past.

Best-Estimate Range*

1.50 percent to 5.20 percent.

** We changed methods for determining the best-estimate range for this assumption. See the Analysis section below for details.*

Recommendation

3.75 percent.

Current Assumption

4.00 percent.

Data

Growth in Salaries for Members Active for Three Consecutive Years (Appendix C).

Methodology

Our actuarial model assumes two separate sources of salary increases: general salary growth and merit (or longevity) increases. We study the general salary growth and merit (or longevity) increases separately because we apply the assumptions in different ways. ASOP 27 defines productivity growth 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.” Merit (or longevity) increases are defined as “the rates of change in an individual’s compensation attributable to personal performance, promotion, seniority, or other individual factors.” In

other words, general salary growth applies broadly to many different groups, while merit or longevity increases apply to specific groups and individuals.

We review general salary growth as part of the economic experience study when we look at broad trends. We typically study merit (or longevity) increases as part of the demographic experience study process when we focus more on trends within individual plans. Ideally, the combination of the two assumptions would model total salary growth.

We used the building block method to model general salary growth. Total inflation and productivity growth represent the two building block components for the general salary growth assumption. The total inflation assumption was developed in the inflation section. To develop our productivity growth, we reviewed growth in salaries for active members employed for three consecutive years.

Analysis

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

- 1. Assembled historical system salary growth by plan, and by years of service, from 1984 through 2010.** We display this data in Appendix C. It represents total salary growth, by years of service, for active members consecutively employed for three years during the period 1984 through 2010. For example, for all PERS active members who were employed at least three consecutive years during 1984 through 2010, the average increase in total salary from their first to second year of service was 8.58 percent.
- 2. Identified the portion of historical salary growth attributable to inflation and productivity.** Since the data in Step 1 represents total salary growth by year of service, we then determined the portion attributable to general salary growth. Under our building block method, that means increases attributable to inflation and productivity. We input the average increase for the STB CPI-W for the period 1984 through 2010, 3.04 percent, and solved for the observed productivity increase so the cumulative observed merit increases equaled the cumulative assumed merit increases over the period of assumed merit increases. Under this method, the productivity increase represents the change in total salary increase not attributable to inflation and observed merit (or longevity) increases. For example, if all PERS active members who were employed at least three consecutive years during 1984 through 2010 experienced an average 8.58 percent increase in total salary from their first to second year of service, then about 0.82 percent is attributable to productivity since average inflation was 3.04 percent over the experience study period and the observed merit (or longevity) increase was 4.54 percent.
- 3. Reviewed the observed productivity for reasonableness.** Overall, we found the results reasonable for each system with observed productivity increases ranging from 0.37 percent for SERS to 0.82, 0.83, and 0.74 percent for PERS, TRS, and WSPRS respectively. We would expect an observed

productivity between 0.00 and 1.00 percent and less credible results for smaller systems like SERS and WSPRS.

- 4. Selected our best estimate.** With the results from Step 3, we now have observed general salary growth rates (total inflation plus productivity) by system for the period 1984 to 2010. Next, we considered expectations for the future. The observed inflation during the experience study period for general salary growth, 3.04 percent, is right in line with our best-estimate recommendation for total inflation of 3.00 percent. Observed productivity came in around 0.80 percent. The economic forecasts we reviewed for our total inflation assumption, and the capital market assumptions from the WISB, suggest lower economic growth over the next fifteen to twenty years than what occurred in the past. With that in mind, we selected a best-estimate productivity assumption of 0.75 percent (8 basis points lower than observed productivity in TRS). We will continue to monitor this assumption and may recommend lowering the assumption further when we have additional historical data to support the reduction.
- 5. Selected our best-estimate range.** We set the low end of the best-estimate range equal to the low end of the best-estimate range for total inflation, 1.50 percent, with 0.00 percent productivity. The high end of the best-estimate range equals the high end of the best-estimate range for total inflation, 4.20 percent, with 1.00 percent productivity. We changed the method used to select this year's best-estimate range from the previous method to provide better consistency with our building block approach for developing this assumption.

We did not separately study general salary growth in PSERS due to insufficient data. We also did not separately study general salary increases in TRS from bonuses paid for national board certification due to insufficient historical data. However, we plan to monitor and separately study this form of salary growth in future studies.

Recommendation

We recommend lowering the general salary increase assumption from 4.00 to 3.75 percent.

However, the current, legislatively prescribed general salary increase assumption of 4.00 percent falls within the best-estimate range and is reasonable.

The current legislatively prescribed general salary growth assumption equals the total inflation assumption plus productivity. Productivity currently prescribed in statute equals 0.50 percent. In 2009, the Legislature implicitly lowered the productivity assumption from 1.00 to 0.50 percent when they lowered the general salary increase assumption from 4.50 to 4.00, but did not lower the inflation assumption. Should the Council or the Legislature decide to adopt my recommendation to lower the total inflation assumption from 3.50 to 3.00 percent and lower the general salary growth assumption from 4.00 to 3.75 percent, the productivity assumption in statute needs to increase from 0.50 to 0.75 percent.

Annual Rate of Investment Return

The assumed annual rate of investment return assumption is a key input for determining contribution rates for the ongoing retirement systems. In simple terms, we calculate contribution rates by comparing today's value of future benefit payments to the assets we have on hand at the same point in time. We determine today's value of future benefit payments and salaries using an assumed rate of future investment returns. In developing this assumption, we relied on data provided by the Washington State Investment Board (WSIB) and consulted with WSIB.

We are recommending a decrease in the assumed annual rate of investment return assumption based on WSIB's expectations for future investment returns. We also considered past investment returns and whether the historical conditions that produced the strong investment markets over the past twenty to thirty years will continue in the future. The recommended rate of investment return assumption represents a single rate that applies to all plans invested in the Commingled Trust Fund (CTF). As the membership of the Plans 1 moves to 100 percent retired status and the Plans 1 remain in the CTF, it may become necessary to use separate investment return assumptions for these plans. We considered making this change, but do not recommend plan specific rate of return assumptions at this time.

Best-Estimate Range

6.00 percent to 8.95 percent.

Recommendation

7.50 percent.

Current Assumption

8.00 percent.

Data

Historical Plan Performance (*Appendix D*).

Historical Investment Data - Current Allocations (*Appendix E*).

Historical Investment Data - Alternate Allocations (*Appendix F*).

WSIB Simulated Future Investment Returns (*Appendix G*).

Methodology

The annual rate of investment return assumption reflects anticipated returns on the retirement plan's current and future assets - net of expenses. Actuarial Standard of Practice (ASOP) 27 identifies two methods for setting the rate of return assumption. We described the first method, the "building block" method in the Background section of this report. ASOP 27 also describes the "cash-flow matching" method for setting the rate of return assumption. Under this method, a well diversified bond portfolio is used to closely match expected benefit payments from the pension plan with income from the bond portfolio.

Due to the asset allocation of the CTF, this option is not a reasonable method for setting the rate of return assumption. In addition to the items discussed in the general economic assumption selection process, we consider several key factors when selecting this assumption, namely – the:

- ❖ Purpose of measurement (i.e. on-going plan valuation, plan termination, etc).
- ❖ Measurement period.
- ❖ Investment or asset allocation policy.

We intend to use this assumption to determine the contribution requirements for the on-going retirement systems. A different measurement (i.e., plan termination or settlement liability) would require use of a different return assumption.

The recommended rate of investment return assumption represents a single rate that applies to all plans invested in the CTF. We base that rate on the average future measurement period—referred to as duration—for all plans combined. However, not all plans have the same duration. Plan 1 liabilities have a shorter duration than the liabilities of the Plans 2/3. This occurs because the Plans 1 have been closed to new entrants since 1977, while the Plans 2/3 are still open to new entrants. This means that all Plan 1 benefits will be paid well before the last Plans 2/3 benefits are paid—hence the shorter future measurement period or duration for the Plans 1.

Ideally, the rate of investment return assumption would be coordinated with the WSIB's current asset allocation policy, or targets, for the CTF. We based the recommendation on WSIB's current asset allocation policy. Future changes to the CTF asset allocation policy may require a new recommendation for the rate of investment return assumption.

Analysis

We reviewed the experience data provided in Appendices D-F, considered the historical conditions that produced past annual investment returns, and relied upon the capital market assumptions provided by the WSIB. We used the capital market assumptions (CMAs) to determine rate of investment return simulations. We then used those simulated returns to set the best-estimate range and the recommended rate of investment return assumption.

The CMAs include three pieces of information for each class of assets the WSIB currently invests in:

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

We set the best-estimate range equal to the 25th and 75th percentile of the WSIB simulated 50-year compounded annual rate of investment return distribution: 6.00 percent and 8.95 percent respectively. We selected the best-estimate as approximately equal to the median of the simulated investment returns which is 7.50 percent. Please see Appendix G for additional information regarding simulated future investment returns. As described in the total inflation section, the rate of return assumption uses broad economic inflation as its base building block. Since the best-estimate for the total inflation assumption equals 2.50 percent, the remaining building block, the assumed real rate of investment return, equals 5.00 percent.

