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# Oregon PERS Financial Modeling
## Impact of Pension Obligation Bonds

Bill Hallmark, David Kelly

# Agenda

- Overview of modeling
- Key findings
- Baseline projections for the system
- Impact of pension obligation bond financing
  - Scenario #1 – Based on Portland Public Schools
  - Scenario #2 – Based on the State of Oregon
  - Scenario #3 – A new pension obligation bond

# Overview of Modeling

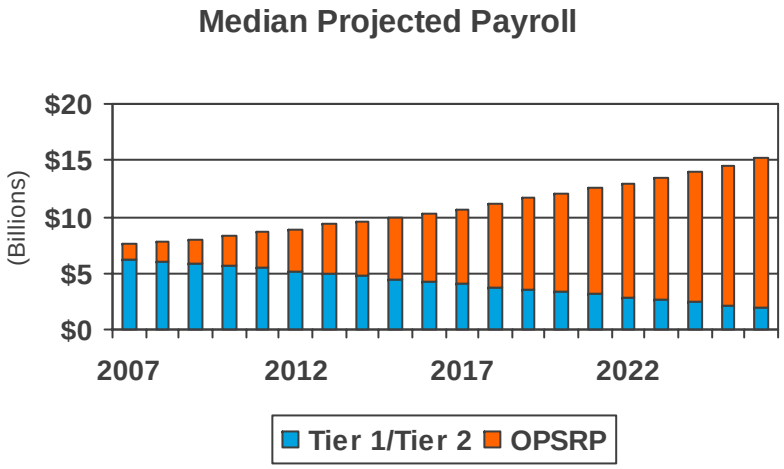
- Basis for Modeling
  - 12/31/2006 Tier 1/Tier 2 and OPSRP actuarial valuations
  - Does not include retiree healthcare or IAP contributions
  - Investment returns through March, 2008
  - OIC investment policy
  - Mercer capital market assumptions
  - 1000 stochastic trials
- Scenarios studied
  - Baseline – Tier 1/Tier 2 plus OPSRP
  - Scenario #1 – Assumes entire system had a side account and pension obligation bond similar to Portland Public Schools
  - Scenario #2 -- Assumes entire system had a side account and pension obligation bond similar to the State of Oregon
  - Scenario #3 – Assumes entire system issued a new pension obligation bond similar to the remaining bond retained by the State of Oregon

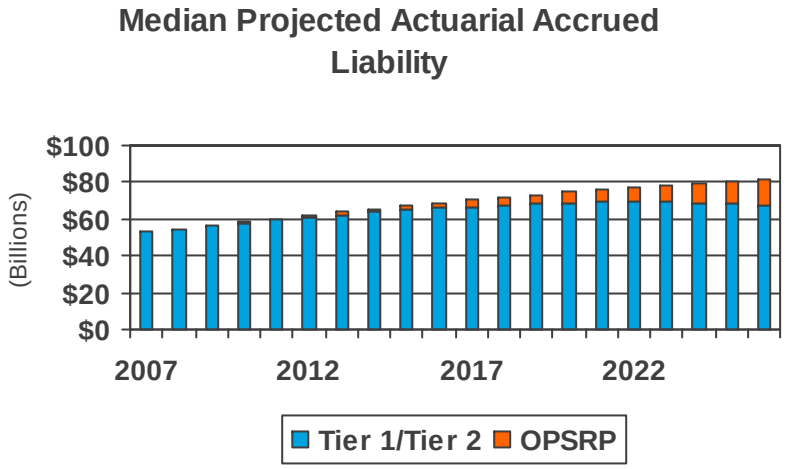
# Key Findings

- Even as OPSRP emerges as the dominant payroll, contribution rates continue to be primarily driven by investment returns on Tier 1/Tier 2 assets.
- Lower contribution rates are expected, but there is significant risk of much higher contribution rates in poor investment environments.
- The downside risks are even more significant in the context of projected tax revenues than just on a percent of payroll basis.
- Most side accounts have performed well compared to the underlying pension obligation bonds so far. However, the potential gains from good investment experience on side accounts may be deferred many years into the future while potential losses may impact contribution rates more immediately.
- PERS may want to consider policy alternatives to help employers manage the downside risks of their side accounts in poor investment return environments.

# **Baseline Projections**
No Side Accounts

# Baseline Projections – No Side Accounts
## Emergence of OPSRP

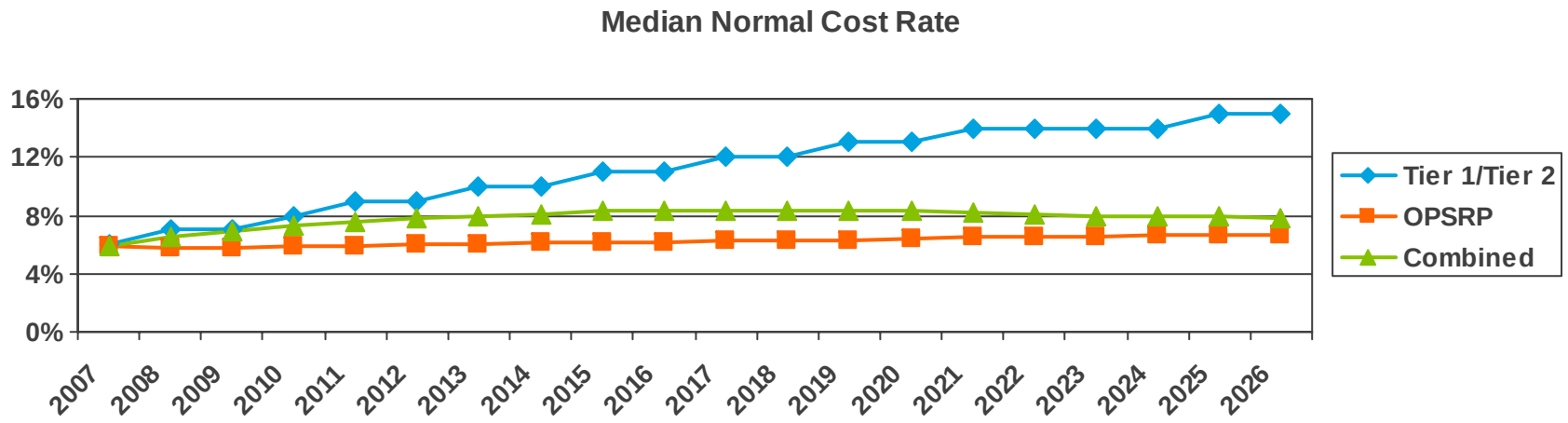



- OPSRP represents a relatively small portion of the total covered payroll now, but is projected to grow to equal Tier 1/Tier 2 payroll in 2014 and become 6.5 times greater than Tier 1/Tier 2 payroll by 2026.
- Even after the majority of the payroll has shifted to OPSRP, most assets and liabilities will remain within the Tier 1/Tier 2 portion of the plan.

# Baseline Projections – No Side Accounts
## Emergence of OPSRP

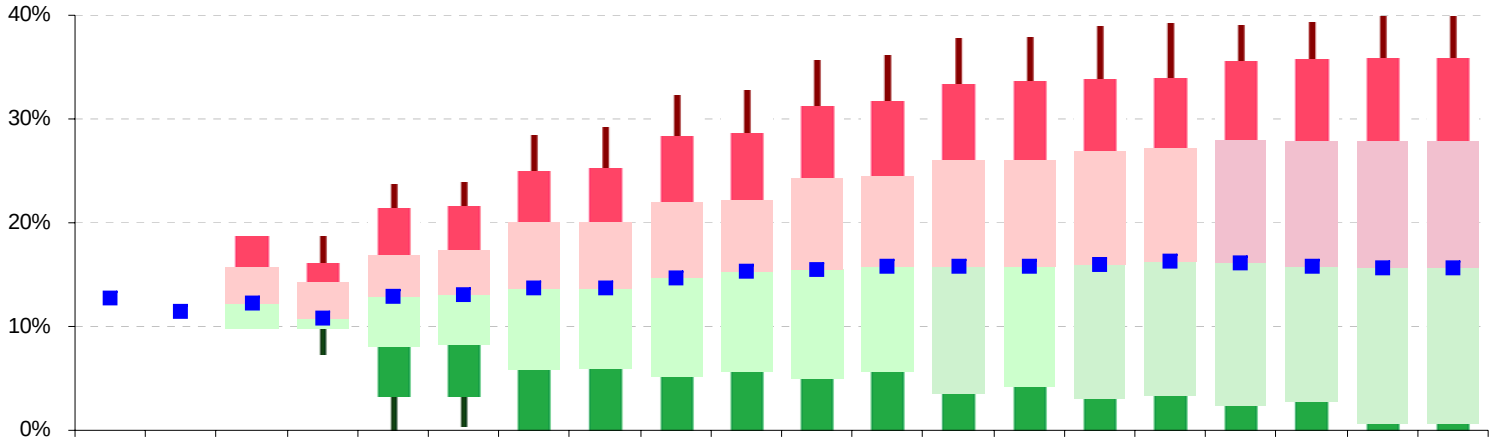
- As Money Match members retire and Tier 1/Tier 2 members age, the normal cost rate for Tier 1/Tier 2 is expected to increase substantially.
- The growing emphasis on OPSRP and the stability of its normal cost rate are expected to keep the combined normal cost rate relatively stable after 2012.
- The short amortization period for the PUC UAL is designed to create a declining UAL rate for the next few years to counter the rising normal cost rate.



# Baseline Projections – No Side Accounts
## Tier 1/Tier 2 Contribution Rate

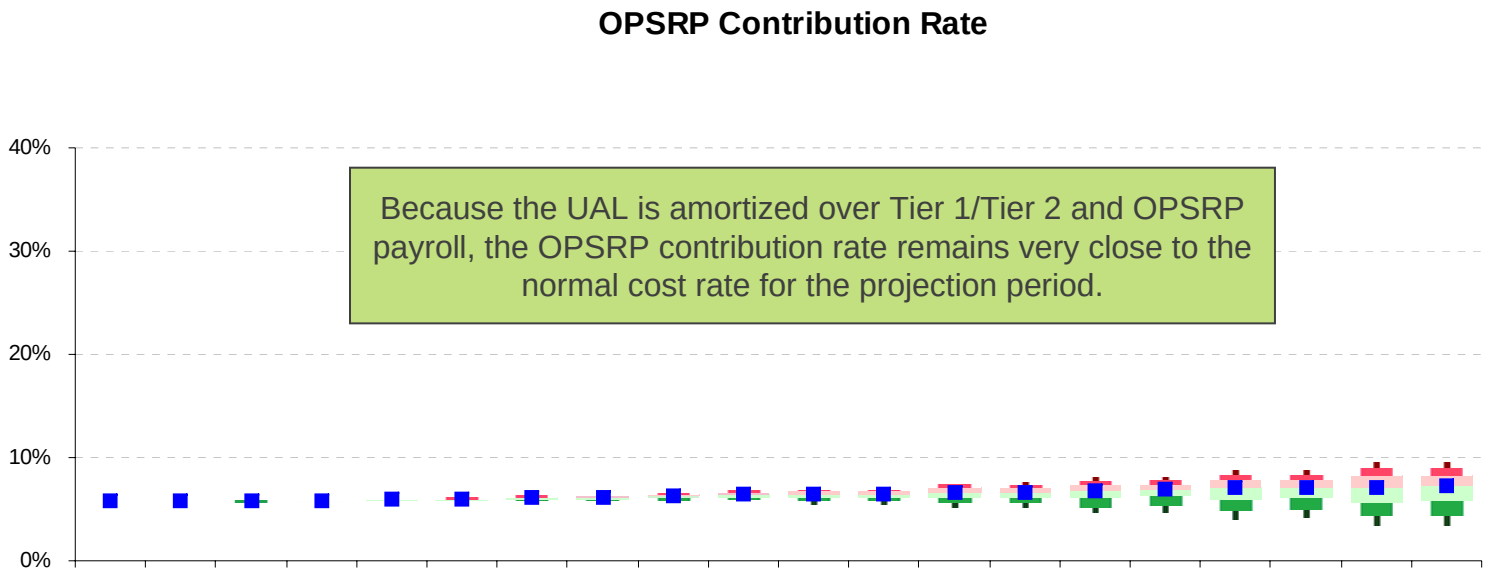
After the PUC UAL is amortized, the rising normal cost rates for Tier 1/Tier 2 cause contribution rates to trend slightly upward. However, this upward trend is applied to a declining payroll.

**Tier 1 / Tier 2 Contribution Rate**




| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 13% | 11% | 19% | 19% | 24% | 24% | 28% | 29% | 32% | 33% | 36% | 36% | 38% | 38% | 39% | 39% | 39% | 39% | 40% | 40% |
| 10th | 13% | 11% | 19% | 16% | 21% | 22% | 25% | 25% | 28% | 29% | 31% | 32% | 33% | 34% | 34% | 34% | 36% | 36% | 36% | 36% |
| 25th | 13% | 11% | 16% | 14% | 17% | 17% | 20% | 20% | 22% | 22% | 24% | 25% | 26% | 26% | 27% | 27% | 28% | 28% | 28% | 28% |
| 50th | 13% | 11% | 12% | 11% | 13% | 13% | 14% | 14% | 15% | 15% | 16% | 16% | 16% | 16% | 16% | 16% | 16% | 16% | 16% | 16% |
| 75th | 13% | 11% | 10% | 10% | 8% | 8% | 6% | 6% | 5% | 6% | 5% | 6% | 4% | 4% | 3% | 3% | 2% | 3% | 1% | 1% |
| 90th | 13% | 11% | 10% | 10% | 3% | 3% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 95th | 13% | 11% | 10% | 7% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# Baseline Projections – No Side Accounts
## OPSRP Contribution Rate

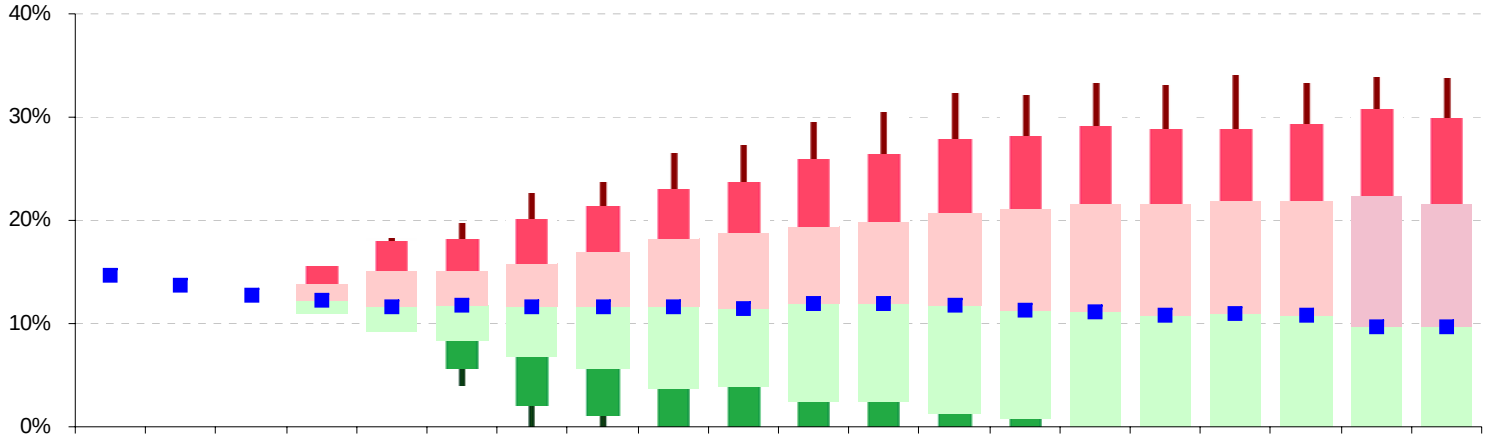



| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 7% | 7% | 7% | 7% | 7% | 8% | 8% | 8% | 9% | 9% | 9% | 10% |
| 10th | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 7% | 7% | 7% | 7% | 7% | 7% | 8% | 8% | 8% | 8% | 9% | 9% |
| 25th | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 8% | 8% | 8% | 8% |
| 50th | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% |
| 75th | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% |
| 90th | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 5% | 5% | 5% | 5% | 4% | 4% |
| 95th | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 5% | 5% | 5% | 5% | 4% | 4% | 3% | 3% |

# Baseline Projections – No Side Accounts
## Total Contribution Rate

The total contribution rate is expected to decline as the PUC UAL is amortized and OPSRP becomes more significant. However, there is significant volatility in the projected contribution rate due to investment experience.

**Total Contribution Rate**

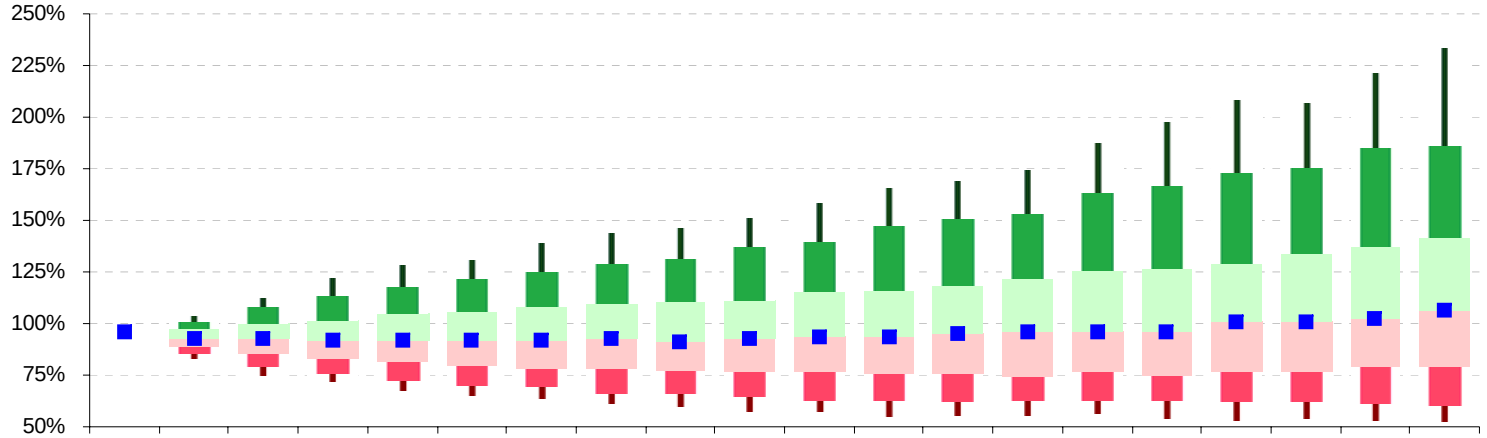



| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 15% | 14% | 13% | 15% | 18% | 20% | 23% | 24% | 26% | 27% | 29% | 30% | 32% | 32% | 33% | 33% | 34% | 33% | 34% | 34% |
| 10th | 15% | 14% | 13% | 15% | 18% | 18% | 20% | 21% | 23% | 24% | 26% | 26% | 28% | 28% | 29% | 29% | 29% | 29% | 31% | 30% |
| 25th | 15% | 14% | 13% | 14% | 15% | 15% | 16% | 17% | 18% | 19% | 19% | 20% | 21% | 21% | 22% | 22% | 22% | 22% | 22% | 22% |
| 50th | 15% | 14% | 13% | 12% | 12% | 12% | 12% | 12% | 12% | 11% | 12% | 12% | 12% | 11% | 11% | 11% | 11% | 11% | 10% | 10% |
| 75th | 15% | 14% | 13% | 11% | 9% | 8% | 7% | 6% | 4% | 4% | 2% | 2% | 1% | 1% | 0% | 0% | 0% | 0% | 0% | 0% |
| 90th | 15% | 14% | 13% | 11% | 9% | 6% | 2% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 95th | 15% | 14% | 13% | 11% | 9% | 4% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# Baseline Projections – No Side Accounts
## Total Funded Status

While the funded status of the system is expected to remain around 100%, there is significant variation due to investment experience.