Often, the starting point for creating an assumption about the future would be to use historical data. For example, over a 30- to 80-year period, typical pension plan asset allocations would have, on average, investment returns of 9 to 10 percent per year. However, the implicit assumption being made is that conditions, or in this case the structure of the economy, are the same now as the past. When historical investment return data, in particular, is used in setting a forward-looking assumption, extra attention is required to determine whether past conditions are likely to repeat in the future.

The following list demonstrates how conditions have changed and their potential impact on future returns:

- ❖ Economies generally move from agricultural, to industrial, to service based. As a country moves along this progression they experience higher than normal growth and innovation. Many developed countries have progressed to the point where higher than normal growth is no longer expected.
- ❖ Price to Earnings ratios (P/E) state the price of stocks relative to their earnings. P/E ratios grew substantially over the last 30 years, meaning investors were willing to pay more for a stock given an equal amount of earnings. When P/E ratios increase, this creates extra return for stocks (without actual business growth). No one knows where P/E ratios will go from here, but they are likely to remain more stable. We do not expect to see another 30-year period of increase like the past 30 years.
- ❖ Similar to P/E ratios, decreasing or increasing dividend yields add or subtract from investment returns. Historically, dividend yields have decreased from about 8 percent to about 2 percent. Lower future dividend yields will mean lower future investment returns.
- ❖ The level of debt of a private company or the government also affects returns. When debt is taken on, returns generally are better. In the United States, for example, government and private debt has generally increased over the historical period we reviewed. However, increasing debt can't occur forever. As the debt burden stabilizes or gets paid down, it takes away from

productivity increases, and therefore negatively impacts returns. The United States is approaching a 100 percent debt to GDP ratio, which has been shown to negatively impact GDP by approximately 1 percent.

- ❖ Under the building block approach, the total investment return is composed of inflation and the real rate of return. Inflation is expected to be lower in the future than over the historical period we reviewed. Given a constant real rate of return and lower inflation, we'd expect lower investment returns in the future than in the 1970s for example.

A number of other theories exist as well. The list above is not exhaustive, but rather meant to illustrate how conditions are different now compared to history and how those different conditions could produce lower future returns.

Recommendation

We recommend lowering the annual rate of investment return assumption from 8.00 to 7.50 percent. This recommendation is consistent with WSIB's expected investment return assumption.

However, the current, legislatively prescribed annual rate of investment return assumption of 8.00 percent falls within the best-estimate range and is reasonable.

Growth in System Membership

The growth in system membership assumption impacts the amortization of the Plan 1 UAAL. Under current law, the UAAL in PERS Plan 1 and TRS Plan 1 must be amortized over a rolling ten-year period, as a percentage of projected payrolls. We use the growth in system membership assumption to estimate the payroll for future new members. In developing this assumption, we relied upon system membership data from DRS and Washington State population data and forecasts from OFM. We also consulted with OFM.

The projected payroll for the PERS Plan 1 UAAL includes pay from current PERS, SERS, and PSERS members as well as projected payroll from future members of PERS Plans 2/3, SERS, and PSERS. Hereafter, for the discussion of growth in system membership, we will use the term "PERS" to apply to the combined system growth of PERS, SERS, and PSERS. The projected payroll for the TRS Plan 1 UAAL includes pay from current TRS members as well as projected payroll from future TRS Plans 2/3 members.

We are recommending a decrease in the PERS and TRS system growth assumptions due to a decrease in the average system and state population growth over the past 20 years. Additionally, OFM projects both the general Washington State population and the Washington State school age population (ages 5-17) growth rates to decrease (Please see Appendix H for more details). During our analysis (see Analysis section below), we found a

high correlation between system and population growth. PERS system growth is highly correlated to general Washington State population growth, while TRS system growth is highly correlated to Washington State school age population growth. Lastly, we expect a short-term reduction in retirement system growth due to state and local government budget cuts in response to the recent recession. Since we are projecting membership growth over a ten-year period, short-term impacts materially affect this assumption.

Best-Estimate Range

0.00 percent to 1.40 percent for TRS.
0.00 percent to 1.60 percent for PERS.

Recommendation

0.80 percent for TRS.
0.95 percent for PERS.

Current Assumption

0.90 percent for TRS.
1.25 percent for PERS.

Data

Growth in Washington State Population - Historical and Projected (*Appendix H*).
Historical System Growth (*Appendix I*).

Annual Magnitude of System Growth Relative to State Population Growth (*Appendix J*).

Analysis

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

- 1. Examined correlation between system growth and state population data.** During 1990-2010, we found a strong correlation between same-year retirement system growth and population growth. PERS had a 0.82 correlation to same-year Washington State population growth while TRS had a 0.53 correlation to same-year Washington State ages 5-17 population growth (Please see Appendix I for more details). Correlations in our last study were based on headcounts instead of annual growth rates. Based on these correlations, we felt confident setting our system growth assumption as a function of population growth in a year.
- 2. Reviewed the annual magnitude of system growth relative to state population growth.** Using historical data we calculated system growth as a percent of population growth. We divided the 1990-2010 average system growth for PERS and TRS by the applicable average population growth for the same period. PERS grew at annual rate of 120.74 percent of general Washington State population growth. TRS grew at an annual rate of

107.83 percent of Washington State ages 5-17 population growth. Please see Appendix J for more details.

- 3. Used OFM's population projections to determine future system growth by year.** We relied on OFM's state population forecasts for our assumed 2011-2020 population growth. Our method for calculating our projected annual system growth is as follows: we used OFM's 2011-2020 projected population growth by year and multiplied it by our assumed long-term ratio of system growth as a percent of state population growth (Step 2). We used general Washington State population growth (for PERS) and Washington State ages 5-17 population growth (for TRS) due to their high correlations (Step 1).
- 4. Took the average annual system growth from 2011 to 2020 to determine our best-estimate.** We now had projected system growth through 2020 based on the long-term magnitude of system growth relative to state population growth. We decided to create a single assumption that applies in each year of our valuation rather than creating an assumption that varies by year. For our best-estimate assumption, we reduced the magnitude of long-term system growth relative to state population growth (step 3) to reflect our expectation that short-term system growth will be lower due to state and local government budget cuts in response to the recent recession. We selected 0.00 percent growth in the first two years, half of the projected system growth in the next two years and three quarters of the projected system growth in the following two years. We assumed the full projected system growth calculated in step 3 for 2017-2020. Lastly, we took the average of the 2011-2020 best estimate system growth path to approximate our best estimate.

We provide tables on the following page to display how we developed our best-estimate for PERS and TRS.

Year	WA Population Growth	Projected Long-Term System Growth*	PERS Best Estimate System Growth
2011	1.01%	1.22%	0.00%
2012	1.13%	1.36%	0.00%
2013	1.32%	1.59%	0.80%
2014	1.27%	1.53%	0.77%
2015	1.25%	1.50%	1.13%
2016	1.23%	1.48%	1.11%
2017	1.21%	1.47%	1.47%
2018	1.19%	1.44%	1.44%
2019	1.17%	1.42%	1.42%
2020	1.15%	1.39%	1.39%
2011-2020 Average			0.95%

**Projected PERS system growth equals projected general Washington State population growth multiplied by long-term PERS growth magnitude factor of 120.74%.*

Year	WA 5-17 Population Growth	Projected Long-Term System Growth*	TRS Best Estimate System Growth
2011	(0.14%)	(0.15%)	0.00%
2012	0.62%	0.67%	0.00%
2013	1.07%	1.15%	0.58%
2014	1.11%	1.19%	0.60%
2015	1.09%	1.17%	0.88%
2016	1.05%	1.14%	0.85%
2017	1.12%	1.20%	1.20%
2018	1.26%	1.35%	1.35%
2019	1.12%	1.21%	1.21%
2020	1.28%	1.39%	1.39%
2011-2020 Average			0.81%

**Projected TRS system growth equals projected Washington State ages 5-17 population growth multiplied by long-term TRS growth magnitude factor of 107.83%.*

- 5. Determined best-estimate range.** For the lower end of the best-estimate range, we selected 0.00 percent. System growth would likely not occur if we experience an extended economic downturn or experience a double dip recession. For the upper end of the best estimate range, we selected the highest single year projected annual system growth during 2011-2020. The highest

projected system growth for PERS was 1.59 percent which we rounded to 1.60 percent. The highest projected system growth for TRS is 1.39 percent, which we rounded to 1.40 percent.

Recommendation

We recommend lowering the growth in system membership assumption from 1.25 to 0.95 percent in PERS. We recommend lowering the growth in system membership assumption from 0.90 to 0.80 percent in TRS.

However, the current, legislatively prescribed growth in system membership assumptions fall within the best-estimate ranges and are reasonable.

Risk Analysis

Of all the economic assumptions, the assumed rate of investment return, by far, has the largest impact on pension funding. Therefore, we focus the risk analysis on our recommendation to reduce the rate of return assumption.

In this section, we study the impact on the Washington state pension systems resulting from lowering the annual investment return assumption from 8.00 to 7.50 percent. Reducing the interest rate to 7.50 percent will affect the overall risk and affordability of the Washington state pension systems as shown in the Pension Score Card below.

Please see the *2010 Risk Assessment Report* for information on the development and use of the Pension Score Card.

Pension Score Card		8.00%		7.50%	
		Value	Score	Value	Score
Category (Dollars in Billions)					
Affordability					
Chance Pensions will Consume More than 8% of GF-S ¹		18.0%	37	18.0%	35
5% Chance GF-S ¹ Consumption will Exceed		9.9%	39	10.0%	38
5% Chance Employer Contribution Rate will Exceed		20.1%	44	20.3%	43
Risk					
Chance of PERS 1, TRS 1 in Pay-Go ²		41%	19	39%	21
Chance of Open Plan in Pay-Go ²		13%	47	11%	49
5% Chance Annual Pay-Go Cost ³ in PERS 1, TRS 1 Exceed		\$1.7	38	\$1.7	38
5% Chance Annual Pay-Go Cost ³ in Open Plans Exceed		\$4.0	11	\$3.6	16
Chance of Total Funded Status Below 60%		34%	24	31%	29
Total Weighted Score			33		34

¹Currently 2.7% of GF-S.

²When today's value of annual cost exceeds \$50 million.

³Pay-Go costs on top of normal pension costs.

Note: The score card above is based on data from our 2009 projections, which includes the UCOLA benefit. If the UCOLA were removed from our risk analysis, and we included recent asset returns, the risk and affordability scores would improve. However, we don't expect the relative differences between the two assumption scenarios and resulting findings to change.

Short-Term Affordability

We found that lowering the rate of return assumption will increase affordability risk (less affordable) as measured under the Pension Score Card due to increased contribution requirements in the short-term (see discussion below for the long-term impacts). Affordability on the score card compares the single most unaffordable points over the projected 50-year period between the two assumed annual investment return assumptions (8.00% and 7.50%). The 8.00 percent annual investment return assumption has a lower maximum contribution rate under the very pessimistic scenario. Under the very pessimistic scenario, the 7.50 percent and 8.00 percent annual investment return assumption had a difference in maximum employer contribution rate of 20 basis points (20.3% - 20.1% = 0.2%).

Contribution Rate Volatility

We found that contribution rates become less volatile under the recommended 7.50 percent assumption than under the current prescribed 8.00 percent return assumption. The difference between the 95th percentile (very pessimistic) and 5th percentile (very optimistic) long-term annual change in effective employer contribution rates for all systems, under the 7.50 percent annual investment return assumption, becomes more narrow in the long-term. In the final year of our 7.50 percent annual investment return projections, the annual change in effective employer contributions on the very pessimistic and the very optimistic

are both approximately nine basis points closer to zero than the very pessimistic and very optimistic scenarios under eight percent annual investment return. The range under the very pessimistic and very optimistic annual change in effective employer contribution rates, under eight percent annual investment return, was -1.72 to 1.98 percent. Under the 7.50 percent annual investment return assumption the range under the very pessimistic and very optimistic annual change was -1.63 to 1.89 percent.

This tells us that the contribution rates become more stable over the long-term when we assume 7.50 percent annual investment return. The percent of GF-S table demonstrates the concept of rates, under 7.50 percent annual investment return, becoming more stable over the long-term. The difference between the percent of GF-S for 95th and 5th percentiles becomes narrower under 7.50 percent in the future.

The reason that employer contribution rates and percent of GF-S become more stable under the 7.50 percent investment return assumption is based on better matching of the expected investment return and the assumed investment return in the model. Under the 8.00 percent investment return assumption, actuarial losses are expected to occur more often than actuarial gains. This puts upward pressure on contribution rates over time as the actuarial losses are recognized. In addition, the additional contributions made under the 7.50 percent investment return assumption help offset increasing contribution rates due to either future funding shortfalls or future benefit improvements.

Risk

Lowering the rate of return assumption will decrease “pay-go” and “low funded status” risks as measured under the Pension Score Card. This occurs because funding at a 7.50 percent assumed rate of return increases required contributions in the short-term and increases the overall assets available to pay plan benefits. Having additional assets on hand improves funded status and therefore lowers pay-go and low funded status risks. We found pay-go risk decreases from a 41 percent chance to a 39 percent chance in the closed plans and decreases from 13 to 11 percent in the open plans. We also found the chance of funded status (on a total combined plan basis) falling below 60 percent fell from 34 percent to 31 percent.

Long-Term Affordability

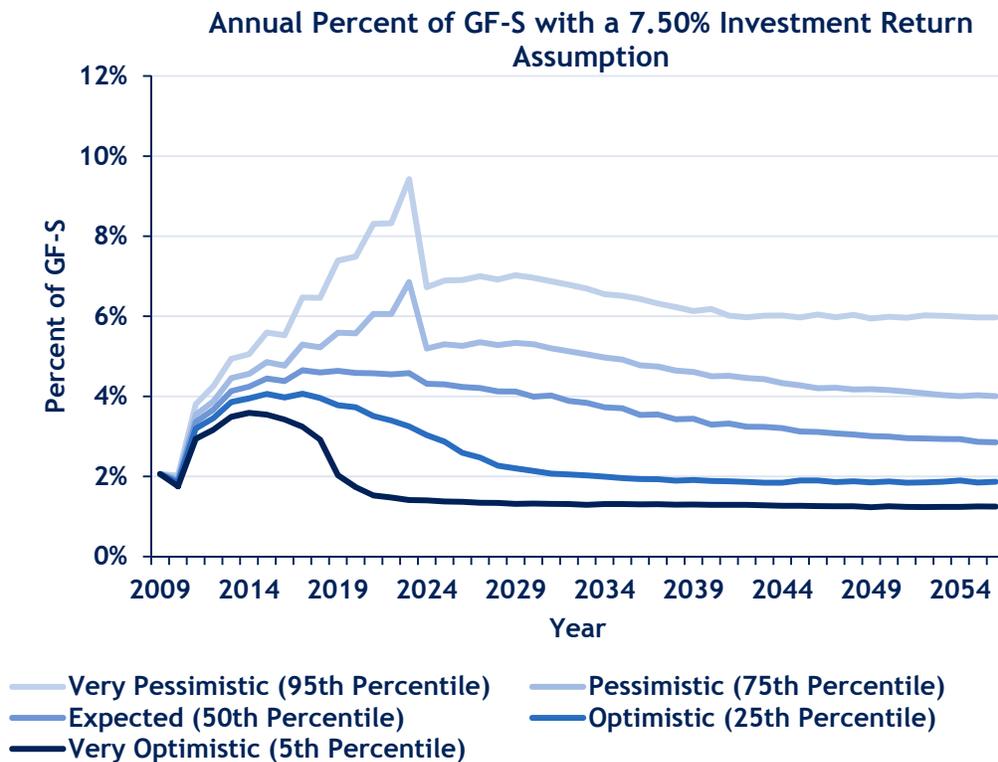
As we discussed above, lowering the rate of return assumption increases required contributions in the short-term and increases affordability risks as measured under the Pension Score Card. However, with the collection of higher contribution rates and the assumed increase in overall assets available to pay benefits, we found an improvement in the long-term affordability of the plans under the recommended annual investment return of 7.50 percent.