**Total Funded Status**

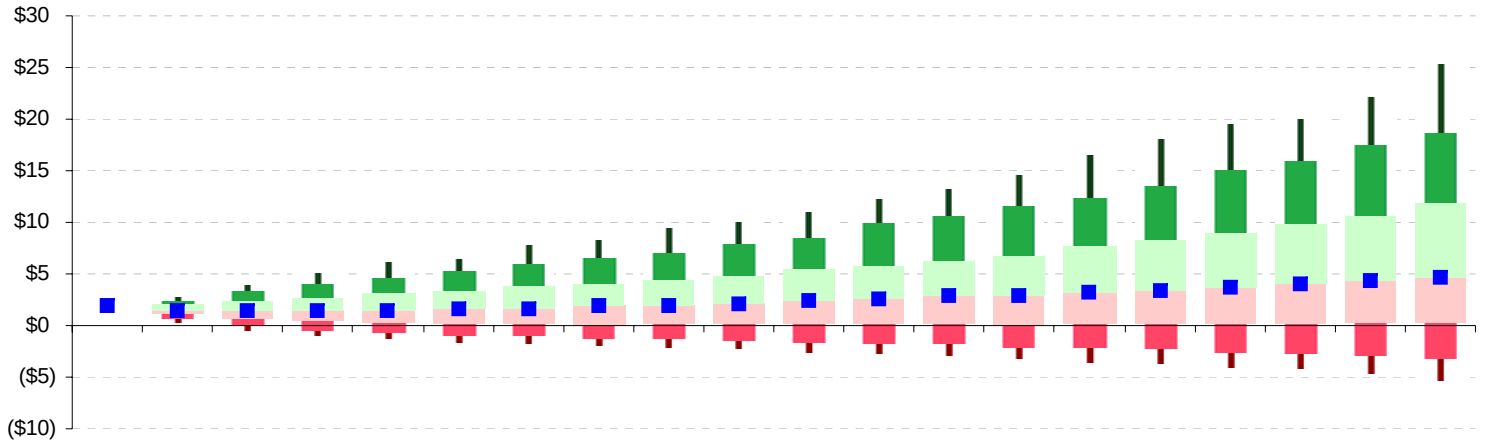



| At PY Ending 12/31 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 96% | 103% | 112% | 122% | 128% | 131% | 139% | 144% | 146% | 151% | 158% | 165% | 169% | 174% | 187% | 197% | 208% | 207% | 221% | 233% |
| 90th | 96% | 101% | 108% | 113% | 118% | 121% | 125% | 129% | 131% | 137% | 140% | 147% | 151% | 153% | 164% | 167% | 173% | 176% | 186% | 186% |
| 75th | 96% | 97% | 100% | 102% | 105% | 106% | 108% | 110% | 111% | 112% | 115% | 117% | 119% | 122% | 126% | 127% | 129% | 134% | 137% | 142% |
| 50th | 96% | 93% | 93% | 92% | 92% | 92% | 92% | 92% | 91% | 93% | 93% | 93% | 95% | 96% | 96% | 96% | 101% | 101% | 103% | 107% |
| 25th | 96% | 89% | 86% | 83% | 81% | 80% | 79% | 78% | 78% | 76% | 76% | 76% | 76% | 74% | 76% | 75% | 76% | 77% | 79% | 79% |
| 10th | 96% | 85% | 79% | 76% | 73% | 70% | 69% | 66% | 66% | 65% | 63% | 63% | 62% | 63% | 63% | 63% | 62% | 62% | 62% | 60% |
| 5th | 96% | 83% | 75% | 72% | 68% | 65% | 63% | 61% | 60% | 57% | 57% | 55% | 56% | 55% | 57% | 54% | 53% | 54% | 53% | 53% |

# Baseline Projections – No Side Accounts
## Rate Guarantee Reserve

Similar to our last analysis, the projected balance in the Rate Guarantee Reserve ranges from a deficit of $5.3 billion to a surplus of $25.3 billion assuming interest of 8% is credited each year to Tier 1 member accounts.

**Tier 1 Rate Guarantee Reserve**




*($billions)*

| At PY Ending 12/31 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | $2 | $3 | $4 | $5 | $6 | $7 | $8 | $8 | $9 | $10 | $11 | $12 | $13 | $15 | $16 | $18 | $20 | $20 | $22 | $25 |
| 90th | $2 | $2 | $3 | $4 | $5 | $5 | $6 | $7 | $7 | $8 | $9 | $10 | $11 | $12 | $12 | $14 | $15 | $16 | $18 | $19 |
| 75th | $2 | $2 | $2 | $3 | $3 | $3 | $4 | $4 | $4 | $5 | $5 | $6 | $6 | $7 | $8 | $8 | $9 | $10 | $11 | $12 |
| 50th | $2 | $2 | $2 | $1 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $3 | $3 | $3 | $3 | $3 | $4 | $4 | $4 | $5 |
| 25th | $2 | $1 | $1 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| 10th | $2 | $1 | ($0) | ($0) | ($1) | ($1) | ($1) | ($1) | ($1) | ($2) | ($2) | ($2) | ($2) | ($2) | ($2) | ($2) | ($3) | ($3) | ($3) | ($3) |
| 5th | $2 | $0 | ($0) | ($1) | ($1) | ($2) | ($2) | ($2) | ($2) | ($2) | ($3) | ($3) | ($3) | ($3) | ($3) | ($4) | ($4) | ($4) | ($5) | ($5) |

## Baseline Projections – No Side Accounts
Observations

- The emergence of OPSRP will control the total normal cost rate, but even after 20 years, OPSRP still represents a small part of the total liability.
- The volatility of investment returns drives significant volatility in the overall contribution rate, particularly as retiree liability becomes a greater multiple of system payroll.
- Investment volatility also produces wide ranging results for the system's funded status and the balance in the rate guarantee reserve.

# Baseline Projections

## Contributions as Percent of Revenue

# Baseline Projections – No Side Accounts
## Projected Tax Revenues

- Contribution rates as a percentage of pay only tell part of the story. Ultimately, it is tax revenues that must support the pension benefits.
- We created a model of projected tax revenues for three types of entities:
  - State General Fund
  - Cities and Counties
  - School Districts
- The types of taxes considered and the weights applied to each entity were developed with input from economists in the Legislative Revenue Office and are shown in the table.
- Key economic variables used in the projections were:
  - GDP growth
  - Inflation
  - Interest rates
  - Equity returns

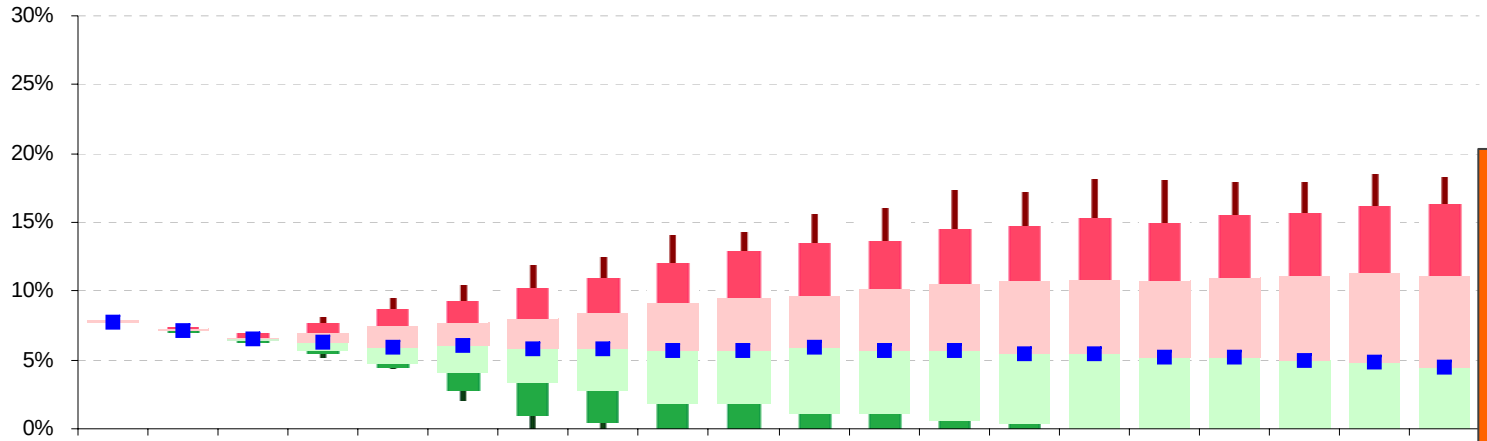
| | State | City / County | School Districts |
|---|---|---|---|
| **Personal Income** | 68% | 13% | 59% |
| **Corporate Income** | 7% | 2% | 6% |
| **Property** | 0% | 40% | 30% |
| **Stable** | 25% | 45% | 5% |

We used a statistical regression of historical tax revenue against key economic data series that are produced in our projections (GDP growth, inflation, interest rates and equity returns) to develop predictive formulae for the various sources of tax revenue. We want to be cautious not to overstate the expected accuracy of these predictive formulae, but back-testing suggests that they will provide a roughly similar pattern of peaks and dips in annual growth of tax revenue. This should be sufficient to test for potential correlation between pension contributions and tax revenues in the Monte Carlo simulations. The projections of tax revenue should not be used for any other purpose and certainly do not supersede the State's own budget estimates. Annual growth in tax revenue will be sensitive to many more factors than are available in our model of capital markets.

# Baseline Projections – No Side Accounts
## Projected City/County Contribution Rates

Projected City and County revenues were scaled to a system-wide level to develop contribution rates.

Contribution rate variability as a percentage of City/County revenues is similar to the volatility as a percentage of payroll.



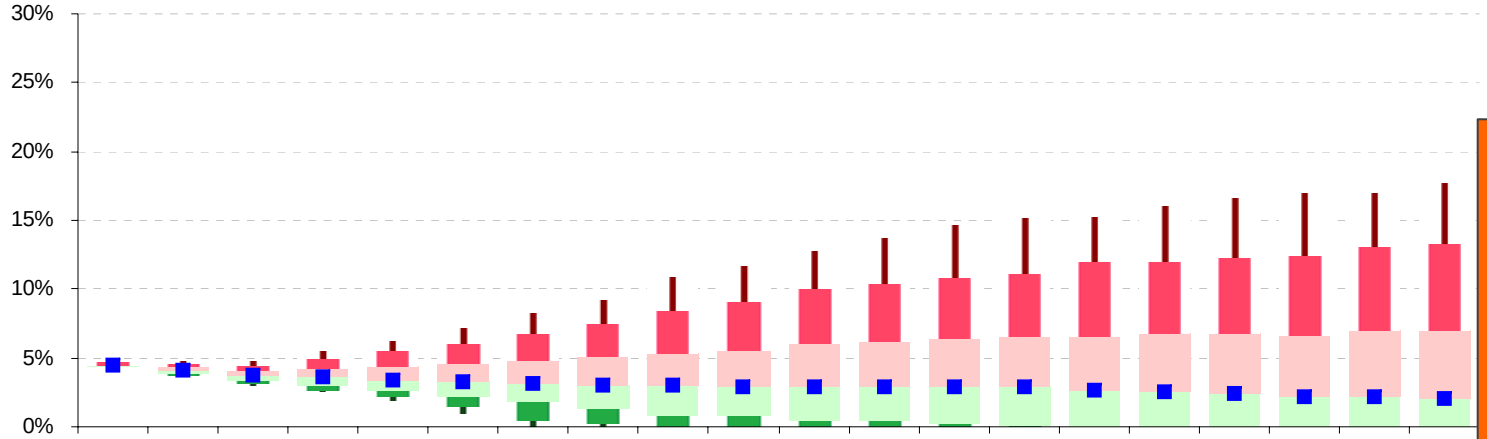

**The 95th percentile is 2.25 times greater than the current rate.**

| At PY Ending 12/31 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 8% | 7% | 7% | 8% | 9% | 10% | 12% | 12% | 14% | 14% | 16% | 16% | 17% | 17% | 18% | 18% | 18% | 18% | 18% | 18% |
| 90th | 8% | 7% | 7% | 8% | 9% | 9% | 10% | 11% | 12% | 13% | 14% | 14% | 15% | 15% | 15% | 15% | 16% | 16% | 16% | 16% |
| 75th | 8% | 7% | 7% | 7% | 8% | 8% | 8% | 9% | 9% | 9% | 10% | 10% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% |
| 50th | 8% | 7% | 7% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 5% | 5% | 5% | 5% | 5% | 5% | 4% |
| 25th | 8% | 7% | 6% | 6% | 5% | 4% | 3% | 3% | 2% | 2% | 1% | 1% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 10th | 8% | 7% | 6% | 5% | 4% | 3% | 1% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 5th | 8% | 7% | 6% | 5% | 4% | 2% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# Baseline Projections – No Side Accounts
## Projected State General Fund Contribution Rates

Projected State General Fund revenues were scaled to a system-wide level to develop contribution rates.

Contribution rate variability as a percentage of State General Fund revenues is significantly greater than the volatility as a percentage of payroll, indicating that higher contribution rates are correlated with lower revenues.



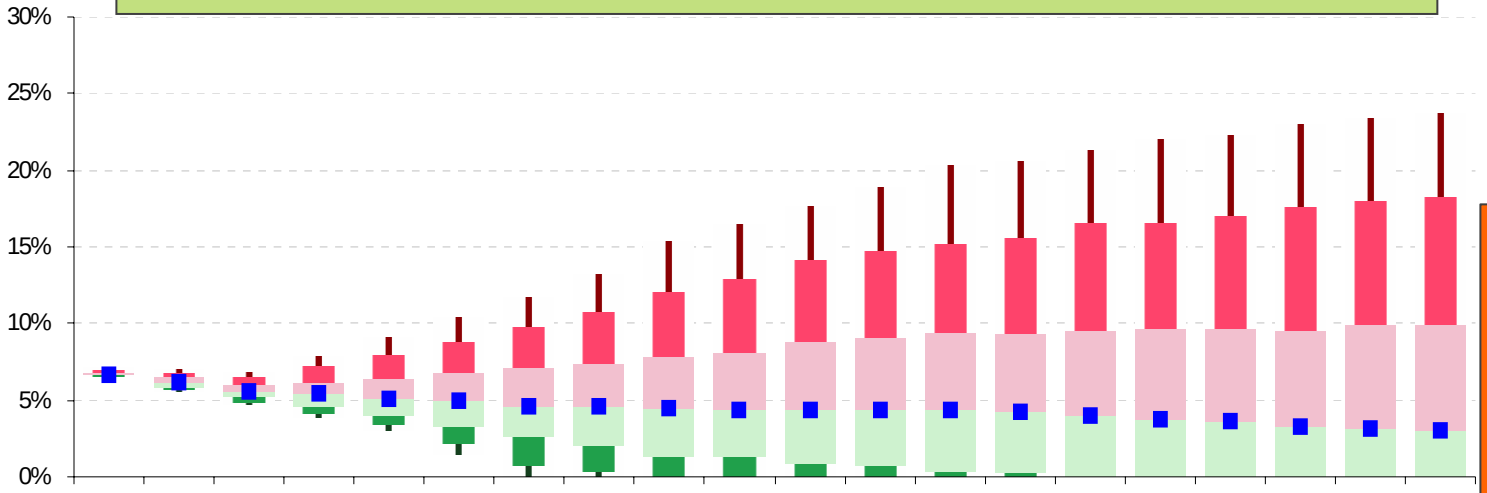

**The 95th percentile is 4.5 times greater than the current rate.**

| At PY Ending 12/31 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 5% | 5% | 5% | 5% | 6% | 7% | 8% | 9% | 11% | 12% | 13% | 14% | 15% | 15% | 15% | 16% | 17% | 17% | 17% | 18% |
| 90th | 5% | 5% | 4% | 5% | 6% | 6% | 7% | 7% | 8% | 9% | 10% | 10% | 11% | 11% | 12% | 12% | 12% | 12% | 13% | 13% |
| 75th | 5% | 4% | 4% | 4% | 4% | 5% | 5% | 5% | 5% | 6% | 6% | 6% | 6% | 6% | 7% | 7% | 7% | 7% | 7% | 7% |
| 50th | 4% | 4% | 4% | 4% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 2% | 2% | 2% | 2% |
| 25th | 4% | 4% | 3% | 3% | 3% | 2% | 2% | 1% | 1% | 1% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 10th | 4% | 4% | 3% | 3% | 2% | 1% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 5th | 4% | 4% | 3% | 3% | 2% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# Baseline Projections – No Side Accounts
## Projected School District Revenues

Projected School District revenues were scaled to a system-wide level to develop contribution rates.

Contribution rate variability as a percentage of School District revenues is greater than the volatility as a percentage of payroll. Volatility for school districts is between that of the General Fund and Cities and Counties.