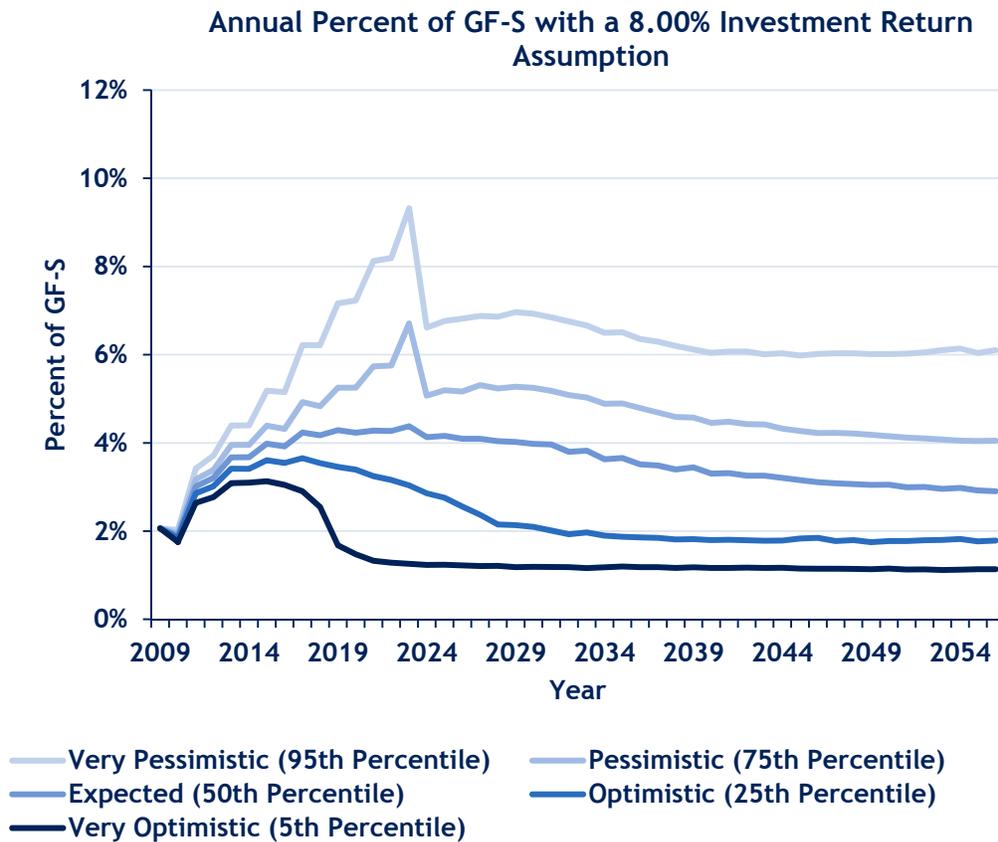
We measured this by reviewing future employer contributions as a percentage of the GF-S budget under the current 8.00 percent assumption and the recommended 7.50 percent rate of return assumption. We display this information in the charts below. We would expect

the trend of decreasing percent of GF-S under the 7.50 percent assumption to continue beyond the 45 years shown here.

Percent of GF-S								
Percentile	2009		2024		2039		2054	
	8.00%	7.50%	8.00%	7.50%	8.00%	7.50%	8.00%	7.50%
5th	2.06	2.06	1.24	1.37	1.18	1.30	1.13	1.24
25th	2.06	2.06	2.86	2.98	1.82	1.89	1.82	1.90
50th	2.06	2.06	4.13	4.29	3.45	3.43	2.98	2.94
75th	2.06	2.06	5.07	5.17	4.57	4.60	4.05	4.01
95th	2.06	2.06	6.61	6.68	6.12	6.14	6.14	6.01

The table above shows select data points from the two graphs below so the differences can be more easily viewed.





A lower percent of GF-S would represent a smaller percent of GF-S being allocated to future pensions. We found affordability between the 8.00 percent and 7.50 percent annual investment return assumptions, on an expected basis, are close to identical over the long term. However, funding at a 7.50 percent annual investment return is more affordable in the pessimistic scenarios and less affordable in the optimistic scenarios (based on higher rate floors).

Summary

We found that lowering the assumed rate of investment return from 8.00 to 7.50 percent will have the following impacts on financial risks to the pension systems:

- ❖ Increase short-term affordability risk (less affordable) as measured under the Pension Score Card. See Recommended Phase-In Section for a discussion of how to manage this risk.
- ❖ Reduce contribution rate volatility in the long-run.
- ❖ Decrease “pay-go” and “low funded status” risks as measured under the Pension Score Card.
- ❖ Improve long-term affordability of the plans.

Please see the *2010 Risk Assessment Report* for a fuller discussion of pension risks. We completed this risk analysis using the same assumptions, methods, and data as disclosed in that report. We updated our latest risk assessment by using known asset returns through June 30, 2011.

Budget Impact of Adopting the Recommended Assumptions

The following table shows the additional contributions required during the 2013-15 Biennium to fund the plans under the recommended set of economic assumptions. We assume full adoption of the recommendation and a resulting increase in contribution rates at the beginning of the 2013-15 Biennium.

Please see the Risk Analysis section for more information on the long-term impacts of adopting the recommendation.

Increase In Contributions From Adopting Recommendation						
(Dollars in Millions)	PERS	TRS	SERS	PSERS	WSPRS	Total
2013-2015						
General Fund	\$69.7	\$157.8	\$28.7	\$4.8	\$0.6	\$261.6
Non-General Fund	99.4	0.0	0.0	0.5	6.6	106.5
Total State	\$169.1	\$157.8	\$28.7	\$5.3	\$7.2	\$368.0
Local Government	180.8	80.2	35.7	1.5	0.0	298.1
Total Employer	\$349.9	\$238.0	\$64.4	\$6.8	\$7.2	\$666.2
Total Employee	\$193.3	\$25.6	\$18.4	\$3.9	\$7.2	\$248.3

Note: Excludes LEOFF 2.

We do not display a budget impact for LEOFF 1 because the plan, on an expected basis, remains fully funded under both the current and recommended set of economic assumptions.

Recommended Phase-In

Adopting the recommended economic assumptions will improve the long-term health and lessen some of the financial risks of the Washington State retirement systems. However, it will also increase short-term budget impacts because contributions to the retirement systems will need to increase in the short-term to replace lower assumed investment returns.* To manage the short-term budget impacts, we recommend phasing in the recommended rate of return assumption over the next five biennia.

**Actual pension costs are based on actual investment returns. Changing the assumed rate of return assumption impacts the amount and timing of future contributions. Funding at an assumed rate of return below actual investment returns will defer required pension contributions and result in higher pension contributions than funding at an assumed rate that ultimately matches future experience.*

Specifically, we recommend lowering the rate of return assumption by 10 basis points each biennium over the next ten years starting in 2013-15 as follows.

Recommended Investment Return Phase-In	
Biennium	Investment Return Assumption
2011-13	8.00%
2013-15	7.90%
2015-17	7.80%
2017-19	7.70%
2019-21	7.60%
2021-23	7.50%

The following table shows the additional contributions required during the 2013-15 Biennium to fund the plans using the recommended phase-in for the rate of return assumption.

Increase In Contributions From Adopting Phase-In						
(Dollars in Millions)	PERS	TRS	SERS	PSERS	WSPRS	Total
2013-2015						
General Fund	\$7.5	\$15.8	\$3.4	\$0.6	\$0.0	\$27.4
Non-General Fund	10.7	0.0	0.0	0.1	0.4	11.1
Total State	\$18.3	\$15.8	\$3.4	\$0.6	\$0.4	\$38.5
Local Government	19.5	8.1	4.3	0.2	0.0	32.0
Total Employer	\$37.8	\$23.9	\$7.7	\$0.8	\$0.4	\$70.6
Total Employee	\$3.7	(\$0.4)	\$0.7	(\$0.2)	\$0.4	\$4.3

Note: Excludes LEOFF 2.

The recommended rate of return assumption phase-in lowers the 2013-15 GF-S budget impact of adopting the full recommendation from approximately \$262 to \$27 million. Additionally, the recommended rate of return assumption phase-in lowers the 2013-15 Biennium's total employer's budget impact of adopting the full recommendation from approximately \$666 to \$71 million. Please see the Risk Analysis section for more information on the long-term impacts of adopting the recommendation.

We do not display a budget impact for LEOFF 1 because the plan, on an expected basis, remains fully funded under both the current and recommended set of economic assumptions.

The recommended rate of return assumption phase-in lessens the short-term budget impacts while retaining most of the system health and risk benefits discussed earlier. Additionally, the rate of return assumption phase-in allows the Council to monitor and confirm the emergence of lower expected investment returns and make adjustments to the phase-in schedule as needed. Future adjustments to the recommended phase-in could include stopping or accelerating the phase-in schedule.



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Report on Long-Term Economic Assumptions

August 31, 2011

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. 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.

This economic experience study includes the most recent and available plan provisions and participant and asset data. We have removed Plan 1 UCOLA benefits to reflect changes from the 2011 Legislative Session. All other plan provisions reflect changes from the 2010 Legislative Session. We have included supplemental contribution rates from the 2011 Legislative Session. Participant data reflects preliminary retirement system census data through June 30, 2010. Asset data reflects preliminary returns through June 30, 2011.

The Department of Retirement Systems provided 2010 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, 2011. 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 adequate and substantially complete for purposes of this experience study.

We relied on the Capital Market Assumptions (CMAs) from the WSIB to formulate expectations for future rates of annual investment return. We reviewed the CMAs 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.

Sincerely,

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

Troy Dempsey, ASA, EA, MAAA
Actuary

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Appendices – Report on Long-Term Economic Assumptions

Appendix A

Historical Inflation Data						
Year	Seattle-Tacoma-Bremerton, WA CPI-W	U.S. City Average CPI-W	GDP Deflator for Personal Consumption Expenditures	Annual % Change		
				Seattle CPI-W	U.S. CPI-W	GDP PCE
1983	293.2	297.4	55.842	(0.27%)	3.05%	4.30%
1984	302.8	307.6	57.955	3.27%	3.43%	3.78%
1985	309.1	318.5	59.854	2.08%	3.54%	3.28%
1986	311.3	323.4	61.313	0.71%	1.54%	2.44%
1987	318.6	335.0	63.589	2.35%	3.59%	3.71%
1988	329.1	348.4	66.121	3.30%	4.00%	3.98%
1989	344.5	365.2	68.994	4.68%	4.82%	4.35%
1990	369.0	384.4	72.147	7.11%	5.26%	4.57%
1991	389.4	399.9	74.755	5.53%	4.03%	3.61%
1992	403.2	411.5	76.954	3.54%	2.90%	2.94%
1993	415.2	423.1	78.643	2.98%	2.82%	2.19%
1994	430.4	433.8	80.265	3.66%	2.53%	2.06%
1995	442.9	446.1	82.041	2.90%	2.84%	2.21%
1996	457.5	459.1	83.826	3.30%	2.91%	2.18%
1997	471.7	469.3	85.395	3.10%	2.22%	1.87%
1998	484.1	475.6	86.207	2.63%	1.34%	0.95%
1999	499.1	486.2	87.596	3.10%	2.23%	1.61%
2000	517.8	503.1	89.777	3.75%	3.48%	2.49%
2001	536.2	516.8	91.488	3.55%	2.72%	1.91%
2002	545.9	523.9	92.736	1.81%	1.37%	1.36%
2003	553.6	535.6	94.622	1.41%	2.23%	2.03%
2004	562.3	549.5	97.098	1.57%	2.60%	2.62%
2005	579.3	568.9	100.000	3.02%	3.53%	2.99%
2006	600.9	587.2	102.746	3.73%	3.22%	2.75%
2007	623.7	604.0	105.564	3.79%	2.86%	2.74%
2008	651.6	628.7	109.061	4.48%	4.09%	3.31%
2009	654.5	624.4	109.258	0.44%	(0.67%)	0.18%
2010	659.6	637.3	111.117	0.78%	2.07%	1.70%

Geometric Averages			
	2011		
	Seattle CPI-W	U.S. CPI-W	GDP PCE
All years	3.76%	3.65%	3.18%
Last 30 years	3.30%	3.21%	2.94%
Last 25 years	3.08%	2.81%	2.51%
Last 20 years	2.95%	2.56%	2.18%
Last 10 years	2.45%	2.39%	2.16%
Last 5 Years	2.63%	2.30%	2.13%

Data sources: Department of Labor, Bureau of Labor Statistics and Department of Commerce, Bureau of Economic Analysis.

Appendix B

	Annual Projected National CPI Increase						Annual Projected GDP Deflator Increase						
	CBO	ERFC	GI	SSA Int*	SSA Low*	SSA High ¹	CBO	ERFC	GI	SSA Int ²	SSA Low ²	SSA High ²	
2011	1.60%	3.00%	2.99%	1.20%	1.10%	1.60%	2011	1.34%	2.24%	2.25%	1.20%	1.10%	1.60%
2012	1.30%	1.79%	1.80%	1.40%	1.20%	1.88%	2012	1.21%	1.63%	1.63%	1.00%	0.90%	1.38%
2013	1.50%	1.73%	1.89%	1.60%	1.30%	2.15%	2013	1.44%	1.62%	1.71%	1.20%	1.00%	1.65%
2014	1.80%		1.96%	1.80%	1.40%	2.43%	2014	1.62%		1.88%	1.40%	1.10%	1.93%
2015	2.00%		2.04%	2.00%	1.50%	2.70%	2015	1.70%		1.98%	1.60%	1.20%	2.20%
2016	2.20%		2.14%	2.20%	1.60%	2.98%	2016	1.87%		2.04%	1.80%	1.30%	2.48%
2017	2.40%		2.04%	2.40%	1.70%	3.25%	2017	2.04%		1.97%	2.00%	1.40%	2.75%
2018	2.40%		1.99%	2.60%	1.80%	3.53%	2018	2.04%		1.96%	2.20%	1.50%	3.03%
2019	2.30%		1.86%	2.80%	1.80%	3.80%	2019	2.03%		1.84%	2.40%	1.50%	3.30%
2020	2.30%		1.78%	2.80%	1.80%	3.80%	2020	2.03%		1.79%	2.40%	1.50%	3.30%
2021	2.30%		1.88%	2.80%	1.80%	3.80%	2021	2.03%		1.82%	2.40%	1.50%	3.30%
2022			2.27%	2.80%	1.80%	3.80%	2022			2.01%	2.40%	1.50%	3.30%
2023			1.85%	2.80%	1.80%	3.80%	2023			1.81%	2.40%	1.50%	3.30%
2024			1.92%	2.80%	1.80%	3.80%	2024			1.85%	2.40%	1.50%	3.30%
2025			1.94%	2.80%	1.80%	3.80%	2025			1.87%	2.40%	1.50%	3.30%
2026			1.97%	2.80%	1.80%	3.80%	2026			1.92%	2.40%	1.50%	3.30%
2027			2.00%	2.80%	1.80%	3.80%	2027			1.94%	2.40%	1.50%	3.30%
2028			2.04%	2.80%	1.80%	3.80%	2028			1.98%	2.40%	1.50%	3.30%
2029			2.08%	2.80%	1.80%	3.80%	2029			2.01%	2.40%	1.50%	3.30%
2030			2.05%	2.80%	1.80%	3.80%	2030			2.02%	2.40%	1.50%	3.30%
2031			2.08%	2.80%	1.80%	3.80%	2031			2.04%	2.40%	1.50%	3.30%
2032			2.07%	2.80%	1.80%	3.80%	2032			2.04%	2.40%	1.50%	3.30%
2033			2.06%	2.80%	1.80%	3.80%	2033			2.06%	2.40%	1.50%	3.30%
2034			2.09%	2.80%	1.80%	3.80%	2034			2.08%	2.40%	1.50%	3.30%
2035			2.04%	2.80%	1.80%	3.80%	2035			2.03%	2.40%	1.50%	3.30%
2036			2.01%	2.80%	1.80%	3.80%	2036			2.01%	2.40%	1.50%	3.30%
2037			2.02%	2.80%	1.80%	3.80%	2037			2.02%	2.40%	1.50%	3.30%
2038			2.05%	2.80%	1.80%	3.80%	2038			2.05%	2.40%	1.50%	3.30%
2039			2.08%	2.80%	1.80%	3.80%	2039			2.08%	2.40%	1.50%	3.30%
2040			2.09%	2.80%	1.80%	3.80%	2040			2.09%	2.40%	1.50%	3.30%
2041			2.10%	2.80%	1.80%	3.80%	2041			2.09%	2.40%	1.50%	3.30%

¹SSA did not provide an annual national forecast. They only provided their 2011 projection and ultimate rate projection for the year they determined the ultimate rate will occur. We linearly interpolated the years between 2011 and the ultimate rate year.

²The SSA-intermediate price differential (National CPI – GDP Deflator) is projected to be zero for 2011 and .40% for 2012 and later. We assumed SSA used the same method for low cost and high cost GDP Deflator approximations using a .30% and .50% price differential respectively.

The national SSA forecasts are produced using a different basket of goods from the CBO, ERFC, and GI national projections. SSA uses Urban Wage Earners and Clerical Workers, while the other forecasts use All Urban Consumers. However, we did not find a significant enough difference between the last 20 years average national CPI between the two baskets of goods to require an adjustment for difference in baskets of goods used (3 basis point difference).

Appendix C

Growth in Salaries for Members Active for Three Consecutive Years							
PERS - 1984 to 2010							
Year of Service	Average Increase in Salary	Average Observed Inflation*	Average Observed Productivity	Average Observed Merit Increase	Currently Assumed Merit Increase	Cumulative Observed Merit Increase	Cumulative Assumed Merit Increase
0							
1	10.05%	3.04%	0.82%	5.96%	6.10%	105.96%	106.10%
2	8.58%	3.04%	0.82%	4.54%	4.80%	110.78%	111.19%
3	7.52%	3.04%	0.82%	3.52%	3.80%	114.67%	115.42%
4	6.80%	3.04%	0.82%	2.84%	2.90%	117.93%	118.77%
5	6.16%	3.04%	0.82%	2.21%	2.20%	120.53%	121.38%
6	5.50%	3.04%	0.82%	1.58%	1.50%	122.44%	123.20%
7	5.12%	3.04%	0.82%	1.21%	1.10%	123.92%	124.55%
8	4.85%	3.04%	0.82%	0.95%	0.90%	125.10%	125.67%
9	4.63%	3.04%	0.82%	0.75%	0.70%	126.04%	126.55%
10	4.43%	3.04%	0.82%	0.55%	0.50%	126.73%	127.19%
11	4.33%	3.04%	0.82%	0.45%	0.40%	127.30%	127.70%
12	4.27%	3.04%	0.82%	0.39%	0.30%	127.80%	128.08%
13	4.15%	3.04%	0.82%	0.28%	0.20%	128.16%	128.34%
14	4.10%	3.04%	0.82%	0.24%	0.20%	128.46%	128.59%
15	4.11%	3.04%	0.82%	0.24%	0.20%	128.77%	128.85%
16	4.09%	3.04%	0.82%	0.22%	0.20%	129.06%	129.11%

* Average change in the CPI-W, Seattle, Tacoma, Bremerton, from 1984 to 2010.