**The 95th percentile is 3.4 times greater than the current rate.**

| At PY Ending 12/31 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 7% | 7% | 7% | 8% | 9% | 10% | 12% | 13% | 15% | 16% | 18% | 19% | 20% | 21% | 21% | 22% | 22% | 23% | 23% | 24% |
| 90th | 7% | 7% | 7% | 7% | 8% | 9% | 10% | 11% | 12% | 13% | 14% | 15% | 15% | 16% | 17% | 17% | 17% | 18% | 18% | 18% |
| 75th | 7% | 6% | 6% | 6% | 6% | 7% | 7% | 7% | 8% | 8% | 9% | 9% | 9% | 9% | 10% | 10% | 10% | 10% | 10% | 10% |
| 50th | 7% | 6% | 6% | 5% | 5% | 5% | 5% | 5% | 4% | 4% | 4% | 4% | 4% | 4% | 4% | 4% | 4% | 3% | 3% | 3% |
| 25th | 7% | 6% | 5% | 5% | 4% | 3% | 3% | 2% | 1% | 1% | 1% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 10th | 7% | 6% | 5% | 4% | 3% | 2% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 5th | 7% | 6% | 5% | 4% | 3% | 2% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# Baseline Projections – No Side Accounts
## Tax Modeling Observations

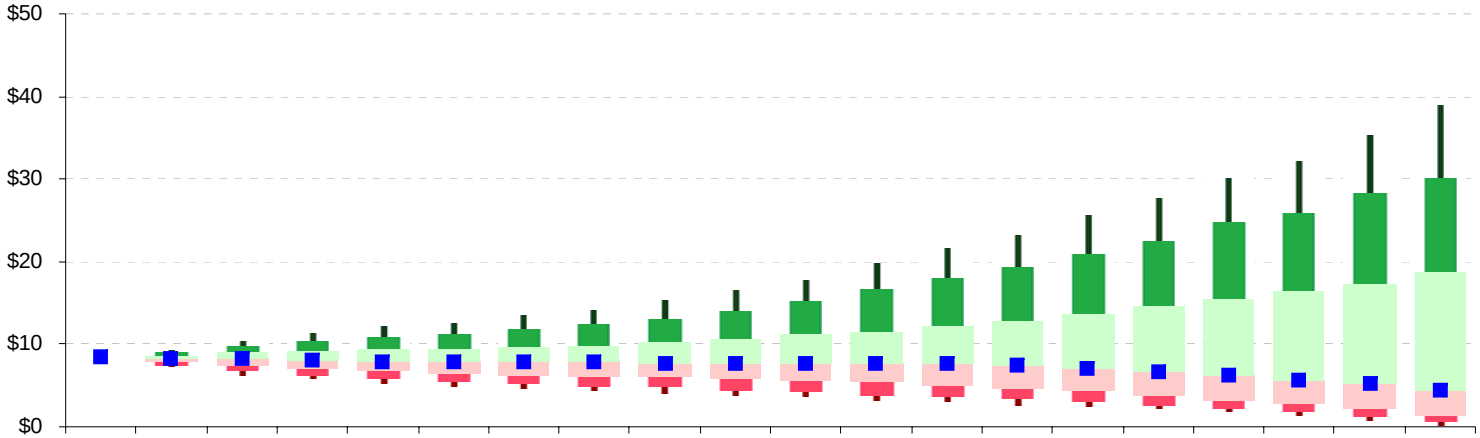
- Income tax revenues are somewhat correlated with investment returns for the PERS portfolio. Consequently, poor investment returns over the long-term that require greater contributions to PERS are more likely to occur when long-term revenue growth is poor.
- The risk to the sponsoring employers whose revenue is based on income tax is understated by simply examining contribution rates as a percentage of payroll.
- The rate collar and the 18-month delay between the valuation and the implementation of contribution rates help address short-term risks, but don't help in the case of a prolonged economic downturn.
- In these cases, the model assumes there are no fundamental policy changes, but in a prolonged economic downturn, there are likely to be significant changes either to the revenue structure, the benefit structure, employment and pay levels, or other cost controlling measures.
- The dollar cost of the pension system, however, will largely be driven by the UAL rate in these situations. Most potential policy changes described above will have little or no impact on the dollar amount of the UAL.

# **Baseline Projections**
# Current Side Accounts

# Baseline Projections – With Side Accounts

## Projected Side Account Balance

Side accounts are amortized over the period ending 12/31/2027, but can only be used to offset contributions to the extent there are required contributions. If investment returns are better than expected, contribution requirements approach 0% of payroll and side accounts grow significantly both due to the investment returns and the smaller transfers to fund required contributions.

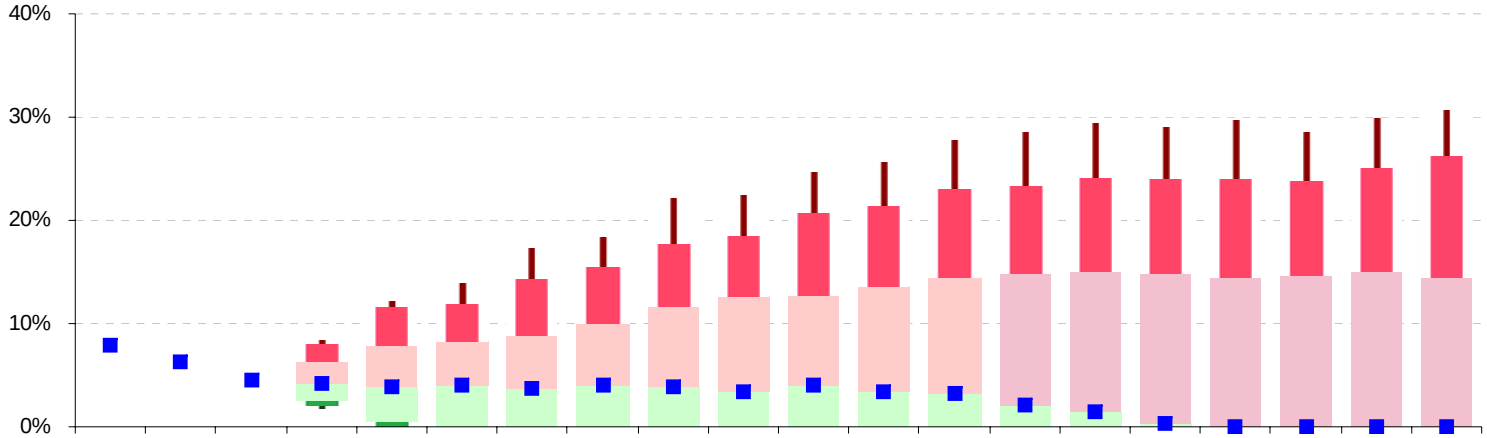



*($billions)*

| At PY Ending 12/31 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | $9 | $9 | $10 | $11 | $12 | $12 | $14 | $14 | $15 | $16 | $18 | $20 | $22 | $23 | $26 | $28 | $30 | $32 | $35 | $39 |
| 90th | $9 | $9 | $10 | $11 | $11 | $11 | $12 | $12 | $13 | $14 | $15 | $17 | $18 | $19 | $21 | $23 | $25 | $26 | $28 | $30 |
| 75th | $9 | $9 | $9 | $9 | $9 | $10 | $10 | $10 | $10 | $11 | $11 | $12 | $12 | $13 | $14 | $15 | $15 | $16 | $17 | $19 |
| 50th | $9 | $8 | $8 | $8 | $8 | $8 | $8 | $8 | $8 | $8 | $8 | $8 | $8 | $7 | $7 | $7 | $6 | $6 | $5 | $5 |
| 25th | $9 | $8 | $7 | $7 | $7 | $7 | $6 | $6 | $6 | $6 | $6 | $5 | $5 | $5 | $4 | $4 | $3 | $3 | $2 | $1 |
| 10th | $9 | $7 | $7 | $6 | $6 | $5 | $5 | $5 | $5 | $4 | $4 | $4 | $4 | $3 | $3 | $3 | $2 | $2 | $1 | $1 |
| 5th | $9 | $7 | $6 | $6 | $5 | $5 | $5 | $4 | $4 | $4 | $4 | $3 | $3 | $3 | $2 | $2 | $2 | $1 | $1 | $0 |

# Baseline Projections – With Side Accounts
## Average Net Contribution Rates

Net of side account amortizations, average contribution rates are expected to reduce to 0% of payroll if investment returns meet or exceed expectations. However, in poor investment environments, contribution rates may still exceed 30% of payroll net of side accounts.

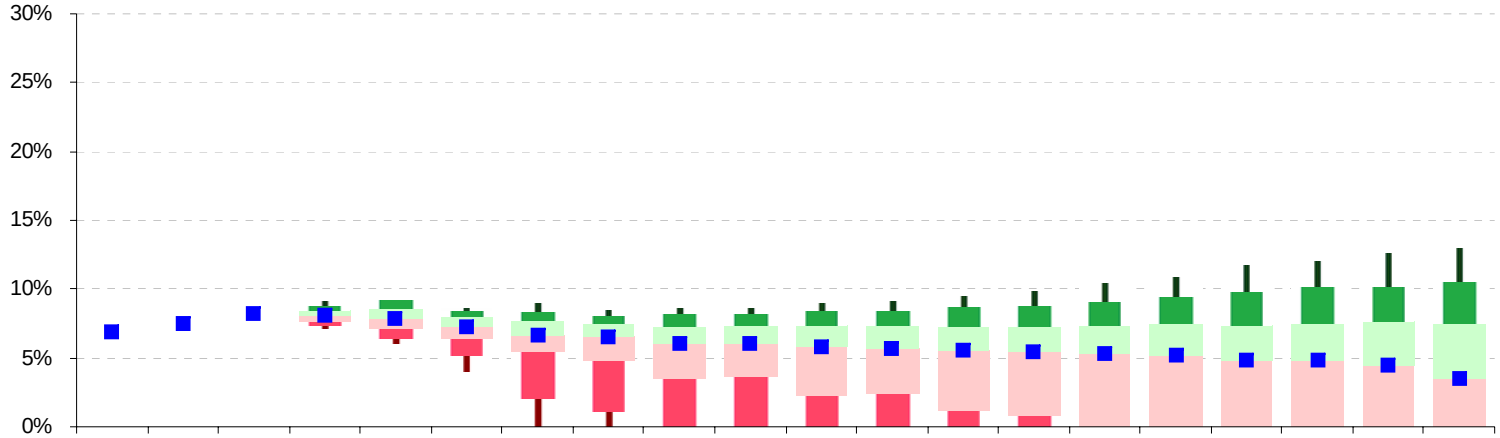



| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 8% | 6% | 5% | 8% | 12% | 14% | 17% | 18% | 22% | 22% | 25% | 26% | 28% | 29% | 29% | 29% | 30% | 29% | 30% | 31% |
| 10th | 8% | 6% | 5% | 8% | 12% | 12% | 14% | 16% | 18% | 19% | 21% | 21% | 23% | 23% | 24% | 24% | 24% | 24% | 25% | 26% |
| 25th | 8% | 6% | 5% | 6% | 8% | 8% | 9% | 10% | 12% | 13% | 13% | 14% | 14% | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| 50th | 8% | 6% | 5% | 4% | 4% | 4% | 4% | 4% | 4% | 3% | 4% | 3% | 3% | 2% | 1% | 0% | 0% | 0% | 0% | 0% |
| 75th | 8% | 6% | 5% | 3% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 90th | 8% | 6% | 5% | 2% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 95th | 8% | 6% | 5% | 2% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# Baseline Projections – With Side Accounts

## Actual Average Side Account Rate Relief

The average rate relief provided by side accounts is expected to decline in the long-term due to either poor investment returns that reduce the available side account or very good investment returns that reduce the contribution rate before side accounts to a level where the entire side account cannot be used.




| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 7% | 8% | 8% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 10% | 10% | 11% | 12% | 12% | 13% | 13% |
| 90th | 7% | 8% | 8% | 9% | 9% | 8% | 8% | 8% | 8% | 8% | 8% | 9% | 9% | 9% | 9% | 9% | 10% | 10% | 10% | 11% |
| 75th | 7% | 8% | 8% | 8% | 9% | 8% | 8% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 8% | 7% | 7% | 8% | 8% |
| 50th | 7% | 8% | 8% | 8% | 8% | 7% | 7% | 6% | 6% | 6% | 6% | 6% | 6% | 5% | 5% | 5% | 5% | 5% | 5% | 3% |
| 25th | 7% | 8% | 8% | 8% | 7% | 6% | 5% | 5% | 4% | 4% | 2% | 2% | 1% | 1% | 0% | 0% | 0% | 0% | 0% | 0% |
| 10th | 7% | 8% | 8% | 7% | 6% | 5% | 2% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 5th | 7% | 8% | 8% | 7% | 6% | 4% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

## Baseline Projections – With Side Accounts
Observations

- Side accounts have become a significant part of the system, representing more than 15% of assets.
- The underlying pension obligation bonds represent a significant liability for public employers in Oregon.
- The dynamics of funding a side account from a pension obligation bond to pre-pay required contributions to PERS are very complex.
- While current side accounts are amortized over the period ending 12/31/2027, many are likely to persist much longer.
- When investment returns are good, the system's contribution rates decline, limiting the use of side accounts and deferring the value of the side account investment gain to future years.


# **Impact of POB Funding**
Scenario 1 – PPS Model

# Impact of POB Funding

## Overview of Pension Obligation Bonds and Side Accounts

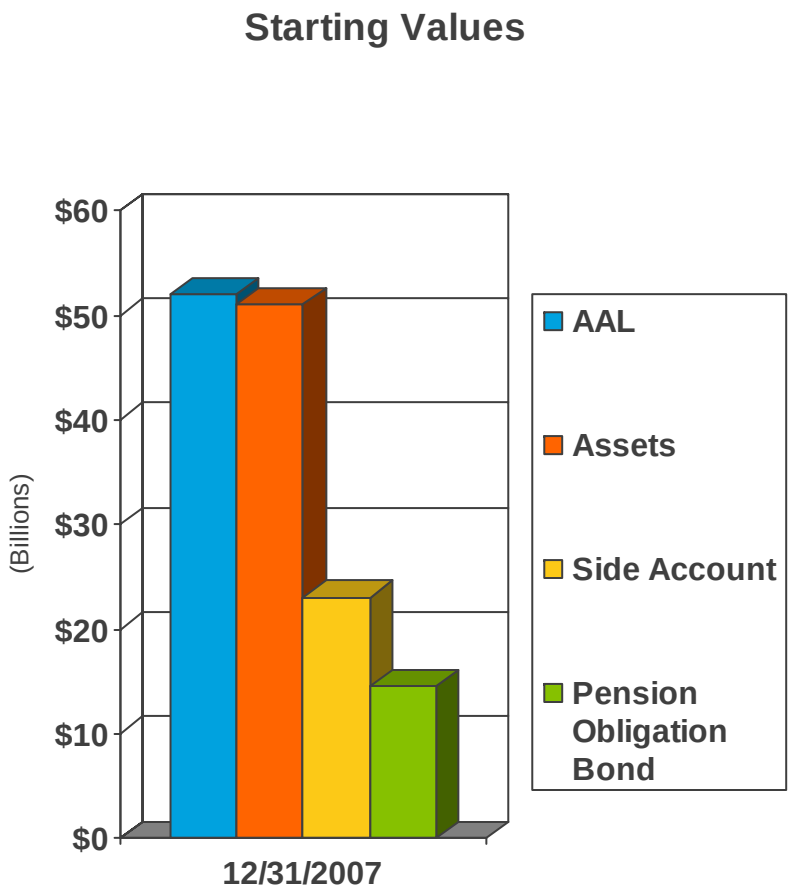
- Issuing Pension Obligation Bonds (POBs) to pre-fund contributions has effectively enhanced benefit security for participants.
- There were many reasons for sponsors to do so, and we are not second guessing those decisions.
- Contrary to expectations, it may have made the overall pension cost more variable, even though the POB payments are fixed.
- Borrowing at a low, certain interest rate to invest at a higher, uncertain expected rate of return clearly has an expected positive value to the borrower, but carries commensurate investment risk.
- A noticeable risk from our analysis is that upside experience is often deferred and illiquid, while downside experience must be recognized more promptly, potentially at an inopportune time.
- Some issuers of POBs may find that issuing the POB is more likely than not to create a negative cash flow impact over the next 20 years.

# Impact of POB Funding

## Overview of Pension Obligation Bonds and Side Accounts

- In many cases, the amount of a Pension Obligation Bond (POB) is based on the Unfunded Accrued Liability (UAL) at the time the bond is issued. One possible rationale for this approach is that:
  - The UAL is a fixed debt, and
  - There is an arbitrage opportunity between the actuarially assumed rate of return and the interest rate on the bond.
- Neither of these statements is true, except in the case of a transition liability.
  - The UAL represents a funding target. It is not a fixed liability. It can change as the result of plan experience or changes in plan design.
  - The actuarially assumed rate of return is used to estimate the current funding target and to budget contributions, but it is not a guaranteed interest rate that can be used for arbitrage.
- The decision to issue a POB is an investment decision. It is simply a decision to borrow money at the bond rate and invest it in the PERS portfolio. If the investment returns are greater than the interest on the bond, the POB will be profitable.