Increase in salary = $(1 + \text{observed inflation} + \text{observed productivity}) * (1 + \text{observed merit}) - 1$

Growth in Salaries for Members Active for Three Consecutive Years							
TRS - 1984 to 2010							
Year of Service	Average Increase in Salary	Average Observed Inflation*	Average Observed Productivity	Average Observed Merit Increase	Currently Assumed Merit Increase	Cumulative Observed Merit Increase	Cumulative Assumed Merit Increase
0							
1	9.26%	3.04%	0.83%	5.19%	5.80%	105.19%	105.80%
2	7.71%	3.04%	0.83%	3.70%	4.30%	109.08%	110.35%
3	7.65%	3.04%	0.83%	3.64%	4.10%	113.05%	114.87%
4	7.38%	3.04%	0.83%	3.38%	3.50%	116.86%	118.89%
5	6.95%	3.04%	0.83%	2.96%	3.10%	120.33%	122.58%
6	6.76%	3.04%	0.83%	2.79%	2.80%	123.68%	126.01%
7	6.71%	3.04%	0.83%	2.74%	2.60%	127.07%	129.29%
8	6.63%	3.04%	0.83%	2.66%	2.40%	130.45%	132.39%
9	6.36%	3.04%	0.83%	2.40%	2.20%	133.58%	135.30%
10	6.21%	3.04%	0.83%	2.25%	2.00%	136.58%	138.01%
11	6.00%	3.04%	0.83%	2.05%	1.90%	139.38%	140.63%
12	5.78%	3.04%	0.83%	1.84%	1.70%	141.94%	143.02%
13	5.49%	3.04%	0.83%	1.56%	1.50%	144.16%	145.17%
14	5.06%	3.04%	0.83%	1.15%	1.00%	145.82%	146.62%
15	4.83%	3.04%	0.83%	0.93%	0.80%	147.17%	147.79%
16	4.45%	3.04%	0.83%	0.55%	0.40%	147.99%	148.38%
17	4.07%	3.04%	0.83%	0.20%	0.10%	148.28%	148.53%
18	3.97%	3.04%	0.83%	0.10%	0.10%	148.42%	148.68%
19	3.96%	3.04%	0.83%	0.09%	0.10%	148.55%	148.83%
20	3.93%	3.04%	0.83%	0.05%	0.10%	148.63%	148.98%
21	3.95%	3.04%	0.83%	0.08%	0.10%	148.75%	149.13%
22	3.98%	3.04%	0.83%	0.11%	0.10%	148.91%	149.28%
23	4.10%	3.04%	0.83%	0.22%	0.10%	149.23%	149.43%
24	4.14%	3.04%	0.83%	0.26%	0.10%	149.63%	149.58%
25	3.89%	3.04%	0.83%	0.02%	0.10%	149.66%	149.73%

*Average change in the CPI-W, Seattle, Tacoma, Bremerton, from 1984 to 2010.

Increase in salary = $(1 + \text{observed inflation} + \text{observed productivity}) * (1 + \text{observed merit}) - 1$

Growth in Salaries for Members Active for Three Consecutive Years							
SERS - 1984 to 2010							
Year of Service	Average Increase in Salary	Average Observed Inflation*	Average Observed Productivity	Average Observed Merit Increase	Currently Assumed Merit Increase	Cumulative Observed Merit Increase	Cumulative Assumed Merit Increase
0							
1	10.12%	3.04%	0.37%	6.49%	6.90%	106.49%	106.90%
2	7.27%	3.04%	0.37%	3.73%	3.90%	110.46%	111.07%
3	6.23%	3.04%	0.37%	2.72%	2.90%	113.47%	114.29%
4	5.70%	3.04%	0.37%	2.22%	2.30%	115.99%	116.92%
5	5.43%	3.04%	0.37%	1.95%	2.20%	118.25%	119.49%
6	5.08%	3.04%	0.37%	1.61%	1.60%	120.16%	121.40%
7	4.72%	3.04%	0.37%	1.27%	1.30%	121.69%	122.98%
8	4.69%	3.04%	0.37%	1.24%	1.20%	123.20%	124.46%
9	4.39%	3.04%	0.37%	0.95%	0.90%	124.37%	125.58%
10	4.33%	3.04%	0.37%	0.89%	0.80%	125.47%	126.58%
11	4.17%	3.04%	0.37%	0.73%	0.70%	126.39%	127.47%
12	3.92%	3.04%	0.37%	0.50%	0.40%	127.02%	127.98%
13	3.87%	3.04%	0.37%	0.44%	0.40%	127.58%	128.49%
14	3.85%	3.04%	0.37%	0.43%	0.30%	128.12%	128.87%
15	3.79%	3.04%	0.37%	0.37%	0.10%	128.60%	129.00%
16	3.53%	3.04%	0.37%	0.11%	0.10%	128.75%	129.13%
17	3.68%	3.04%	0.37%	0.26%	0.10%	129.09%	129.26%
18	3.52%	3.04%	0.37%	0.11%	0.10%	129.22%	129.39%
19	3.69%	3.04%	0.37%	0.27%	0.10%	129.58%	129.52%

*Average change in the CPI-W, Seattle, Tacoma, Bremerton, from 1984 to 2010.

Increase in salary = $(1 + \text{observed inflation} + \text{observed productivity}) * (1 + \text{observed merit}) - 1$

Growth in Salaries for Members Active for Three Consecutive Years							
WSPRS - 1984 to 2010							
Year of Service	Average Increase in Salary	Average Observed Inflation*	Average Observed Productivity	Average Observed Merit Increase	Currently Assumed Merit Increase	Cumulative Observed Merit Increase	Cumulative Assumed Merit Increase
0							
1	13.01%	3.04%	0.74%	8.89%	7.10%	108.89%	107.10%
2	10.50%	3.04%	0.74%	6.48%	5.90%	115.94%	113.42%
3	9.17%	3.04%	0.74%	5.20%	5.20%	121.97%	119.32%
4	8.88%	3.04%	0.74%	4.92%	5.20%	127.97%	125.52%
5	8.75%	3.04%	0.74%	4.79%	5.20%	134.09%	132.05%
6	7.20%	3.04%	0.74%	3.30%	4.50%	138.52%	137.99%
7	4.79%	3.04%	0.74%	0.97%	0.80%	139.86%	139.09%
8	3.94%	3.04%	0.74%	0.15%	0.80%	140.07%	140.21%
9	3.97%	3.04%	0.74%	0.18%	0.80%	140.33%	141.33%
10	4.62%	3.04%	0.74%	0.81%	0.80%	141.46%	142.46%
11	4.35%	3.04%	0.74%	0.55%	0.80%	142.23%	143.60%
12	3.98%	3.04%	0.74%	0.19%	0.40%	142.50%	144.17%
13	3.90%	3.04%	0.74%	0.12%	0.40%	142.67%	144.75%
14	3.22%	3.04%	0.74%	-0.54%	0.40%	141.90%	145.33%
15	4.40%	3.04%	0.74%	0.60%	0.40%	142.75%	145.91%
16	5.01%	3.04%	0.74%	1.19%	0.40%	144.44%	146.49%
17	3.92%	3.04%	0.74%	0.13%	0.40%	144.63%	147.08%
18	3.73%	3.04%	0.74%	-0.05%	0.40%	144.56%	147.67%
19	4.07%	3.04%	0.74%	0.28%	0.40%	144.97%	148.26%
20	4.46%	3.04%	0.74%	0.66%	0.40%	145.92%	148.85%
21	4.65%	3.04%	0.74%	0.84%	0.40%	147.14%	149.45%
22	5.01%	3.04%	0.74%	1.18%	0.40%	148.88%	150.05%
23	4.23%	3.04%	0.74%	0.43%	0.40%	149.53%	150.65%
24	4.51%	3.04%	0.74%	0.70%	0.40%	150.57%	151.25%
25	4.65%	3.04%	0.74%	0.84%	0.40%	151.84%	151.85%

*Average change in the CPI-W, Seattle, Tacoma, Bremerton, from 1984 to 2010.