# Impact of POB Funding – Scenario #1
## Starting Values



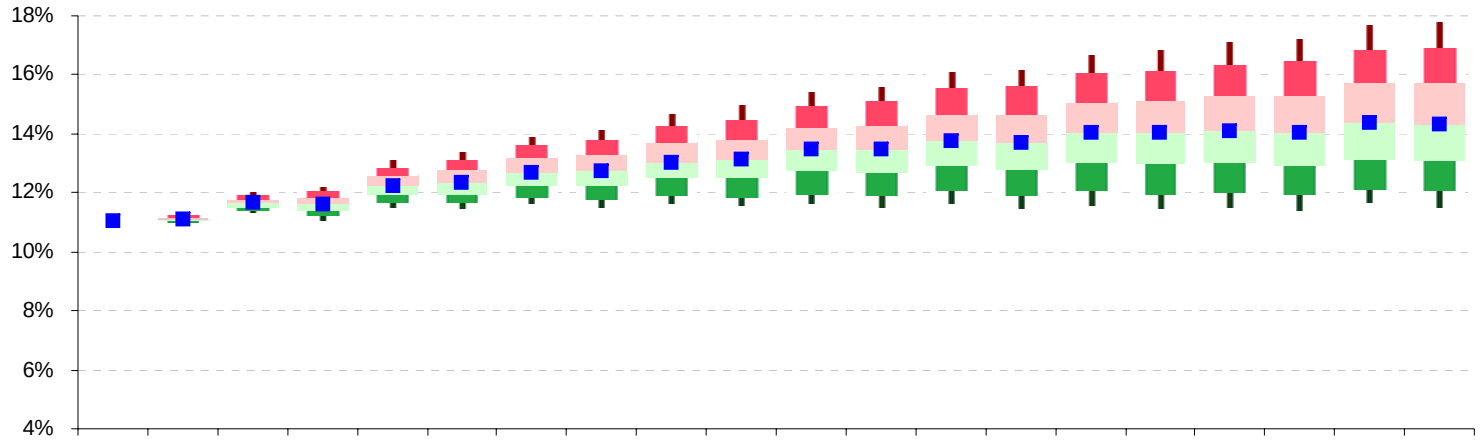

- Portland Public School's side accounts and pension obligation bonds are used as a model for this scenario
- The bonds were initially issued in 2002 and 2003
- The remaining bond payments and side account balance have been scaled to the entire system
- As of 12/31/2007:
  - Side account = $23.0 billion
  - POB = $14.5 billion
  - Net contribution rate = 0.0%
  - POB payment = 11.5%
  - Funded status = 142%

# Impact of POB Funding – Scenario #1

## POB Payments as a Percentage of Payroll

This POB is designed with payments increasing as a percentage of projected payroll. The actual POB payments are fixed dollar amounts. The POB payments represent a floor on the total contribution rate.

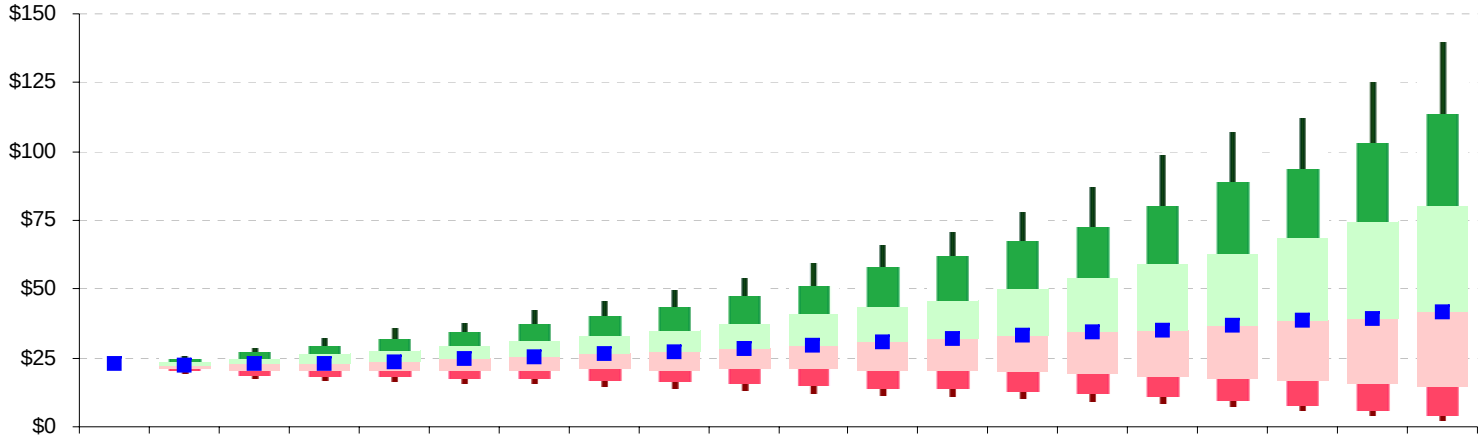
**Pension Obligation Bond Payments**




| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 11% | 11% | 12% | 12% | 13% | 13% | 14% | 14% | 15% | 15% | 15% | 16% | 16% | 16% | 17% | 17% | 17% | 17% | 18% | 18% |
| 10th | 11% | 11% | 12% | 12% | 13% | 13% | 14% | 14% | 14% | 14% | 15% | 15% | 16% | 16% | 16% | 16% | 16% | 16% | 17% | 17% |
| 25th | 11% | 11% | 12% | 12% | 13% | 13% | 13% | 13% | 14% | 14% | 14% | 14% | 15% | 15% | 15% | 15% | 15% | 15% | 16% | 16% |
| 50th | 11% | 11% | 12% | 12% | 12% | 12% | 13% | 13% | 13% | 13% | 13% | 14% | 14% | 14% | 14% | 14% | 14% | 14% | 14% | 14% |
| 75th | 11% | 11% | 12% | 11% | 12% | 12% | 12% | 12% | 12% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% |
| 90th | 11% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% |
| 95th | 11% | 11% | 11% | 11% | 11% | 11% | 12% | 11% | 12% | 12% | 12% | 11% | 12% | 11% | 12% | 11% | 12% | 11% | 12% | 12% |

# Impact of POB Funding – Scenario #1
## Projected Side Account Balance

Because the side account is so large relative to required contributions, it is likely that it will continue to grow over the next 20 years. The excess may be used to fund contributions far into the future.



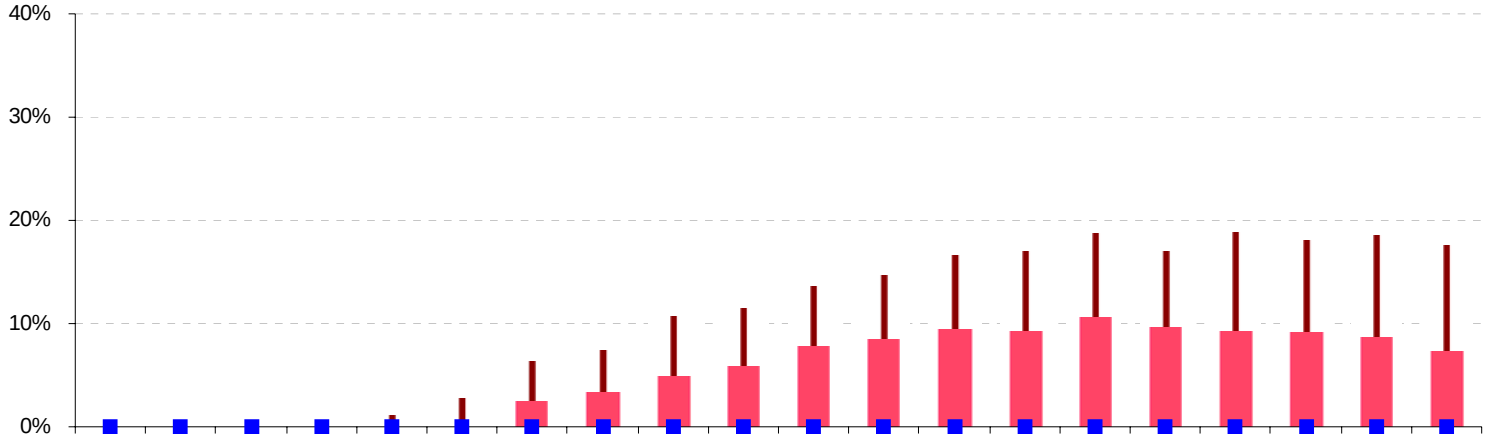

*($billions)*

| At PY Ending 12/31 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | $23 | $25 | $29 | $32 | $36 | $38 | $43 | $45 | $50 | $54 | $59 | $66 | $70 | $78 | $87 | $98 | $107 | $112 | $125 | $140 |
| 90th | $23 | $25 | $27 | $30 | $32 | $34 | $38 | $40 | $43 | $48 | $52 | $58 | $63 | $68 | $73 | $80 | $89 | $94 | $104 | $114 |
| 75th | $23 | $24 | $25 | $26 | $28 | $29 | $31 | $33 | $35 | $37 | $41 | $43 | $46 | $50 | $54 | $59 | $63 | $69 | $74 | $80 |
| 50th | $23 | $22 | $23 | $23 | $24 | $25 | $25 | $26 | $27 | $28 | $30 | $31 | $32 | $33 | $34 | $35 | $37 | $38 | $39 | $42 |
| 25th | $23 | $21 | $21 | $21 | $21 | $20 | $21 | $21 | $21 | $21 | $21 | $21 | $21 | $20 | $20 | $18 | $18 | $17 | $16 | $15 |
| 10th | $23 | $20 | $19 | $18 | $18 | $17 | $17 | $17 | $16 | $15 | $15 | $14 | $14 | $13 | $12 | $11 | $9 | $8 | $6 | $4 |
| 5th | $23 | $20 | $18 | $17 | $16 | $16 | $16 | $15 | $14 | $13 | $12 | $11 | $11 | $10 | $9 | $9 | $7 | $6 | $4 | $2 |

# Impact of POB Funding – Scenario #1
## Net Contribution Rate

While the vast majority of scenarios result in no contributions over the 20-year projection, there is still a risk of substantial contributions. In effect, any additional gains are deferred far into the future, but significant losses could be felt in a shorter timeframe.

**Net Contribution Rate**



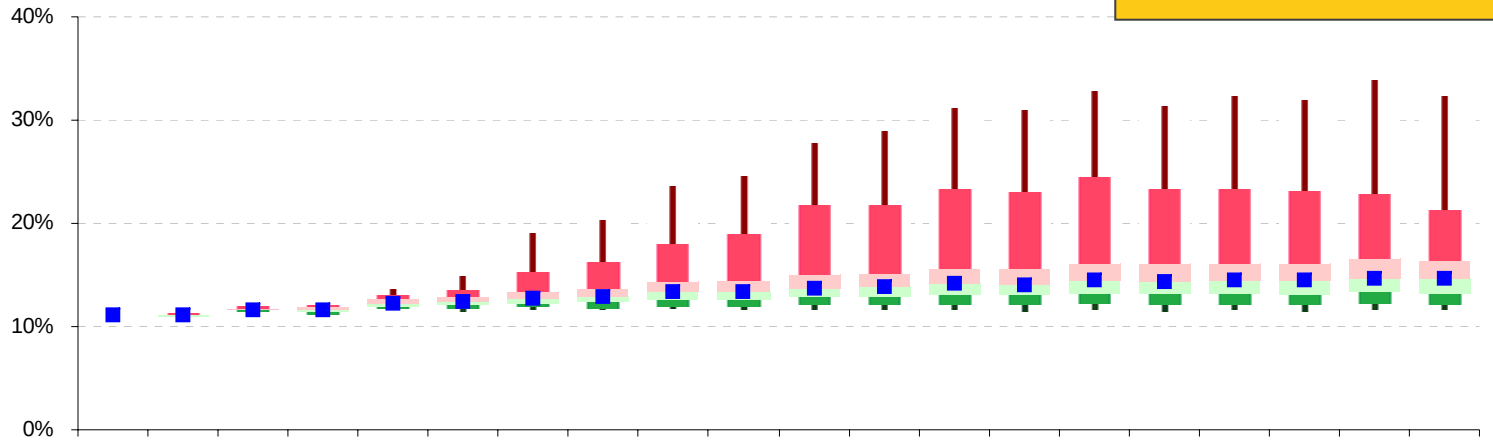

| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 0% | 0% | 0% | 0% | 1% | 3% | 6% | 7% | 11% | 11% | 14% | 15% | 17% | 17% | 19% | 17% | 19% | 18% | 19% | 18% |
| 10th | 0% | 0% | 0% | 0% | 0% | 0% | 3% | 3% | 5% | 6% | 8% | 9% | 10% | 9% | 11% | 10% | 9% | 9% | 9% | 7% |
| 25th | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 50th | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 75th | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 90th | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 95th | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# Impact of POB Funding – Scenario #1

## Net Contribution Rate Including POB Payment

With the added cost of the POB payments, total pension payments cannot drop below 12% of payroll, but reach 32% of payroll in the 95th percentile. The large surplus in the side account prevents rates from going even higher. Without a side account rates ranged from 0% to 34%.

**Net Contribution Rate + POB Payment**

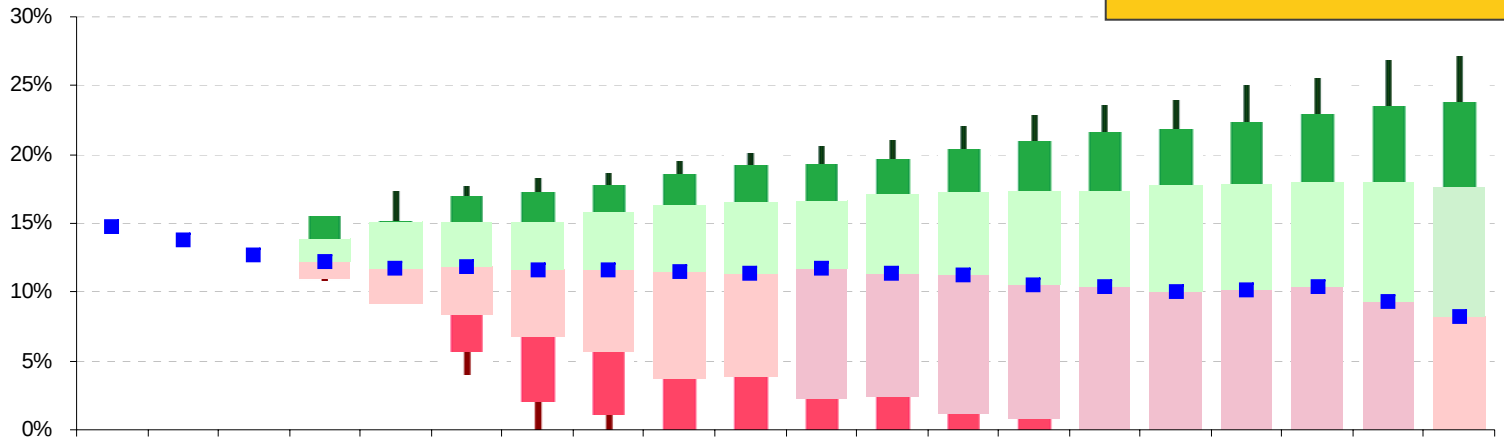



| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 11% | 11% | 12% | 12% | 14% | 15% | 19% | 20% | 24% | 25% | 28% | 29% | 31% | 31% | 33% | 31% | 32% | 32% | 34% | 32% |
| 90th | 11% | 11% | 12% | 12% | 13% | 14% | 15% | 16% | 18% | 19% | 22% | 22% | 23% | 23% | 24% | 23% | 23% | 23% | 23% | 21% |
| 75th | 11% | 11% | 12% | 12% | 13% | 13% | 13% | 14% | 14% | 15% | 15% | 15% | 16% | 16% | 16% | 16% | 16% | 16% | 17% | 16% |
| 50th | 11% | 11% | 12% | 12% | 12% | 12% | 13% | 13% | 13% | 13% | 14% | 14% | 14% | 14% | 14% | 14% | 14% | 14% | 15% | 15% |
| 25th | 11% | 11% | 12% | 11% | 12% | 12% | 12% | 12% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% |
| 10th | 11% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% |
| 5th | 11% | 11% | 11% | 11% | 12% | 11% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 11% | 12% | 12% | 12% | 11% | 12% | 12% |

# Impact of POB Funding – Scenario #1
## Actual Side Account Rate Relief

The amortization schedule for the side account could support substantially higher contributions, but if PERS required contributions decrease, a smaller and smaller portion of the side account is used. In some cases, the side account cannot be used at all.

**Actual Side Fund Amortization**



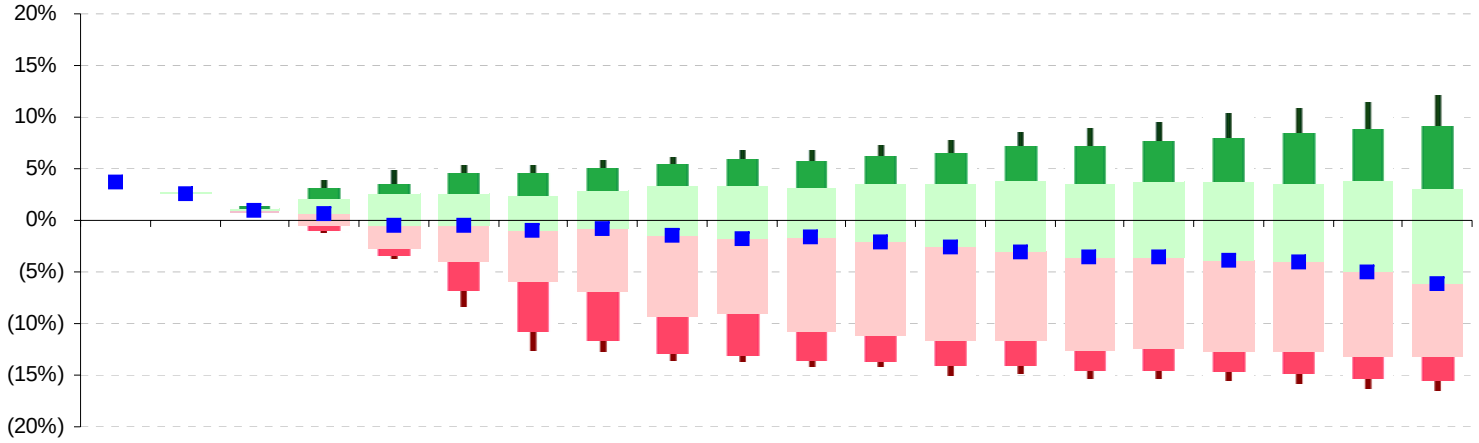

| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 15% | 14% | 13% | 15% | 17% | 18% | 18% | 19% | 19% | 20% | 21% | 21% | 22% | 23% | 24% | 24% | 25% | 26% | 27% | 27% |
| 90th | 15% | 14% | 13% | 15% | 15% | 17% | 17% | 18% | 19% | 19% | 19% | 20% | 20% | 21% | 22% | 22% | 22% | 23% | 24% | 24% |
| 75th | 15% | 14% | 13% | 14% | 15% | 15% | 15% | 16% | 16% | 17% | 17% | 17% | 17% | 17% | 17% | 18% | 18% | 18% | 18% | 18% |
| 50th | 15% | 14% | 13% | 12% | 12% | 12% | 12% | 12% | 11% | 11% | 12% | 11% | 11% | 11% | 10% | 10% | 10% | 10% | 9% | 8% |
| 25th | 15% | 14% | 13% | 11% | 9% | 8% | 7% | 6% | 4% | 4% | 2% | 2% | 1% | 1% | 0% | 0% | 0% | 0% | 0% | 0% |
| 10th | 15% | 14% | 13% | 11% | 9% | 6% | 2% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 5th | 15% | 14% | 13% | 11% | 9% | 4% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# Impact of POB Funding – Scenario #1

## Net Annual Gain from Side Account Compared to POB Payment

In a few years, the POB payments are likely to exceed the rate relief provided by the side account. The benefits of the side account are deferred far into the future.

**Actual Side Fund Amortization Less POB Payment**



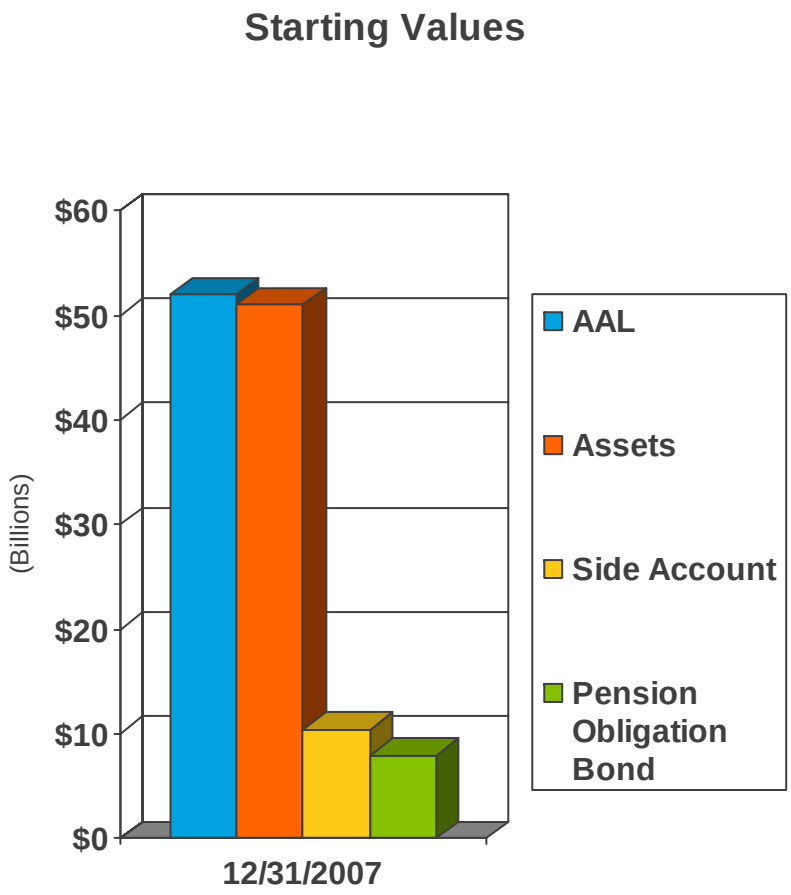

| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 4% | 3% | 1% | 4% | 5% | 5% | 5% | 6% | 6% | 7% | 7% | 7% | 8% | 9% | 9% | 10% | 10% | 11% | 11% | 12% |
| 90th | 4% | 3% | 1% | 3% | 4% | 5% | 5% | 5% | 6% | 6% | 6% | 6% | 7% | 7% | 7% | 8% | 8% | 9% | 9% | 9% |
| 75th | 4% | 3% | 1% | 2% | 3% | 3% | 2% | 3% | 3% | 3% | 3% | 4% | 4% | 4% | 3% | 4% | 4% | 4% | 4% | 3% |
| 50th | 4% | 3% | 1% | 1% | (1%) | (0%) | (1%) | (1%) | (1%) | (2%) | (2%) | (2%) | (3%) | (3%) | (4%) | (4%) | (4%) | (4%) | (5%) | (6%) |
| 25th | 4% | 3% | 1% | (0%) | (3%) | (4%) | (6%) | (7%) | (9%) | (9%) | (11%) | (11%) | (12%) | (12%) | (13%) | (12%) | (13%) | (13%) | (13%) | (13%) |
| 10th | 4% | 3% | 1% | (1%) | (3%) | (7%) | (11%) | (12%) | (13%) | (13%) | (14%) | (14%) | (14%) | (14%) | (14%) | (15%) | (15%) | (15%) | (15%) | (15%) |
| 5th | 4% | 3% | 1% | (1%) | (4%) | (8%) | (13%) | (13%) | (14%) | (14%) | (14%) | (14%) | (15%) | (15%) | (15%) | (15%) | (16%) | (16%) | (16%) | (16%) |

## Impact of POB Funding – Scenario #1
Observations

- The timing of the pension obligation bonds appears to have been close to perfect, resulting in a significant gain to date and significantly lower expected long-term pension costs. However, risks remain and the ultimate results may differ.
- Because of the size of the investment, the reward for any additional gains will be deferred many years into the future while the impact of losses may be felt in a shorter timeframe.
- In the next few years, the payments on the pension obligation bonds may exceed what would have been required to be contributed to PERS without a side account.
- After the pension obligation bonds have been paid off, it is likely that the side account will continue to fund required contributions to PERS.

# Impact of POB Funding
## Scenario 2 – State Model

# Impact of POB Funding – Scenario #2
## Starting Values



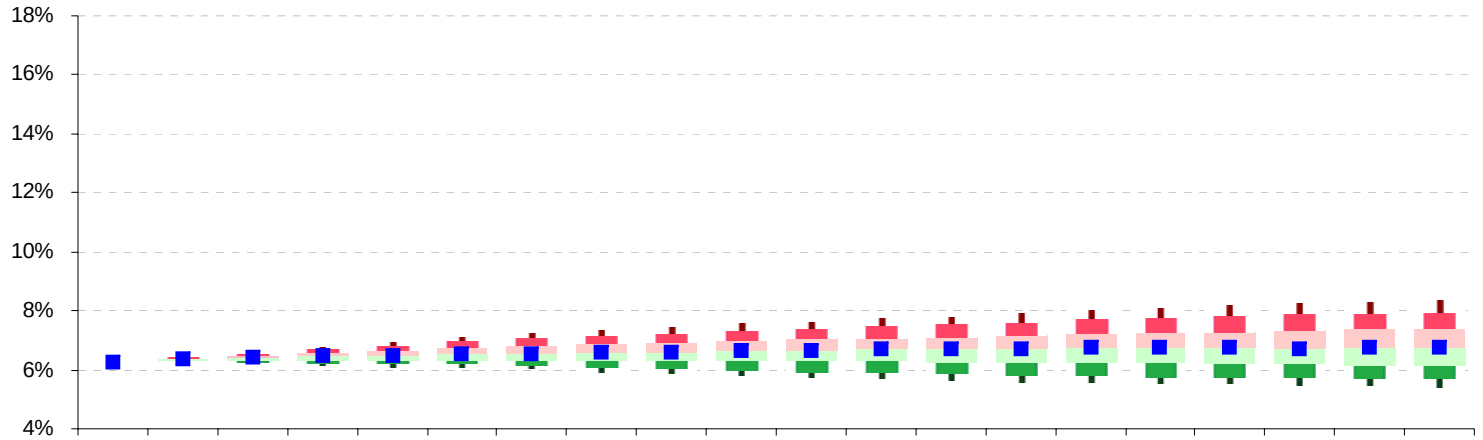

- The State of Oregon's side account and pension obligation bond are used as a model for this scenario
- The bond was originally issued in 2003.
- The remaining bond payments and side account balance have been scaled to the entire system
- As of 12/31/2007:
  - Side account = $10.4 billion
  - POB = $7.9 billion
  - Net contribution rate = 5.0%
  - POB payment = 6.3%
  - Funded status = 118%

# Impact of POB Funding – Scenario #2

## POB Payments as a Percentage of Payroll

The relatively more modest size of the scenario #2 pension obligation bond results in a lower floor to contribution rates than in scenario #1

**Pension Obligation Bond Payments**

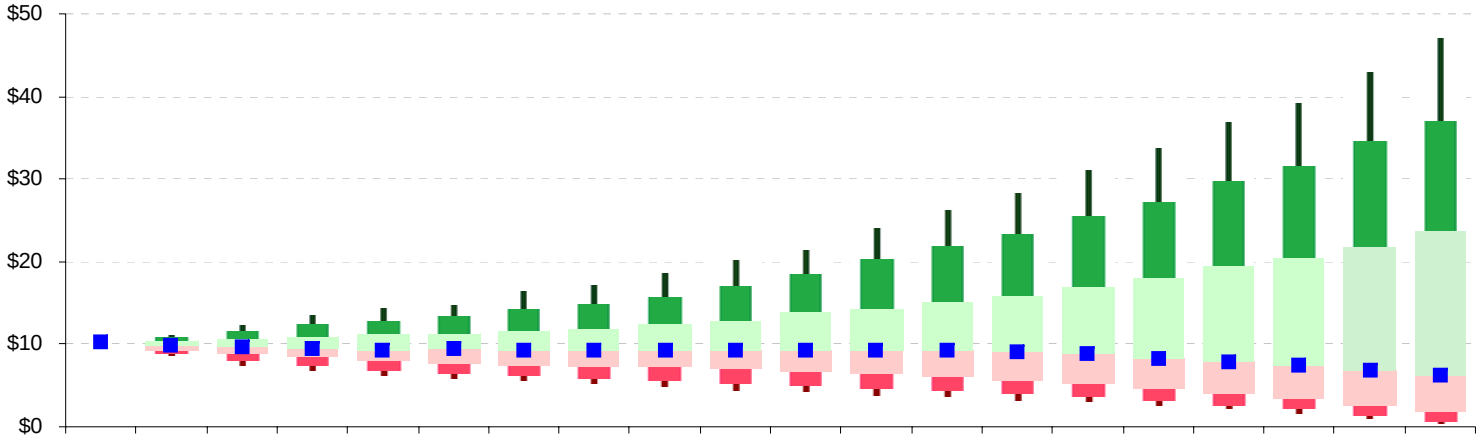



| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 6% | 6% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% |
| 10th | 6% | 6% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% |
| 25th | 6% | 6% | 6% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% |
| 50th | 6% | 6% | 6% | 6% | 6% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% |
| 75th | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% |
| 90th | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% |
| 95th | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 5% | 5% | 5% |

# Impact of POB Funding – Scenario #2
## Projected Side Account Balance

The side account is expected to decline over the amortization period, but even with the smaller size compared to scenario #1, there is a significant chance the side fund will continue to grow and persist beyond the amortization period.

**Side Fund Balance**



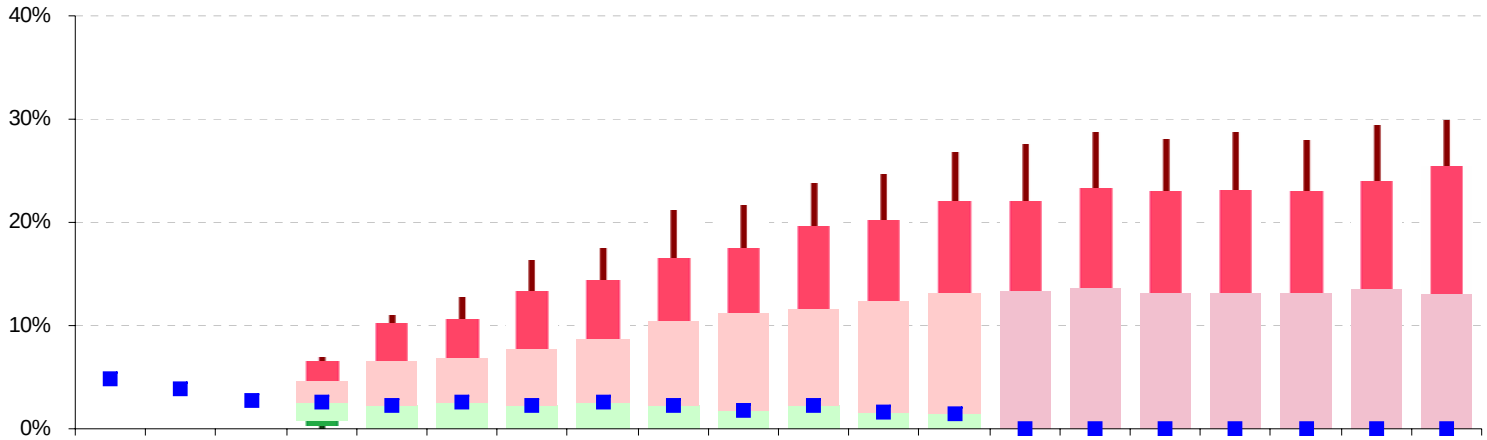

*($billions)*

| At PY Ending 12/31 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | $10 | $11 | $12 | $13 | $14 | $15 | $16 | $17 | $19 | $20 | $21 | $24 | $26 | $28 | $31 | $34 | $37 | $39 | $43 | $47 |
| 90th | $10 | $11 | $12 | $12 | $13 | $13 | $14 | $15 | $16 | $17 | $18 | $20 | $22 | $23 | $26 | $27 | $30 | $32 | $35 | $37 |
| 75th | $10 | $10 | $11 | $11 | $11 | $11 | $12 | $12 | $12 | $13 | $14 | $14 | $15 | $16 | $17 | $18 | $20 | $21 | $22 | $24 |
| 50th | $10 | $10 | $10 | $9 | $9 | $9 | $9 | $9 | $9 | $9 | $9 | $9 | $9 | $9 | $9 | $8 | $8 | $7 | $7 | $6 |
| 25th | $10 | $9 | $9 | $8 | $8 | $8 | $7 | $7 | $7 | $7 | $7 | $6 | $6 | $6 | $5 | $5 | $4 | $3 | $3 | $2 |
| 10th | $10 | $9 | $8 | $7 | $7 | $7 | $6 | $6 | $6 | $5 | $5 | $5 | $4 | $4 | $4 | $3 | $3 | $2 | $1 | $1 |
| 5th | $10 | $9 | $7 | $7 | $6 | $6 | $6 | $5 | $5 | $5 | $4 | $4 | $4 | $3 | $3 | $3 | $2 | $2 | $1 | $0 |

# Impact of POB Funding – Scenario #2
## Net Contribution Rate

The net contribution rate is expected to decrease to 0%, but there remains a risk of significant contribution rates even after the side account offset

**Net Contribution Rate**



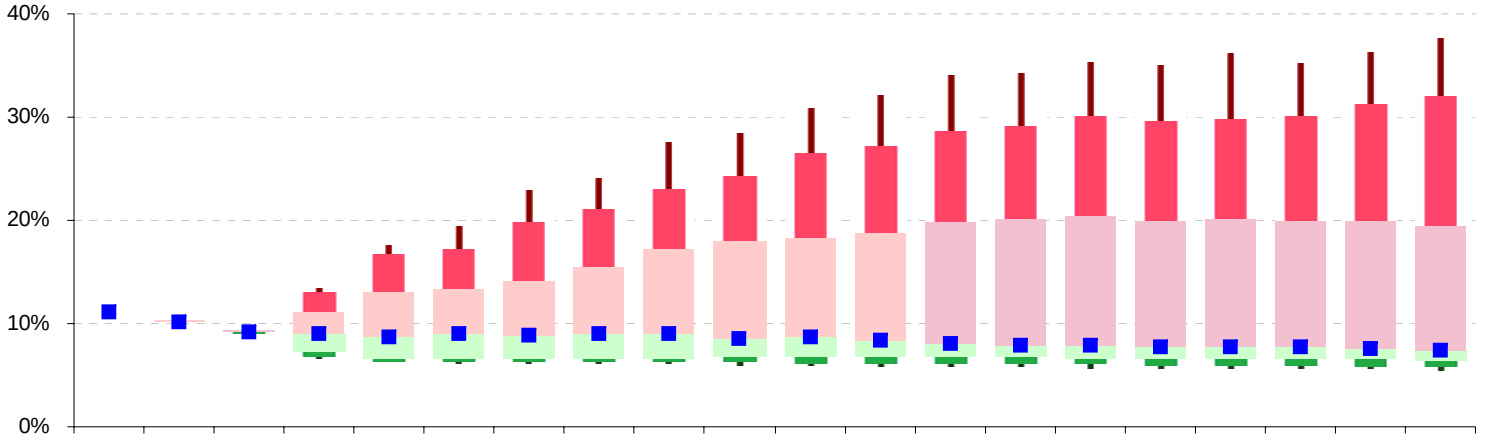

| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 5% | 4% | 3% | 7% | 11% | 13% | 16% | 17% | 21% | 22% | 24% | 25% | 27% | 28% | 29% | 28% | 29% | 28% | 29% | 30% |
| 10th | 5% | 4% | 3% | 7% | 10% | 11% | 13% | 15% | 17% | 18% | 20% | 20% | 22% | 22% | 23% | 23% | 23% | 23% | 24% | 25% |
| 25th | 5% | 4% | 3% | 5% | 7% | 7% | 8% | 9% | 11% | 11% | 12% | 12% | 13% | 13% | 14% | 13% | 13% | 13% | 14% | 13% |
| 50th | 5% | 4% | 3% | 3% | 2% | 3% | 2% | 3% | 2% | 2% | 2% | 2% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 75th | 5% | 4% | 3% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 90th | 5% | 4% | 3% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 95th | 5% | 4% | 3% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# Impact of POB Funding – Scenario #2

## Net Contribution Rate Including POB Payment

Projected rates range from 6% to 38% of payroll compared to 0% to 34% without a side account and 12% to 32% in scenario #1. Some of the potential gains from the side account are deferred to the future.