Increase in salary = (1 + observed inflation + observed productivity) * (1 + observed merit) - 1

Appendix D

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	16.70%
2007	21.33%
2008	(1.22%)
2009	(22.84%)
2010	13.22%
2011	21.14%

Geometric Averages	2009	2011
Total Period	10.40%	10.84%
Last 20 Years	7.99%	8.77%
Last 10 Years	3.95%	6.68%

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

Appendix E

Historical Investment Data – Current Allocations									
Year	Investment Return	Year	Investment Return	Year	Investment Return	Year	Investment Return	Year	Investment Return
1926	6.87%	1947	1.53%	1968	13.47%	1989	13.50%	2010	13.22%
1927	22.10%	1948	2.75%	1969	(11.58%)	1990	8.30%	2011	21.14%
1928	26.54%	1949	13.51%	1970	2.16%	1991	9.50%		
1929	(14.85%)	1950	21.78%	1971	13.42%	1992	8.20%		
1930	(16.67%)	1951	9.75%	1972	10.27%	1993	13.07%		
1931	(29.66%)	1952	8.33%	1973	(13.14%)	1994	2.10%		
1932	0.19%	1953	(0.82%)	1974	(14.56%)	1995	16.24%		
1933	57.40%	1954	36.69%	1975	30.91%	1996	16.49%		
1934	9.46%	1955	16.66%	1976	29.01%	1997	20.18%		
1935	30.10%	1956	1.45%	1977	3.86%	1998	17.12%		
1936	31.10%	1957	(4.96%)	1978	8.09%	1999	11.76%		
1937	(26.97%)	1958	30.90%	1979	16.80%	2000	13.56%		
1938	21.64%	1959	7.99%	1980	20.86%	2001	(6.75%)		
1939	1.57%	1960	3.12%	1981	1.76%	2002	(5.15%)		
1940	(3.34%)	1961	18.93%	1982	2.50%	2003	3.02%		
1941	(5.93%)	1962	(3.75%)	1983	47.30%	2004	16.72%		
1942	19.62%	1963	14.89%	1984	(0.03%)	2005	13.05%		
1943	32.49%	1964	13.35%	1985	29.80%	2006	16.70%		
1944	21.99%	1965	15.09%	1986	26.90%	2007	21.33%		
1945	34.34%	1966	(4.84%)	1987	16.90%	2008	(1.22%)		
1946	(5.62%)	1967	27.44%	1988	4.20%	2009	(22.84%)		

Actual investment return for fiscal years ending June 30, 1982 and thereafter. Returns restated for 1993 and beyond. Estimated investment return prior to 1982.

Geometric Averages		
	2009	2011
Total Period	9.29%	9.36%
Last 60 years	9.89%	9.88%
Last 50 years	9.46%	9.63%
Last 40 years	9.81%	10.21%
Last 30 years	10.43%	10.84%

Rolling 30-Year Averages*	
Minimum	7.72%
Maximum	12.65%
Average	10.19%

* Starting in 1926. Last period ending 2011.

Assumptions*	Allocation		Return
Asset Class	2009	2011	
Global Equity	37%	37%	S&P 500
Fixed Income	20%	20%	Average of long-term corporate and government bond index
Private Equity	25%	25%	U.S. small cap stock index
Real Estate	13%	13%	Average of long-term corporate and government bond index
Tangible	5%	5%	CPI + 200 basis points

*Constant asset allocations from 1926 through 1981. Based on Washington State Investment Board's asset allocation for the given year.

Appendix F

Historical Investment Data – Alternate Allocations									
Year	Investment Return	Year	Investment Return	Year	Investment Return	Year	Investment Return	Year	Investment Return
1926	10.00%	1947	2.43%	1968	7.10%	1989	13.50%	2010	13.22%
1927	25.77%	1948	4.81%	1969	(7.73%)	1990	8.30%	2011	21.14%
1928	26.75%	1949	13.23%	1970	8.50%	1991	9.50%		
1929	(3.71%)	1950	19.46%	1971	13.43%	1992	8.20%		
1930	(12.41%)	1951	13.09%	1972	13.98%	1993	13.07%		
1931	(27.44%)	1952	11.96%	1973	(8.79%)	1994	2.10%		
1932	0.62%	1953	0.82%	1974	(15.62%)	1995	16.24%		
1933	34.46%	1954	34.09%	1975	27.09%	1996	16.49%		
1934	3.91%	1955	18.77%	1976	21.38%	1997	20.18%		
1935	31.52%	1956	1.46%	1977	(4.10%)	1998	17.12%		
1936	23.20%	1957	(3.23%)	1978	3.69%	1999	11.76%		
1937	(20.42%)	1958	24.35%	1979	9.98%	2000	13.56%		
1938	21.00%	1959	6.53%	1980	18.11%	2001	(6.75%)		
1939	1.74%	1960	4.85%	1981	(2.82%)	2002	(5.15%)		
1940	(3.97%)	1961	17.29%	1982	2.50%	2003	3.02%		
1941	(6.22%)	1962	(2.27%)	1983	47.30%	2004	16.72%		
1942	13.37%	1963	14.36%	1984	(0.03%)	2005	13.05%		
1943	16.52%	1964	11.54%	1985	29.80%	2006	16.70%		
1944	13.36%	1965	7.52%	1986	26.90%	2007	21.33%		
1945	24.83%	1966	(5.27%)	1987	16.90%	2008	(1.22%)		
1946	(4.52%)	1967	11.56%	1988	4.20%	2009	(22.84%)		

Actual investment return for fiscal years ending June 30, 1982, and thereafter. Returns restated for 1993 and beyond. Estimated investment return prior to 1982.

Geometric Averages		
	2009	2011
Total Period	8.36%	8.56%
Last 60 years	9.06%	9.08%
Last 50 years	8.44%	8.68%
Last 40 years	9.17%	9.46%
Last 30 years	10.18%	10.84%

Rolling 30-Year Averages*	
Minimum	7.04%
Maximum	11.67%
Average	9.01%

* Starting in 1926. Last period ending 2011.

Assumptions*		
Asset Class	Allocation	Return
Equity	60%	S&P 500
Fixed Income	40%	Average of long-term corporate and government bond index

*Constant asset allocation from 1926 through 1981. Based on Washington State Investment Board's 2004 asset allocation.

Appendix G

WSIB Simulated Future Investment Returns			
Portfolio Statistics & Capital Market Assumptions			
2011 Asset Class	Target Allocation	Expected 1-Year Return	Standard Deviation
Global Equity	37%	8.65%	17.62%
Tangible Assets	5%	6.50%	8.00%
Fixed Income	20%	4.25%	5.00%
Private Equity	25%	11.50%	27.00%
Real Estate	13%	8.00%	15.00%
Cash	0%	3.00%	2.00%
Total 2011 Target CTF	100%		

2009			
Global Equity	37%	8.50%	16.90%
Tangible Assets	5%	6.50%	8.00%
Fixed Income	20%	5.25%	4.75%
Private Equity	25%	11.50%	29.00%
Real Estate	13%	8.00%	15.00%
Cash	0%	3.50%	1.50%
Total 2009 Target CTF	100%		

Simulated Future Investment Returns		
	Measurement Period	
2011	15 Years	50 Years
75th percentile	10.14%	8.95%
60th percentile	8.50%	8.04%
55th percentile	8.01%	7.76%
Expected Return	7.52%	7.49%
45th percentile	7.04%	7.22%
40th percentile	6.55%	6.94%
25th percentile	4.94%	6.03%
	Measurement Period	
2009	20 Years	50 Years
75th percentile	9.65%	8.87%
60th percentile	8.34%	8.05%
55th percentile	7.94%	7.80%
Expected Return	7.60%	7.57%
45th percentile	7.17%	7.31%
40th percentile	6.78%	7.07%
25th percentile	5.51%	6.25%

Source: Washington State Investment Board.