**Net Contribution Rate + POB Payment**

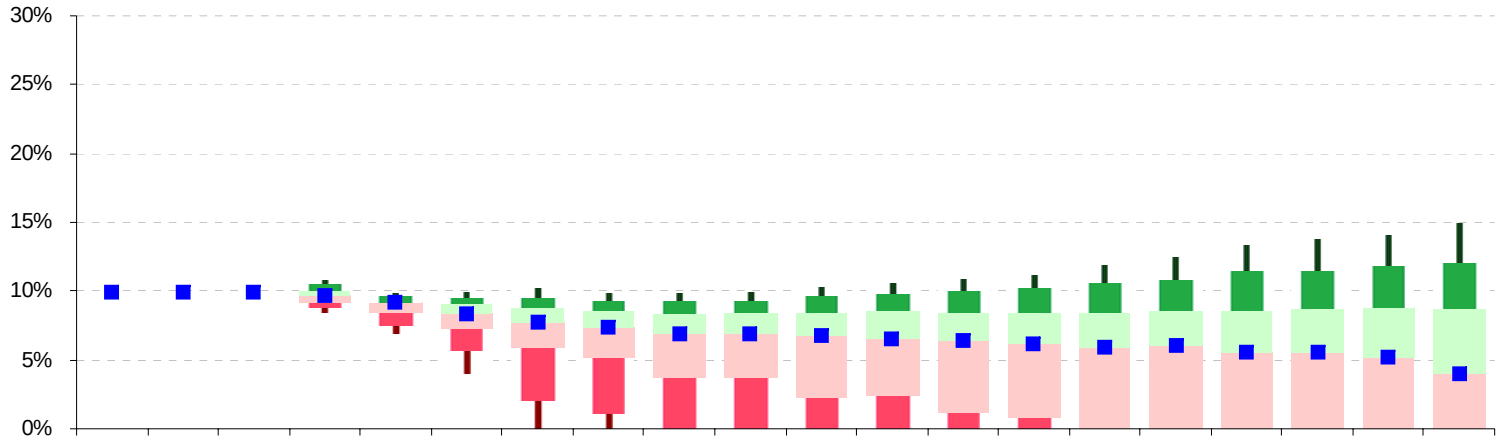



| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 11% | 10% | 9% | 13% | 18% | 19% | 23% | 24% | 28% | 28% | 31% | 32% | 34% | 34% | 35% | 35% | 36% | 35% | 36% | 38% |
| 90th | 11% | 10% | 9% | 13% | 17% | 17% | 20% | 21% | 23% | 24% | 27% | 27% | 29% | 29% | 30% | 30% | 30% | 30% | 31% | 32% |
| 75th | 11% | 10% | 9% | 11% | 13% | 13% | 14% | 15% | 17% | 18% | 18% | 19% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% |
| 50th | 11% | 10% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 7% |
| 25th | 11% | 10% | 9% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% |
| 10th | 11% | 10% | 9% | 7% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% |
| 5th | 11% | 10% | 9% | 7% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% |

# Impact of POB Funding – Scenario #2
## Actual Side Account Rate Relief

The use of the side account after favorable investment returns is limited by the PERS required contribution rate.

**Actual Side Fund Amortization**



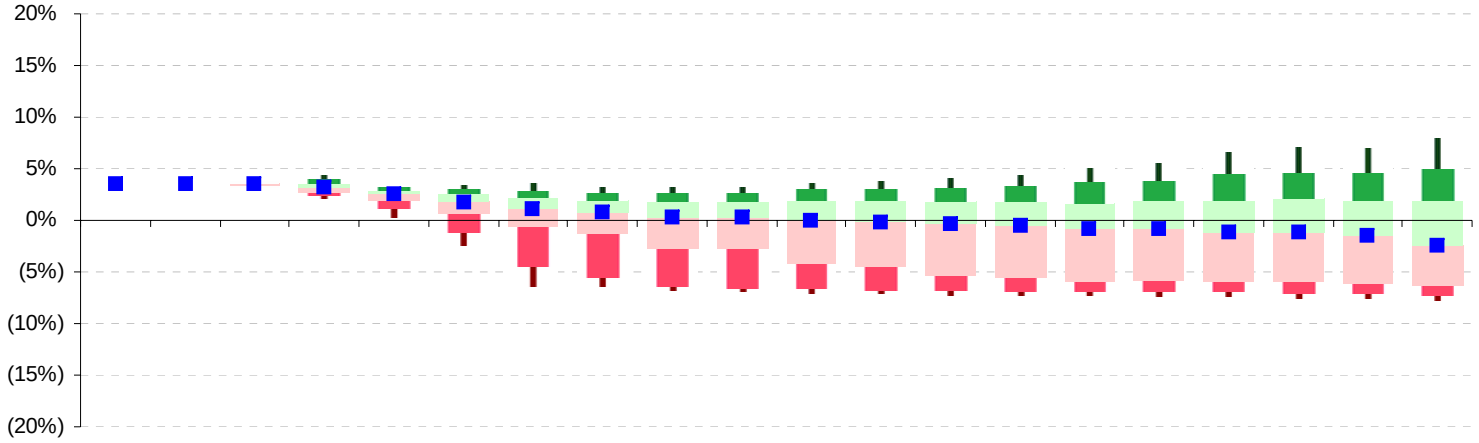

| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 10% | 10% | 10% | 11% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 11% | 11% | 11% | 12% | 12% | 13% | 14% | 14% | 15% |
| 90th | 10% | 10% | 10% | 11% | 10% | 10% | 10% | 9% | 9% | 9% | 10% | 10% | 10% | 10% | 11% | 11% | 11% | 11% | 12% | 12% |
| 75th | 10% | 10% | 10% | 10% | 9% | 9% | 9% | 9% | 8% | 8% | 8% | 9% | 8% | 8% | 8% | 9% | 9% | 9% | 9% | 9% |
| 50th | 10% | 10% | 10% | 10% | 9% | 8% | 8% | 7% | 7% | 7% | 7% | 7% | 6% | 6% | 6% | 6% | 6% | 6% | 5% | 4% |
| 25th | 10% | 10% | 10% | 9% | 8% | 7% | 6% | 5% | 4% | 4% | 2% | 2% | 1% | 1% | 0% | 0% | 0% | 0% | 0% | 0% |
| 10th | 10% | 10% | 10% | 9% | 8% | 6% | 2% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 5th | 10% | 10% | 10% | 9% | 7% | 4% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# Impact of POB Funding – Scenario #2

## Net Annual Gain from Side Account Compared to POB Payment

In the latter portion of the projection period, the POB payments may exceed the rate relief provided by the side account. The benefits of the side account are deferred into the future.

**Actual Side Fund Amortization Less POB Payment**



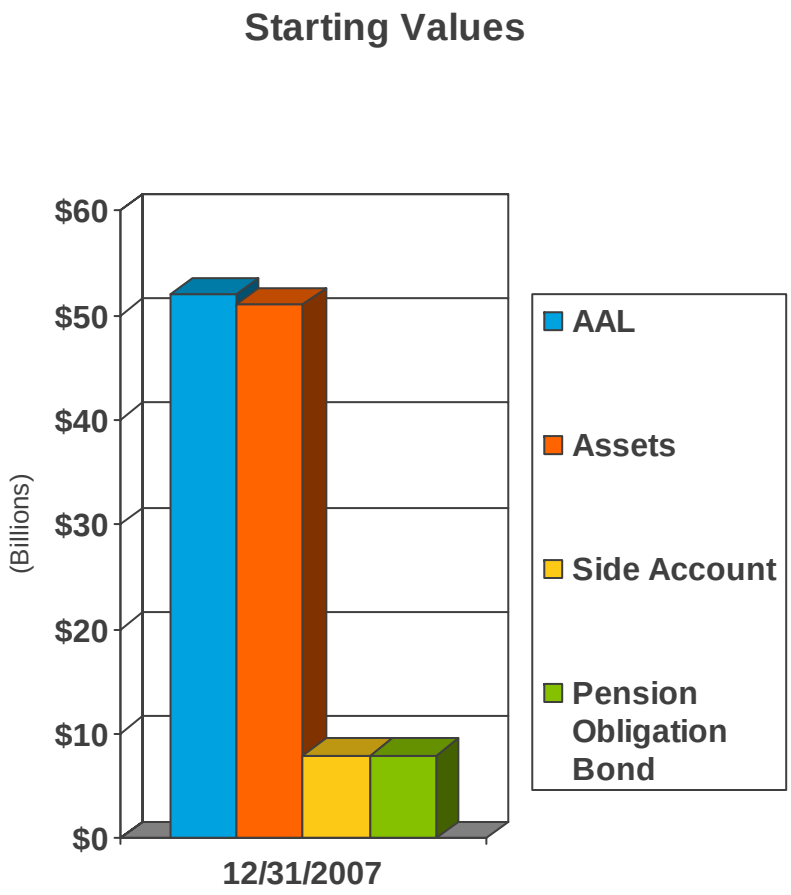

| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 4% | 4% | 4% | 4% | 3% | 3% | 4% | 3% | 3% | 3% | 4% | 4% | 4% | 4% | 5% | 5% | 7% | 7% | 7% | 8% |
| 90th | 4% | 4% | 4% | 4% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 4% | 4% | 4% | 5% | 5% | 5% |
| 75th | 4% | 4% | 4% | 4% | 3% | 3% | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 2% |
| 50th | 4% | 4% | 3% | 3% | 3% | 2% | 1% | 1% | 0% | 0% | 0% | (0%) | (0%) | (1%) | (1%) | (1%) | (1%) | (1%) | (1%) | (2%) |
| 25th | 4% | 4% | 3% | 3% | 2% | 1% | (1%) | (1%) | (3%) | (3%) | (4%) | (4%) | (5%) | (5%) | (6%) | (6%) | (6%) | (6%) | (6%) | (6%) |
| 10th | 4% | 3% | 3% | 2% | 1% | (1%) | (4%) | (5%) | (6%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) |
| 5th | 4% | 3% | 3% | 2% | 0% | (2%) | (6%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (8%) | (8%) | (8%) |

## Impact of POB Funding – Scenario #2
Observations

- The timing of the pension obligation bonds issued by the State of Oregon was close to perfect, resulting in a significant gain for the State and significantly lower expected long-term pension costs.
- However, the reward for significant additional gains will be deferred into the future while the impact of losses may be felt in a shorter timeframe.
- In the next decade, the state may find that its payments on the pension obligation bonds equal or exceed what other entities without a side account pay to PERS.
- After the pension obligation bond has been paid off, it is likely that the side account will continue to fund required contributions to PERS.


# **Impact of POB Funding**
## Scenario 3 – A New Bond

# Impact of POB Funding – Scenario #3
## Starting Values

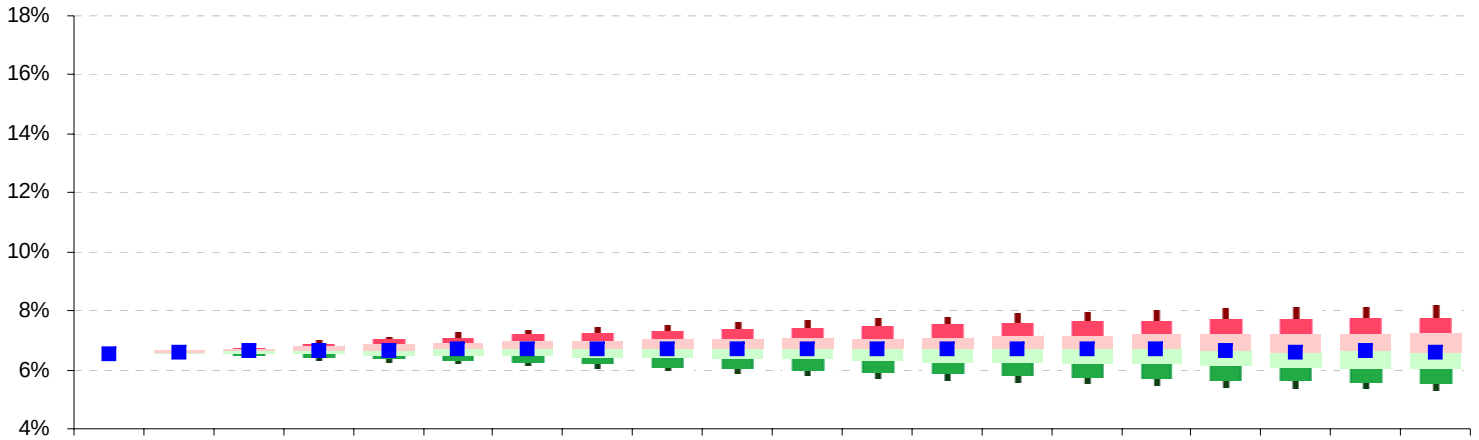



- A new POB and side account are modeled in this scenario.
- The pension obligation bond is equal to the remaining balance on the state's bond
- The remaining bond payments and side account balance have been scaled to the entire system
- As of 12/31/2007:
  - Side account = $7.9 billion
  - POB = $7.9 billion
  - POB interest rate = 5.75%
  - Net contribution rate = 8.0%
  - POB payment = 7.0%
  - Funded status = 113%

# Impact of POB Funding – Scenario #3

## POB Payments as a Percentage of Payroll

**Pension Obligation Bond Payments**

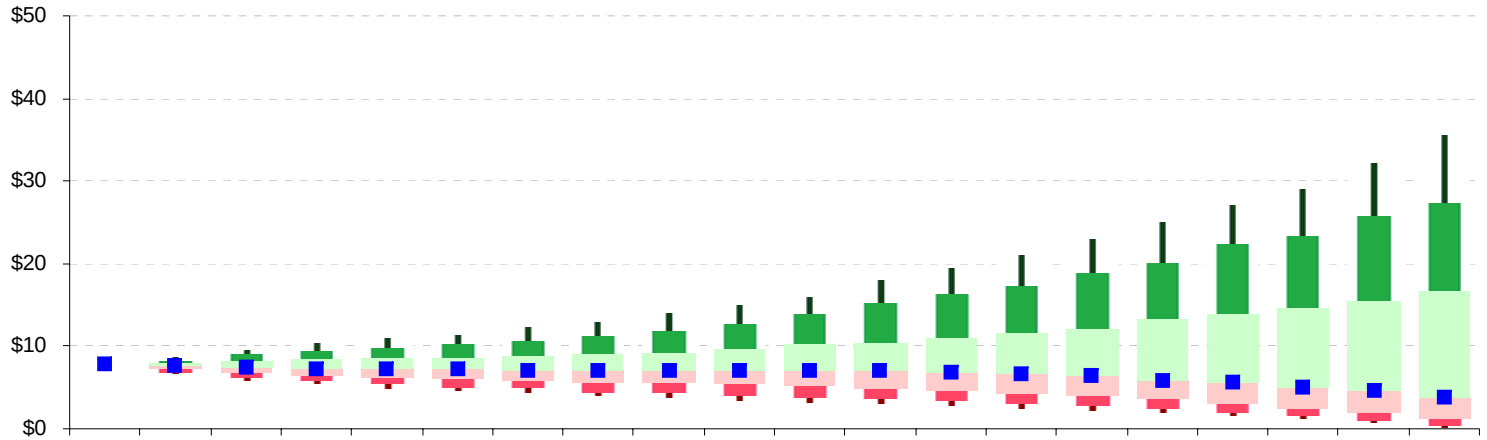



| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% |
| 10th | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% |
| 25th | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% |
| 50th | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% |
| 75th | 7% | 7% | 7% | 7% | 7% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% |
| 90th | 7% | 7% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% |
| 95th | 7% | 7% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 5% | 5% | 5% | 5% | 5% |

# Impact of POB Funding – Scenario #3
## Projected Side Account Balance

The side account is expected to decline over the amortization period, but even with the smaller size compared to scenarios #1 and #2, there is a significant chance the side fund will continue to grow and persist beyond the amortization period.

**Side Fund Balance**



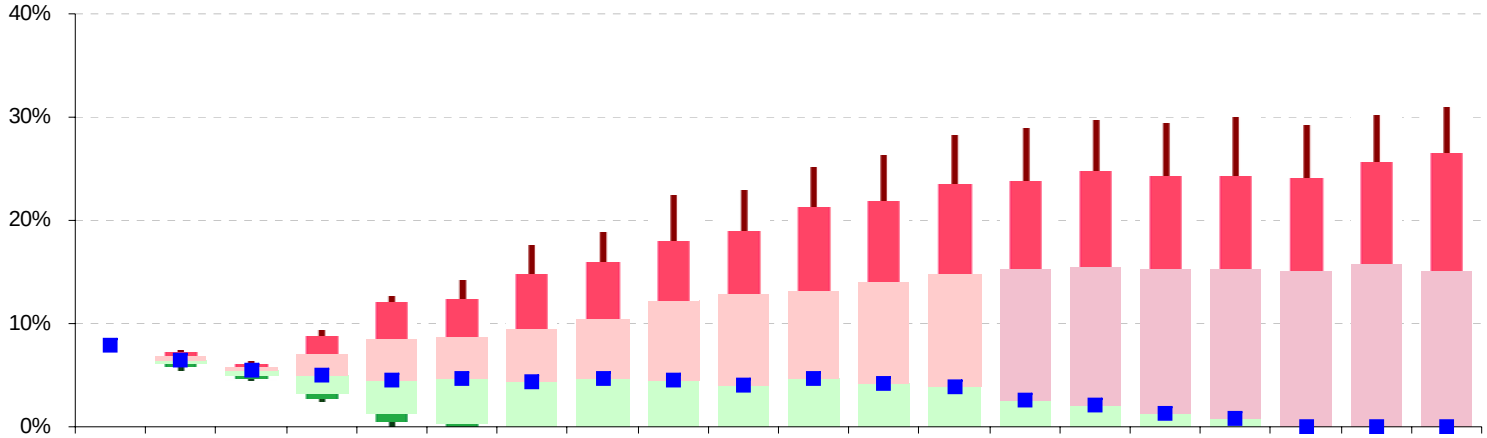

*($billions)*

| At PY Ending 12/31 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | $8 | $9 | $9 | $10 | $11 | $11 | $12 | $13 | $14 | $15 | $16 | $18 | $19 | $21 | $23 | $25 | $27 | $29 | $32 | $35 |
| 90th | $8 | $8 | $9 | $10 | $10 | $10 | $11 | $11 | $12 | $13 | $14 | $15 | $16 | $17 | $19 | $20 | $22 | $23 | $26 | $27 |
| 75th | $8 | $8 | $8 | $8 | $9 | $9 | $9 | $9 | $9 | $10 | $10 | $11 | $11 | $12 | $12 | $13 | $14 | $15 | $16 | $17 |
| 50th | $8 | $8 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $6 | $6 | $6 | $5 | $5 | $4 |
| 25th | $8 | $7 | $7 | $7 | $6 | $6 | $6 | $6 | $6 | $5 | $5 | $5 | $5 | $4 | $4 | $4 | $3 | $2 | $2 | $1 |
| 10th | $8 | $7 | $6 | $6 | $5 | $5 | $5 | $5 | $4 | $4 | $4 | $4 | $3 | $3 | $3 | $2 | $2 | $2 | $1 | $0 |
| 5th | $8 | $7 | $6 | $5 | $5 | $5 | $4 | $4 | $4 | $3 | $3 | $3 | $3 | $2 | $2 | $2 | $2 | $1 | $1 | $0 |

# Impact of POB Funding – Scenario #3
## Net Contribution Rate

The net contribution rate is expected to decrease to 0%, but there remains a risk of significant contribution rates even after the side account offset.

**Net Contribution Rate**



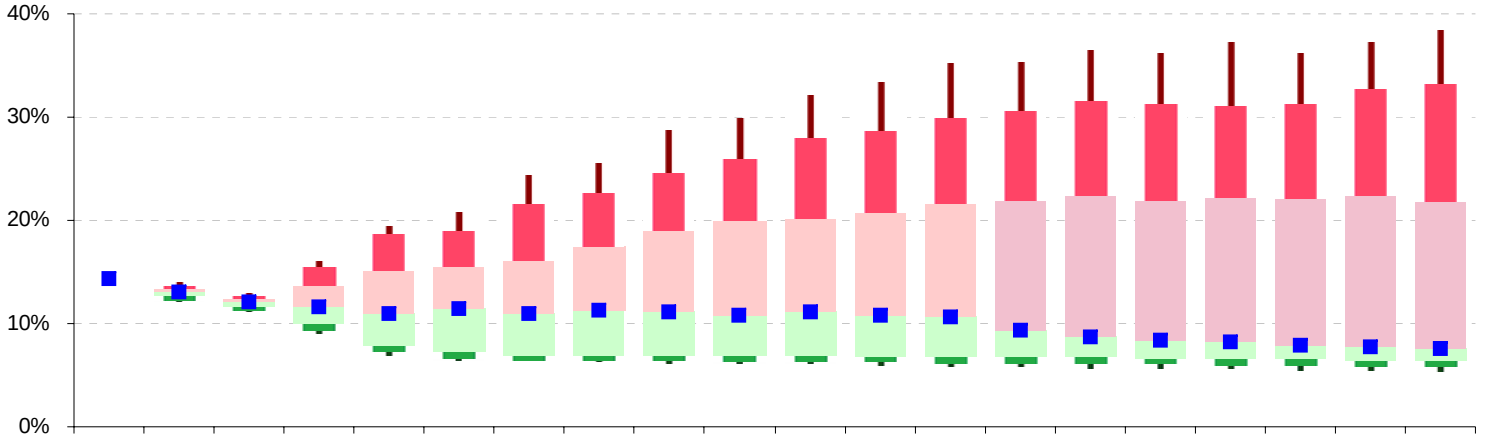

| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 8% | 7% | 6% | 9% | 13% | 14% | 18% | 19% | 22% | 23% | 25% | 26% | 28% | 29% | 30% | 29% | 30% | 29% | 30% | 31% |
| 10th | 8% | 7% | 6% | 9% | 12% | 12% | 15% | 16% | 18% | 19% | 21% | 22% | 23% | 24% | 25% | 24% | 24% | 24% | 26% | 27% |
| 25th | 8% | 7% | 6% | 7% | 8% | 9% | 9% | 10% | 12% | 13% | 13% | 14% | 15% | 15% | 16% | 15% | 15% | 15% | 16% | 15% |
| 50th | 8% | 6% | 5% | 5% | 4% | 5% | 4% | 5% | 4% | 4% | 5% | 4% | 4% | 3% | 2% | 1% | 1% | 0% | 0% | 0% |
| 75th | 8% | 6% | 5% | 3% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 90th | 8% | 6% | 5% | 3% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 95th | 8% | 6% | 4% | 2% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# Impact of POB Funding – Scenario #3

## Net Contribution Rate Including POB Payment

Projected rates range from 5% to 38% of payroll compared to 0% to 34% without a side account. Some of the potential gains from the side account are deferred to the future.

**Net Contribution Rate + POB Payment**

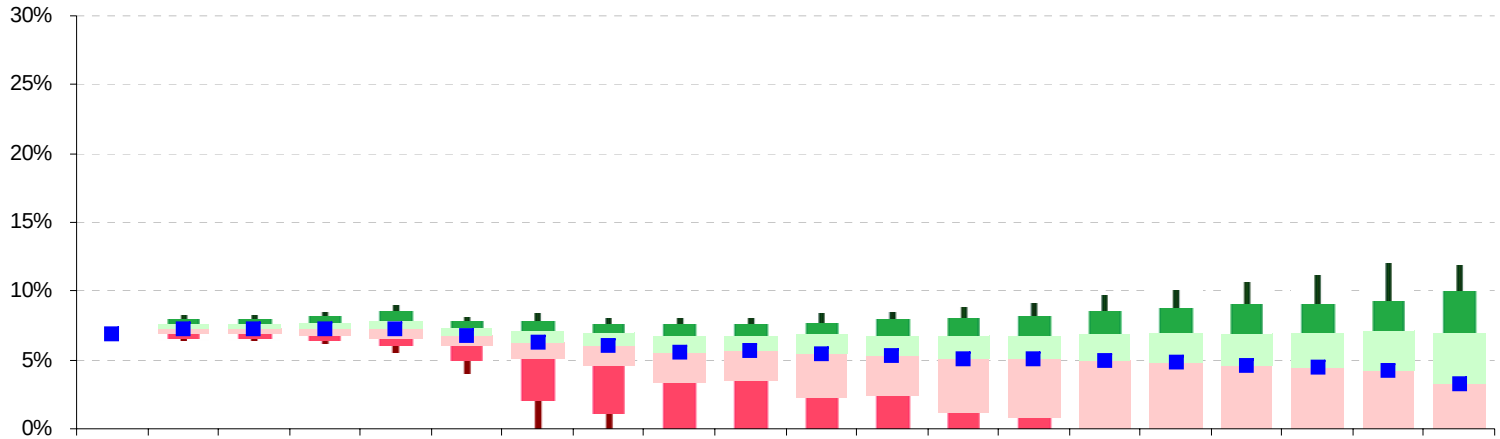



| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 14% | 14% | 13% | 16% | 19% | 21% | 24% | 26% | 29% | 30% | 32% | 33% | 35% | 35% | 36% | 36% | 37% | 36% | 37% | 38% |
| 90th | 14% | 14% | 13% | 15% | 19% | 19% | 22% | 23% | 25% | 26% | 28% | 29% | 30% | 31% | 32% | 31% | 31% | 31% | 33% | 33% |
| 75th | 14% | 13% | 12% | 14% | 15% | 16% | 16% | 17% | 19% | 20% | 20% | 21% | 22% | 22% | 22% | 22% | 22% | 22% | 22% | 22% |
| 50th | 14% | 13% | 12% | 12% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 9% | 9% | 8% | 8% | 8% | 8% | 8% |
| 25th | 14% | 13% | 12% | 10% | 8% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 6% |
| 10th | 14% | 12% | 11% | 9% | 7% | 7% | 7% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% |
| 5th | 14% | 12% | 11% | 9% | 7% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 5% |

# Impact of POB Funding – Scenario #3
## Actual Side Account Rate Relief

The use of the side account after favorable investment returns is limited by the PERS required contribution rate.

**Actual Side Fund Amortization**



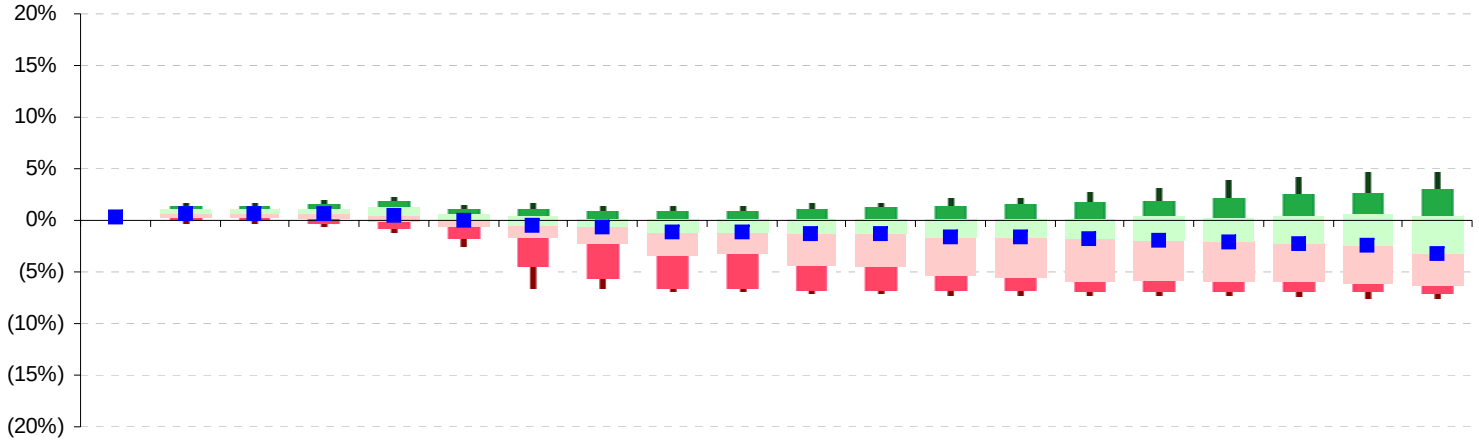

| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 7% | 8% | 8% | 9% | 9% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 9% | 9% | 10% | 10% | 11% | 11% | 12% | 12% |
| 90th | 7% | 8% | 8% | 8% | 9% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 9% | 9% | 9% | 9% | 9% | 10% |
| 75th | 7% | 8% | 8% | 8% | 8% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% |
| 50th | 7% | 7% | 7% | 7% | 7% | 7% | 6% | 6% | 6% | 6% | 5% | 5% | 5% | 5% | 5% | 5% | 5% | 4% | 4% | 3% |
| 25th | 7% | 7% | 7% | 7% | 7% | 6% | 5% | 5% | 3% | 3% | 2% | 2% | 1% | 1% | 0% | 0% | 0% | 0% | 0% | 0% |
| 10th | 7% | 7% | 7% | 6% | 6% | 5% | 2% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 5th | 7% | 6% | 6% | 6% | 6% | 4% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# Impact of POB Funding – Scenario #3

## Net Annual Gain from Side Account Compared to POB Payment

In a few years, the POB payments may exceed the rate relief provided by the side account. The benefits of the side account are deferred into the future.

**Actual Side Fund Amortization Less POB Payment**




| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 0% | 2% | 2% | 2% | 2% | 1% | 2% | 1% | 1% | 1% | 2% | 2% | 2% | 2% | 3% | 3% | 4% | 4% | 5% | 5% |
| 90th | 0% | 1% | 1% | 2% | 2% | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 2% | 2% | 2% | 2% | 3% | 3% | 3% |
| 75th | 0% | 1% | 1% | 1% | 1% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 1% | 0% |
| 50th | 0% | 1% | 1% | 1% | 1% | 0% | (0%) | (1%) | (1%) | (1%) | (1%) | (1%) | (2%) | (2%) | (2%) | (2%) | (2%) | (2%) | (2%) | (3%) |
| 25th | 0% | 0% | 0% | 0% | (0%) | (1%) | (2%) | (2%) | (3%) | (3%) | (4%) | (5%) | (5%) | (5%) | (6%) | (6%) | (6%) | (6%) | (6%) | (6%) |
| 10th | 0% | (0%) | (0%) | (0%) | (1%) | (2%) | (5%) | (6%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) |
| 5th | 0% | (0%) | (0%) | (1%) | (1%) | (3%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (7%) | (8%) | (8%) |

## Impact of POB Funding – Scenario #3
Observations

- A new pension obligation bond is likely to have favorable results due to the difference between the expected return and the interest rate on the bond.
- However, the reward for significant gains may be deferred into the future while the impact of losses may be felt in a shorter timeframe.
- The net result is more volatile than the result without a pension obligation bond.
- After the pension obligation bond has been paid off, the side account may continue to fund some of the required contributions to PERS.
- When considering a new pension obligation bond, employers may want to consider the likelihood that PERS contribution rates prior to side accounts may decline to a level below the payment on the bond.

# Impact of POB Funding
## Policy Considerations

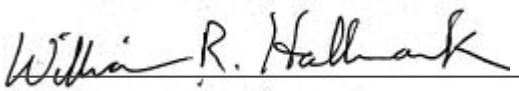
- To help employers manage the risks in their POB financing strategies, PERS may want to consider and evaluate:
  - Alternative investment options for side accounts – A more conservative alternative may help side account owners, who have already made considerable gains, reduce the risk of losing those gains.
  - Transfers of portions of side accounts to other employers – While it is not clear why another employer would be willing to pay the full amount for a side account, there may be some interest in getting partial value today for a portion of a side account as opposed to waiting 20 or more years to receive the value.
- In order to get immediate value from their side account, employers with large side accounts may want to consider and evaluate:
  - Consolidation with other employers without side accounts.
  - Contracting with other employers to perform services requiring PERS covered personnel.


# Appendix

# Appendix
## Projection Certification

The projections in this report are based on the data, methods, assumptions and plan provisions described in the Oregon Public Employees Retirement System actuarial valuation report as of December 31, 2006. The liabilities, costs and other information projected in this report were determined in accordance with generally accepted actuarial principles and procedures. Actual experience, however, could differ from these assumptions and may produce results that differ materially and significantly from this report.

We are available to answer any questions on the material contained in the report, or to provide explanations or further details as may be appropriate.



May 16, 2008

**William R. Hallmark, ASA, MAAA** **Date**
**Enrolled Actuary No. 08-5656**

May 16, 2008

**David A. Kelly, FIA, FSA, MAAA, CFA** **Date**
**Enrolled Actuary No. 08-6961**

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503 273 5900

# Appendix
# Actuarial Basis

## *Data*

We have based our projection of the liabilities on the data, methods, assumptions and plan provisions described in the December 31, 2006, Actuarial Valuation ("Valuation Report") for the Oregon Public Employees Retirement System.

Assets as of December 31, 2007, were based on values provided by Oregon PERS reflecting the Board's earnings crediting decisions for 2007.

We have assumed that the active participant data reflected in the valuation of the Plan remains stable over the projection period (i.e. – participants leaving employment are replaced by new hires in such a way that the total counts, average age, and average service remain stable from year to year). No new members are assumed to be eligible for Tier 1 and Tier 2 benefits; all new entrants are assumed to become members under the OPSRP benefit formula.

Current State and Portland Public School Pension Obligation Bond balances and payment schedules were provided by Oregon PERS.

## *Methods / Policies*

Liabilities are based on the Projected Unit Credit method and are rolled forward according to the following rules:

**Normal cost:** Normal cost increases with assumed wage growth adjusted for wage experience, demographic experience and asset return experience (if applicable). Demographic experience follows assumptions described in the Valuation Report.

**Accrued liability:** Liabilities increase with normal cost and decrease with benefit payments. Results are adjusted for wage, demographic and asset experience (if applicable).

**Contribution Rates:** The projected contribution rates are calculated on each odd valuation date in accordance with methodologies described in the Valuation Report. Rates are applied 18 months after the determination date.

**Expenses:** Administration expenses were assumed to be equal to $8.5M plus .05% of Market Value of Assets.

**Actuarial Value of Assets**: Equal to Market Value of Assets excluding Contingency, Capital Preservation and Tier 1 Rate Guarantee Reserves

**Tax Revenue Projections:** Historical tax revenue data was provided by the client. Statistical regression and input from the Legislative Revenue Office were used to develop predictive formulae for each type of tax revenue (personal, property, corporate and stable taxes) based upon the economic metrics available in our capital market simulation. These projections are not suitable for any purpose other than this analysis.

# Appendix
# Actuarial Basis

## *Investment Policy*

General Accounts were assumed to be invested as follows: 17% Domestic Equity; 22% International Equity; 7% Global Equity; 11% Real Estate; 17% Private Equity; 27% Fixed Income.

Variable Accounts were assumed to be invested in 100% Domestic Equity.

## *Assumptions*

In general, all assumptions are as described in the Valuation Report.

The major assumptions used in our projections are shown below. They are aggregate average assumptions that apply to the whole population and were held constant throughout the projection period. The economic experience adjustments were allowed to vary in future years given the conditions defined in each economic scenario.

- Valuation interest rate — 8.00%
- General Accounts Growth — 8.00%
- Variable Account Growth — 8.50%
- Wage growth assumption — 3.75%
- Wage growth experience — inflation + 1.25%
- Demographic experience — reflects decrement assumptions as described in the Valuation Report.
- Actual Investment earnings are based on Mercer's Capital Market Outlook reflecting actual market experience through 4/30/2008.

## *Reserve Projections*

Contingency Reserve as of 12/31/2007 was estimated to be $663.2M. No future increases or decreases from this reserve were assumed.

Capital Preservation Reserve was assumed to be $0 throughout the projection period.

Tier 1 Rate Guarantee Reserve ("T1RGR") was estimated to be $1,878.6M as of 12/31/2007. The reserve was assumed to grow with returns in excess of 8% on Tier 1 Member Accounts plus T1RGR. When aggregate returns were below 8%, applicable amounts from the T1RGR were transferred to the Tier 1 Member Accounts to maintain the 8% target growth on the member accounts. The T1RGR reserve was allowed to go negative.