Appendix H

Growth in Washington State Population - Historical and Projected*								
Historical Growth			Projected Growth					
Year	Count	Annual Growth	Year	Count	Annual Growth	Geometric Averages	2009	2011
1980	4,132,156		2011	6,801,432	1.01%	All years	1.46%	1.43%
1981	4,229,278	2.35%	2012	6,877,966	1.13%	Last 25 years	1.71%	1.71%
1982	4,276,549	1.12%	2013	6,968,554	1.32%	Last 20 years	1.79%	1.65%
1983	4,307,247	0.72%	2014	7,056,956	1.27%	Last 15 years	1.50%	1.41%
1984	4,354,067	1.09%	2015	7,144,852	1.25%	Last 10 years	1.37%	1.37%
1985	4,415,785	1.42%	2016	7,232,659	1.23%	Last 5 years	1.56%	1.53%
1986	4,462,212	1.05%	2017	7,320,466	1.21%	Next 5 years	1.43%	1.19%
1987	4,527,098	1.45%	2018	7,407,922	1.19%	Next 10 years	1.36%	1.19%
1988	4,616,886	1.98%	2019	7,494,927	1.17%	Next 15 years	1.29%	1.15%
1989	4,728,077	2.41%	2020	7,581,302	1.15%	Next 20 years	1.22%	1.10%
1990	4,866,692	2.93%	2021	7,666,766	1.13%			
1991	5,021,339	3.18%	2022	7,751,267	1.10%			
1992	5,141,178	2.39%	2023	7,834,735	1.08%			
1993	5,265,691	2.42%	2024	7,917,123	1.05%			
1994	5,364,342	1.87%	2025	7,998,348	1.03%			
1995	5,470,108	1.97%	2026	8,078,242	1.00%			
1996	5,567,764	1.79%	2027	8,156,872	0.97%			
1997	5,663,763	1.72%	2028	8,234,310	0.95%			
1998	5,750,030	1.52%	2029	8,310,573	0.93%			
1999	5,830,833	1.41%	2030	8,385,714	0.90%			
2000	5,894,121	1.09%						
2001	5,974,910	1.37%						
2002	6,041,710	1.12%						
2003	6,098,300	0.94%						
2004	6,167,800	1.14%						
2005	6,256,400	1.44%						
2006	6,375,600	1.91%						
2007	6,488,000	1.76%						
2008	6,587,600	1.54%						
2009	6,668,200	1.22%						
2010	6,733,250	1.24%						

*Source: Office of Financial Management. Additional computations have been performed to summarize data.

Appendix I

Historical System Growth*									
Year	PERS		WA Population		TRS		WA Population Ages 5-17		
	# of Active Members	Annual Growth	# of People	Annual Growth	# of Active Members	Annual Growth	# of People	Annual Growth	
1990	150,241	7.97%	4,866,692	2.93%	51,323	4.34%	893,252	3.54%	
1991	165,008	9.83%	5,021,339	3.18%	52,779	2.84%	930,866	4.21%	
1992	171,947	4.21%	5,141,178	2.39%	55,276	4.73%	960,367	3.17%	
1993	174,576	1.53%	5,265,691	2.42%	56,571	2.34%	992,179	3.31%	
1994	177,456	1.65%	5,364,342	1.87%	57,731	2.05%	1,020,268	2.83%	
1995	178,833	0.78%	5,470,108	1.97%	59,103	2.38%	1,050,730	2.99%	
1996	182,603	2.11%	5,567,764	1.79%	59,425	0.54%	1,077,440	2.54%	
1997	186,440	2.10%	5,663,763	1.72%	60,815	2.34%	1,101,252	2.21%	
1998	191,850	2.90%	5,750,030	1.52%	61,828	1.67%	1,113,531	1.12%	
1999	196,382	2.36%	5,830,833	1.41%	62,684	1.38%	1,119,908	0.57%	
2000	199,986	1.84%	5,894,121	1.09%	63,858	1.87%	1,119,537	(0.03%)	
2001	201,283	0.65%	5,974,910	1.37%	66,220	3.70%	1,122,896	0.30%	
2002	203,976	1.34%	6,041,710	1.12%	66,063	(0.24%)	1,123,343	0.04%	
2003	203,764	(0.10%)	6,098,300	0.94%	66,075	0.02%	1,120,959	(0.21%)	
2004	206,110	1.15%	6,167,800	1.14%	66,634	0.85%	1,120,795	(0.01%)	
2005	205,928	(0.09%)	6,256,400	1.44%	67,270	0.95%	1,125,051	0.38%	
2006	207,918	0.97%	6,375,600	1.91%	67,736	0.69%	1,136,510	1.02%	
2007	211,602	1.77%	6,488,000	1.76%	64,939	(4.13%)	1,143,570	0.62%	
2008	217,423	2.75%	6,587,600	1.54%	66,524	2.44%	1,144,197	0.05%	
2009	216,049	(0.63%)	6,668,200	1.22%	67,388	1.30%	1,142,408	(0.16%)	
2010	213,075	(1.38%)	6,733,250	0.98%	66,325	(1.58%)	1,138,433	(0.35%)	
Geometric Averages									
Last 20 Years	1.76%		1.64%		1.29%		1.22%		
Last 10 Years	0.64%		1.34%		0.38%		0.17%		
Last 5 Years	0.68%		1.48%		0.28%		0.24%		
Correlations									
1990-2010 PERS Annual Growth and WA Population Annual Growth				82%	1990-2010 TRS Annual Growth and WA Population Ages 5-17 Annual Growth				53%

*Source: Department of Retirement Systems and Office of Financial Management. Additional computations have been performed to summarize data.

Appendix J

Annual Magnitude of System Growth Relative to State Population Growth				
	PERS System Growth	WA Population Growth	TRS System Growth	WA 5-17 Population Growth
1990	7.97%	2.93%	4.34%	3.54%
1991	9.83%	3.18%	2.84%	4.21%
1992	4.21%	2.39%	4.73%	3.17%
1993	1.53%	2.42%	2.34%	3.31%
1994	1.65%	1.87%	2.05%	2.83%
1995	0.78%	1.97%	2.38%	2.99%
1996	2.11%	1.79%	0.54%	2.54%
1997	2.10%	1.72%	2.34%	2.21%
1998	2.90%	1.52%	1.67%	1.12%
1999	2.36%	1.41%	1.38%	0.57%
2000	1.84%	1.09%	1.87%	(0.03%)
2001	0.65%	1.37%	3.70%	0.30%
2002	1.34%	1.12%	(0.24%)	0.04%
2003	(0.10%)	0.94%	0.02%	(0.21%)
2004	1.15%	1.14%	0.85%	(0.01%)
2005	(0.09%)	1.44%	0.95%	0.38%
2006	0.97%	1.91%	0.69%	1.02%
2007	1.77%	1.76%	(4.13%)	0.62%
2008	2.75%	1.54%	2.44%	0.05%
2009	(0.63%)	1.22%	1.30%	(0.16%)
2010	(1.38%)	0.98%	(1.58%)	(0.35%)
Geometric Average	2.05%	1.70%	1.43%	1.33%
Magnitude Factor		120.74% = 2.05% ÷ 1.70%		107.83% = 1.43% ÷ 1.33%

Appendix K

Economic Assumptions for Selected Public Plans Outside Washington				
Economic Assumptions				
State	Plan Name	Investment Return	General Salary Growth	Inflation
AK	Alaska Public Employees Retirement System	8.25%	4.00%	3.50%
AK	Alaska Teachers Retirement System	8.25%	4.00%	3.50%
CA	California Public Employees' Retirement System	7.75%	3.25%	3.00%
CA	California State Teachers' Retirement System	8.00%	4.25%	3.25%
CO	Public Employees' Retirement Association of Colorado (State & School Divisions)	8.00%	4.50%	3.75%
FL	Florida Retirement System	7.75%	4.00%	3.00%
ID	Public Employee Retirement System of Idaho	7.75%	4.00%	3.50%
IA	Iowa Public Employees' Retirement System	7.50%	4.00%	3.25%
MO	Missouri State Employees' Retirement System	8.50%	4.00%	3.20%
OH	Ohio Public Employees Retirement System	8.00%	4.00%	4.00%
OR	Oregon Public Employees Retirement System	8.00%	3.75%	2.75%
WI	Wisconsin Retirement System	7.80%	4.00%	3.0% - 3.5%

Assumptions are developed according to individual plan needs for use in a variety of actuarial models. Additional assumptions may be used, in combination with the reported general salary growth assumption, to model total salary growth. Investment return assumptions are heavily dependent on the plan's asset allocation.

Data gathered from 2010 annual financial reports for the retirement systems where available. Wisconsin data based on 2009 financial reports and active member actuarial valuations. Additional data for Florida gathered from the 2010 actuarial valuations for the Florida Retirement Systems.

Appendix L

Historical Economic Assumptions for Washington State Pension Systems				
Valuation Years	Investment Return	General Salary Growth	Inflation	System Growth
1974 - 1978	9% in 1975 grading to 6.5% in 1980	7% in 1975 grading to 5% in 1980	7% in 1975 grading to 3.5% in 1980	0% TRS 1% PERS
1979 - 1984	10% in 1980 grading to 6.5% in 1990	10% in 1980 grading to 5% in 1990	10% in 1980 grading to 5% in 1990	0% TRS 0% PERS
1985 - 1988	10% in 1985 grading to 7.0% in 1990	5.25%	4.00%	1% TRS 1% PERS
1989 - 1994	7.50%	5.50%	5.00%	0.75% TRS 1.25% PERS
1995 - 1997	7.50%	5.00%	4.25%	0.9% TRS 1.25% all Others
1998 - 1999	7.50%	4.00%	3.50%	0.9% TRS 1.25% all Others
2000 - 2008	8.00%	4.50%	3.50%	0.9% TRS 1.25% all Others
2009 - Present	8.00%	4.00%*	3.50%	0.9% TRS 1.25% all Others

*4.50% for LEOFF 2.