# Appendix
# Actuarial Basis

## *Side Fund Projections*

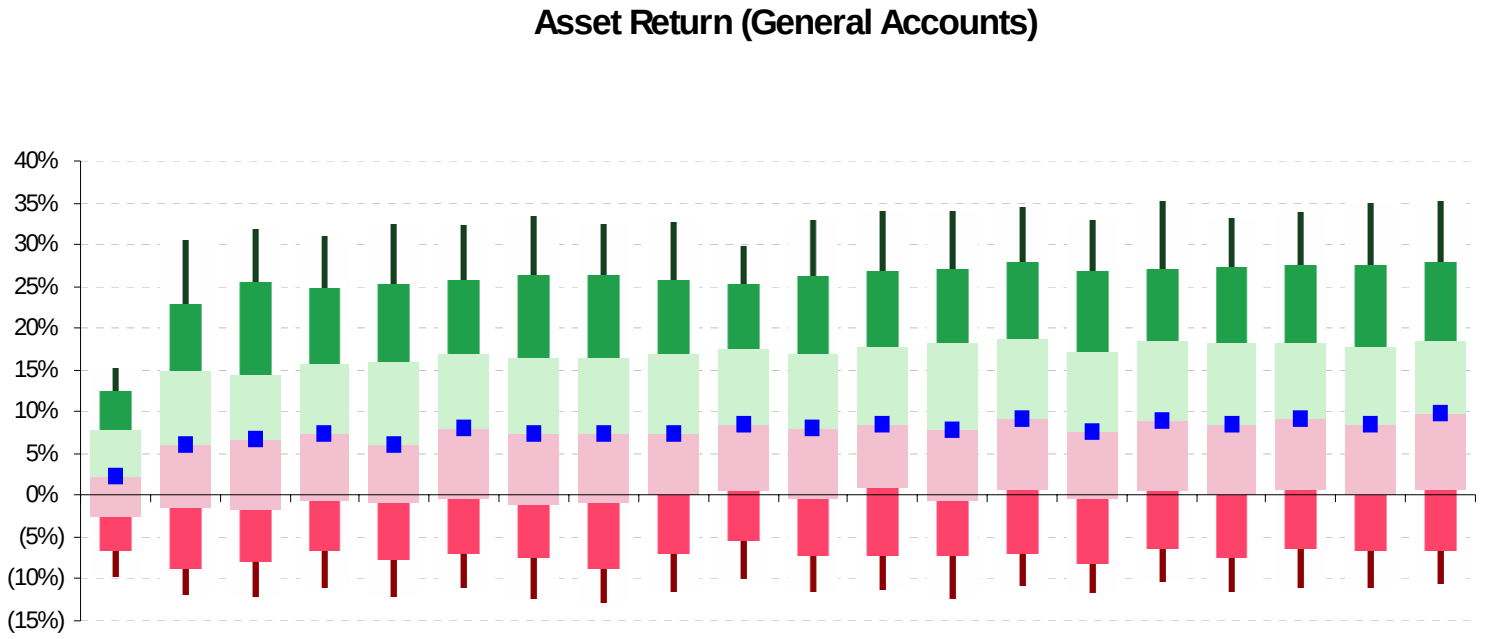
Current Side Funds were estimated to be $8,557.3M as of 12/31/2007.

For each of the scenarios studied, the side fund, remaining POB, and POB payment schedule were scaled from the original amounts to system-wide amounts in proportion to payroll. The original amounts and the scenario amounts as of 12/31/2007 are as follows:

| | Scenario Amounts | | | Original Amounts | |
|---|---|---|---|---|---|
| | Side Fund | POB | Based on | Side Fund | POB |
| **Scenario 1** | $22,959,963,621 | $14,538,118,926 | PPS | $752,400,402 | $476,415,673 |
| **Scenario 2** | 10,359,738,658 | 7,898,152,309 | State of Oregon | 2,730,764,218 | 2,081,905,000 |
| **Scenario 3** | 7,898,152,309 | 7,898,152,309 | State of Oregon | N/A | 2,081,905,000 |

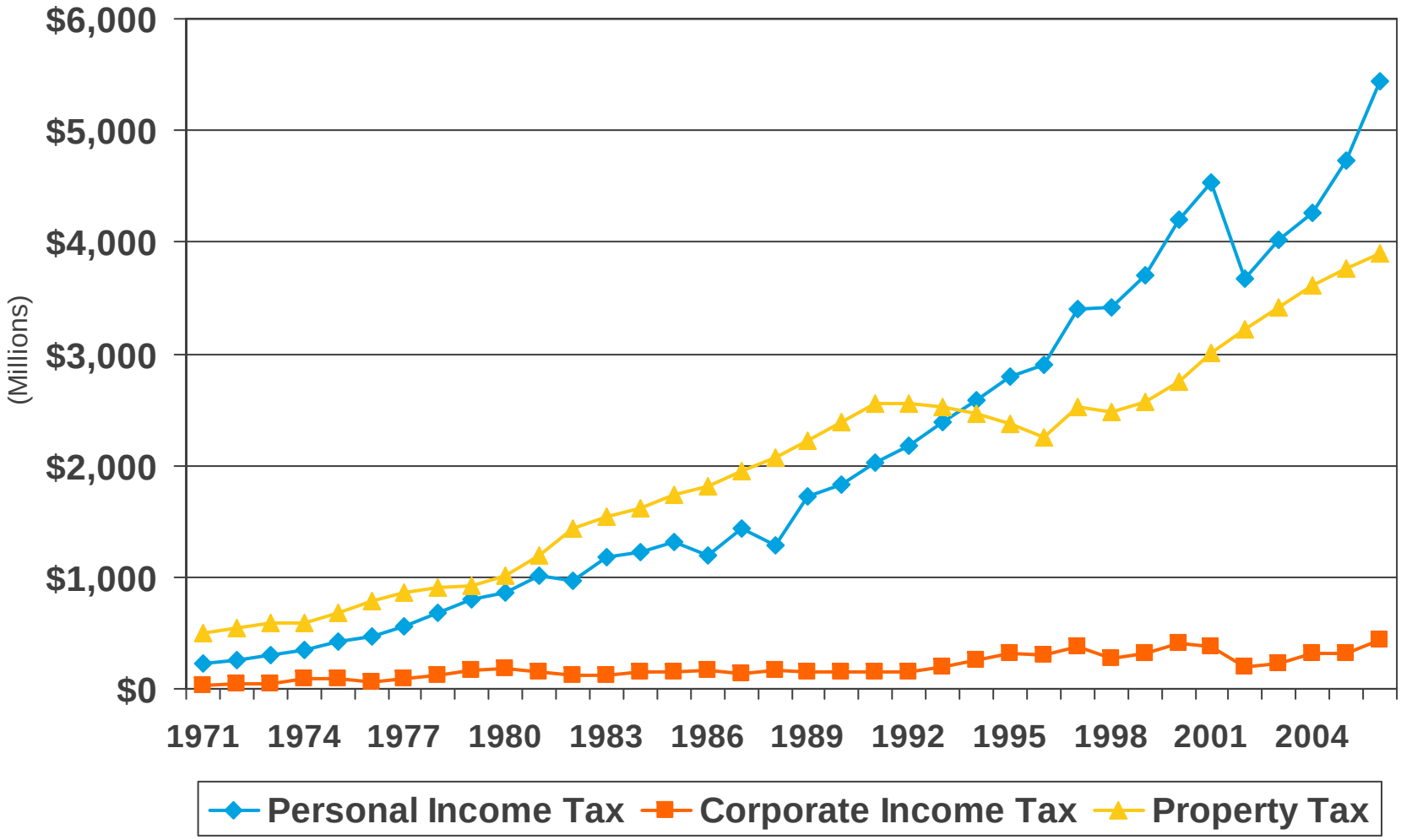
# Appendix
## Asset Return (General Accounts)

Investment returns for 2008 reflect actual returns through March.



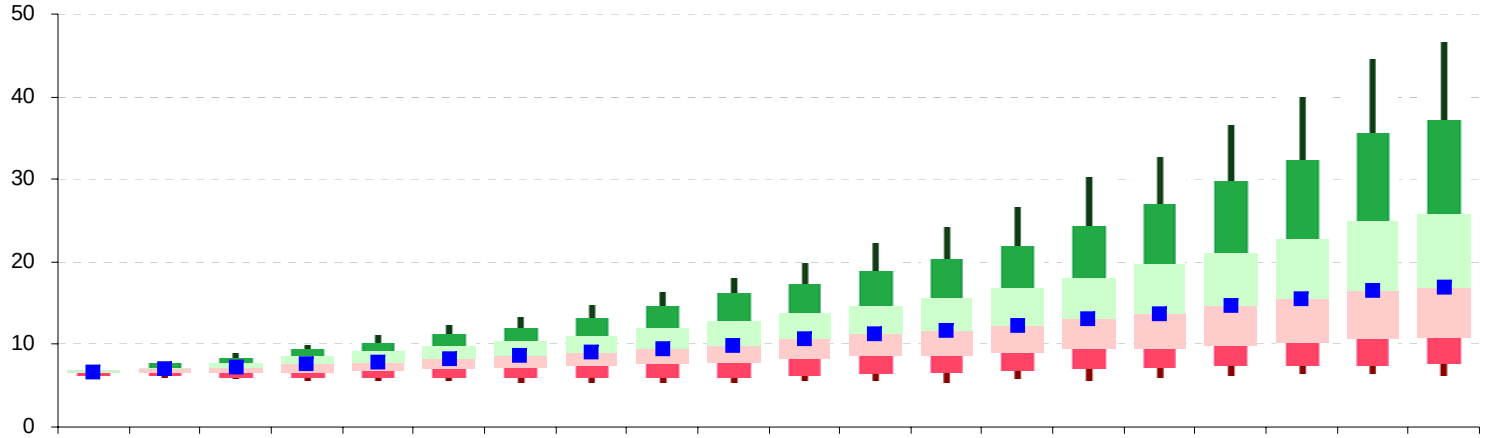

| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95th | 15% | 30% | 32% | 31% | 32% | 32% | 33% | 33% | 33% | 30% | 33% | 34% | 34% | 34% | 33% | 35% | 33% | 34% | 35% | 35% |
| 90th | 12% | 23% | 25% | 25% | 25% | 26% | 26% | 26% | 26% | 25% | 26% | 27% | 27% | 28% | 27% | 27% | 27% | 27% | 27% | 28% |
| 75th | 8% | 15% | 15% | 16% | 16% | 17% | 16% | 16% | 17% | 17% | 17% | 18% | 18% | 19% | 17% | 19% | 18% | 18% | 18% | 18% |
| 50th | 2% | 6% | 7% | 7% | 6% | 8% | 7% | 7% | 7% | 9% | 8% | 9% | 8% | 9% | 8% | 9% | 8% | 9% | 9% | 10% |
| 25th | (3%) | (1%) | (2%) | (0%) | (1%) | (0%) | (1%) | (1%) | 0% | 1% | (0%) | 1% | (1%) | 1% | (0%) | 0% | 0% | 1% | 0% | 1% |
| 10th | (7%) | (9%) | (8%) | (6%) | (8%) | (7%) | (7%) | (9%) | (7%) | (6%) | (7%) | (7%) | (7%) | (7%) | (8%) | (6%) | (7%) | (6%) | (7%) | (7%) |
| 5th | (10%) | (12%) | (12%) | (11%) | (12%) | (11%) | (12%) | (13%) | (12%) | (10%) | (11%) | (11%) | (12%) | (11%) | (12%) | (10%) | (11%) | (11%) | (11%) | (11%) |

# Appendix
## Historical Tax Revenues (Net of Kicker)



# Appendix
## Projected State General Fund Revenue

**Projected State General Fund Revenue (from all sources)**



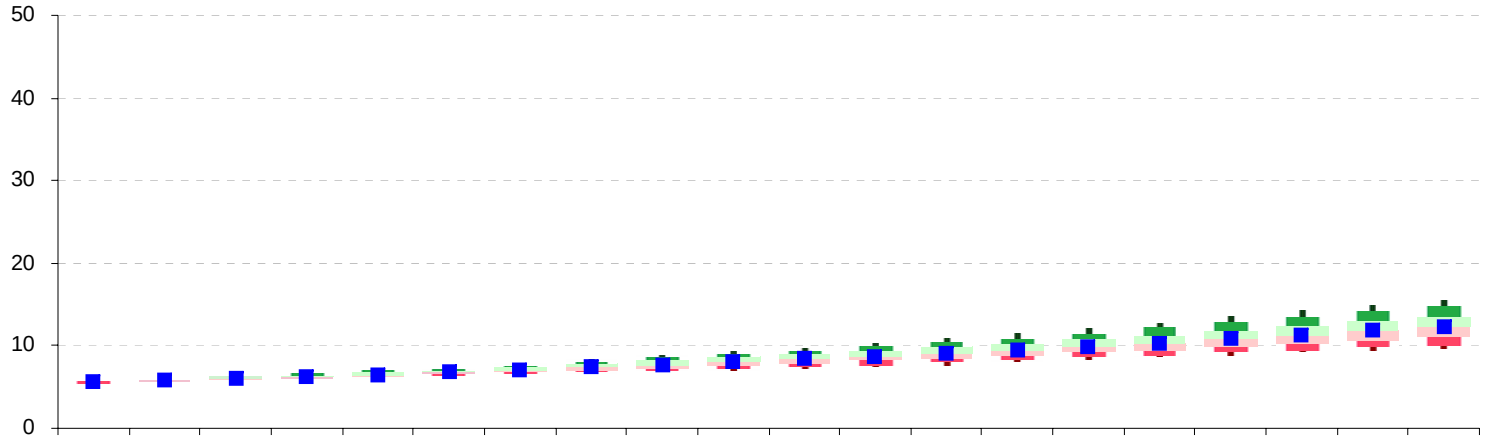

*($billions)*

| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 15 | 16 | 18 | 20 | 22 | 24 | 27 | 30 | 33 | 36 | 40 | 44 | 47 |
| 10th | 7 | 8 | 8 | 9 | 10 | 11 | 12 | 13 | 15 | 16 | 17 | 19 | 20 | 22 | 24 | 27 | 30 | 32 | 36 | 37 |
| 25th | 7 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 20 | 21 | 23 | 25 | 26 |
| 50th | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 9 | 10 | 11 | 11 | 12 | 12 | 13 | 14 | 15 | 16 | 17 | 17 |
| 75th | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 10 | 10 | 10 | 11 | 11 |
| 90th | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 8 |
| 95th | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |

We used a statistical regression of historical tax revenue against key economic data series that are produced in our projections (GDP growth, inflation, interest rates and equity returns) to develop predictive formulae for the various sources of tax revenue. We want to be cautious not to overstate the expected accuracy of these predictive formulae, but back-testing suggests that they will provide a roughly similar pattern of peaks and dips in annual growth of tax revenue. This should be sufficient to test for potential correlation between pension contributions and tax revenues in the Monte Carlo simulations. The projections of tax revenue should not be used for any other purpose and certainly do not supersede the State's own budget estimates. Annual growth in tax revenue will be sensitive to many more factors than are available in our model of capital markets.

# Appendix
## Projected City/County Tax Revenue

**Projected City/County Tax Revenue (from all sources)**



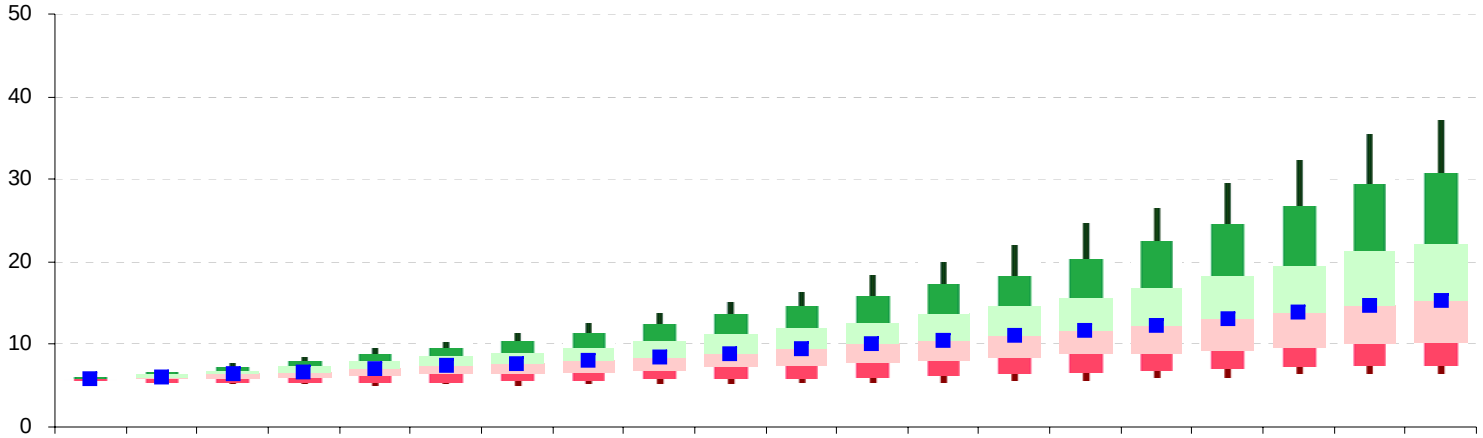

*($billions)*

| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 13 | 13 | 14 | 15 | 16 |
| 10th | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 9 | 9 | 9 | 10 | 10 | 11 | 12 | 12 | 13 | 14 | 14 | 15 |
| 25th | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 9 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 12 | 13 | 14 |
| 50th | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 10 | 10 | 10 | 11 | 11 | 12 | 12 |
| 75th | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 10 | 10 | 11 | 11 |
| 90th | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 9 | 10 | 10 | 10 |
| 95th | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 9 | 10 | 10 |

We used a statistical regression of historical tax revenue against key economic data series that are produced in our projections (GDP growth, inflation, interest rates and equity returns) to develop predictive formulae for the various sources of tax revenue. We want to be cautious not to overstate the expected accuracy of these predictive formulae, but back-testing suggests that they will provide a roughly similar pattern of peaks and dips in annual growth of tax revenue. This should be sufficient to test for potential correlation between pension contributions and tax revenues in the Monte Carlo simulations. The projections of tax revenue should not be used for any other purpose and certainly do not supersede the State's own budget estimates. Annual growth in tax revenue will be sensitive to many more factors than are available in our model of capital markets.

# OPERS - Current
## Projected School Districts Tax Revenue

**Projected School Districts Tax Revenue (from all sources)**




*($billions)*

| For PY Ending 12/31 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th | 6 | 7 | 8 | 8 | 9 | 10 | 11 | 12 | 14 | 15 | 16 | 18 | 20 | 22 | 25 | 26 | 29 | 32 | 35 | 37 |
| 10th | 6 | 7 | 7 | 8 | 9 | 10 | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 20 | 22 | 25 | 27 | 29 | 31 |
| 25th | 6 | 6 | 7 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 20 | 21 | 22 |
| 50th | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 12 | 12 | 13 | 14 | 15 | 15 |
| 75th | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 10 | 10 | 10 |
| 90th | 6 | 6 | 6 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 8 |
| 95th | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |

We used a statistical regression of historical tax revenue against key economic data series that are produced in our projections (GDP growth, inflation, interest rates and equity returns) to develop predictive formulae for the various sources of tax revenue. We want to be cautious not to overstate the expected accuracy of these predictive formulae, but back-testing suggests that they will provide a roughly similar pattern of peaks and dips in annual growth of tax revenue. This should be sufficient to test for potential correlation between pension contributions and tax revenues in the Monte Carlo simulations. The projections of tax revenue should not be used for any other purpose and certainly do not supersede the State's own budget estimates. Annual growth in tax revenue will be sensitive to many more factors than are available in our model of capital markets.

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