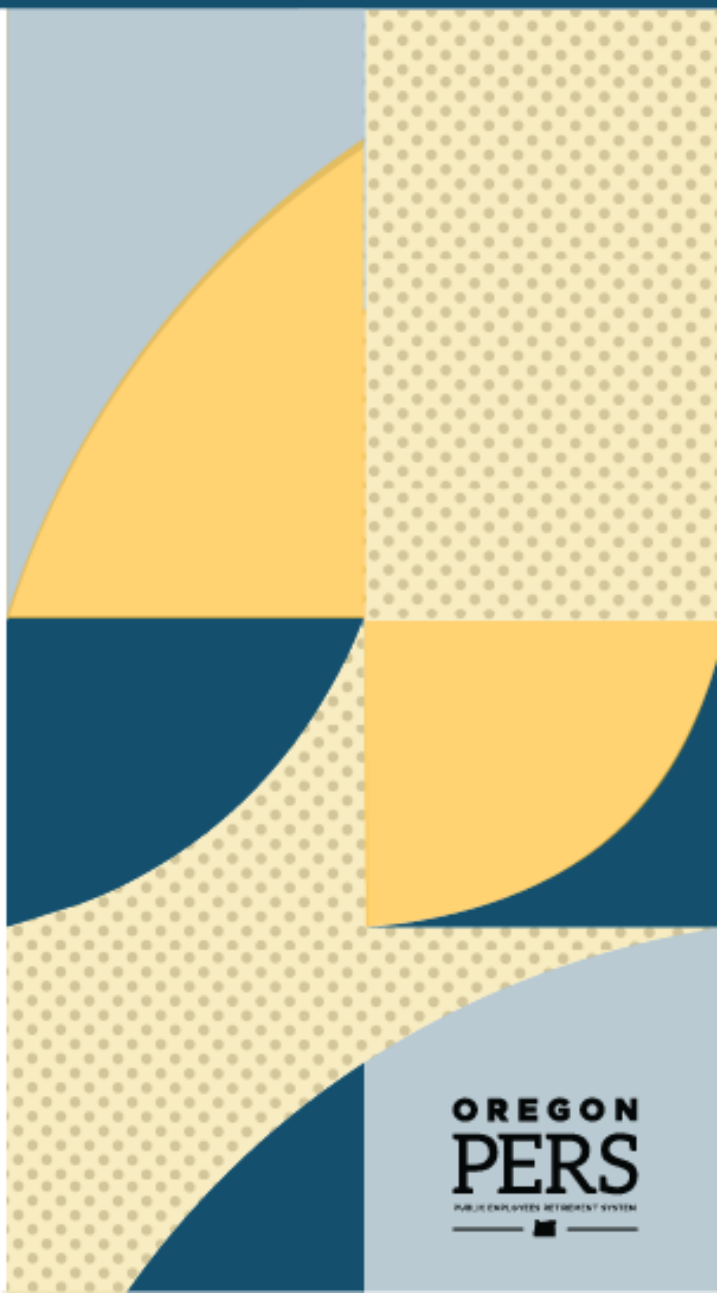
Unfunded Actuarial Liability Resolution Program

Guide to **Financial Modeling**

The purpose of this guide, created as part of PERS' Unfunded Actuarial Liability Resolution Program (UALRP), is to help employers understand the annual financial modeling presentation and how they can use the information for budgeting and forecasting.



Disclaimer

This guide is for employer educational purposes only and is not intended to provide legal or financial advice. If there is any conflict between this guide and federal law, Oregon law, or administrative rules, the laws and rules shall prevail.

In addition, as this guide intends to explain PERS employer rate information in the simplest terms possible, some actuarial information is simplified and may not apply to all situations or employers.

About this guide

Terms that are **cherry-red colored** are defined in the "Glossary" section at the end of this guide. Click a term to go to the page that contains the definition.

Click "return to table of contents" in the footer of any page to return to the beginning of the guide.

Links to pages on the PERS website are included throughout to enable you to dive deeper into certain topics.

The charts and graphs in this document were prepared for discussion purposes by Milliman for PERS. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Any recipient of this work product who desires professional guidance should engage qualified professionals for advice appropriate to its own specific needs.

This guide is one of a series. To see the other guides, go to the Employer Rate Relief Programs section of the PERS website.

Assistance

If you have questions about any of the information in this guide or about your agency's particular situation, email Actuarial.Services@pers.oregon.gov.

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Revised March 2024

Introduction

At the end of each year, following the publication of employer valuations, PERS' consulting **actuary** Milliman, Inc. presents a financial modeling update to the PERS Board. This presentation focuses on how current assumptions and projections will affect **unfunded actuarial liability (UAL)** base and net rates, and funded status over a long period of time using the actuary's variable-return financial modeling results.

The purpose of this guide is to help you use the information presented in the financial modeling update presented to the PERS Board by Milliman every December. This guide explains how you can use the presentation to improve your internal budgeting and forecasting results and account for variability in your actuarial assumptions.

IMPORTANT

PERS' current financial modeling is a 20-year projection based on expert assumptions about future economic conditions. The further out the results, the more subject they are to variability.

Financial models used

PERS consulting actuary presents data using two financial models: a steady return model and a variable return model. For the purposes of this guide, we will focus on the more detailed variable return model. However, it's important to understand the strengths and limitations of each model to understand the results they demonstrate.

The **steady return model** shows constant year-to-year future investment returns. It presents results for four different investment return outcomes.

Benefits:

- Simpler, clearer presentation.
- Compares current actuarial assumptions with possible alternatives.

Considerations:

- Rarely are all actuarial assumptions met, so model is not realistic.
- Fails to capture the range of potential results.

The **variable return model** demonstrates how results may vary at, above, and below projections. The actuary runs a **Monte Carlo simulation**, which determines the likelihood of possible outcomes by running 10,000 scenarios with a range of values. This model presents results in ranges of likelihood, and each outcome is ranked from most to least favorable.

Benefits:

- Provides a range of possibilities and highlights the most likely results.
- It is more realistic.

Considerations:

- This model type results in multiple outcomes, and determining which outcome you think is most likely for your scenario can be difficult.
- The model assumptions used to calculate scenarios are challenging to understand and explain.

Rate collar

The financial modeling presentation begins with an explanation of the **rate collar**. All rates are shown both uncollared and collared.

- The **uncollared total rate** is the theoretical contribution rate required to reach 100% funded status over a specified amortization period if all actuarial assumptions are met. This rate fulfills the goal to fully fund benefits but at the cost of reduced rate stability.
- The **collared total base rate** is limited to a certain range of increase or decrease (hence, the "collar") for a single biennium. This promotes rate stability but increases the risk that benefits will not be adequately funded.

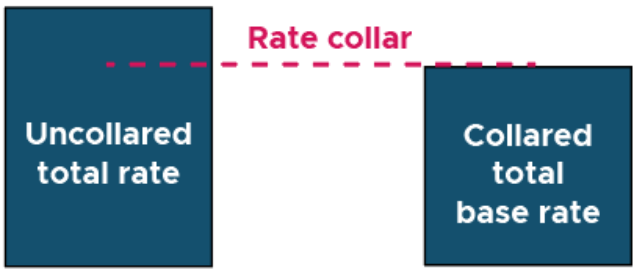

Figure 1: Rate collar

PERS fund rate of return

Each graph in this section shows a range of possible outcomes based on the potential rate of **investment return**. In these results, the diamonds represent the median outcome. For the purposes of this financial modeling presentation, the median assumed rate is 7.33%.

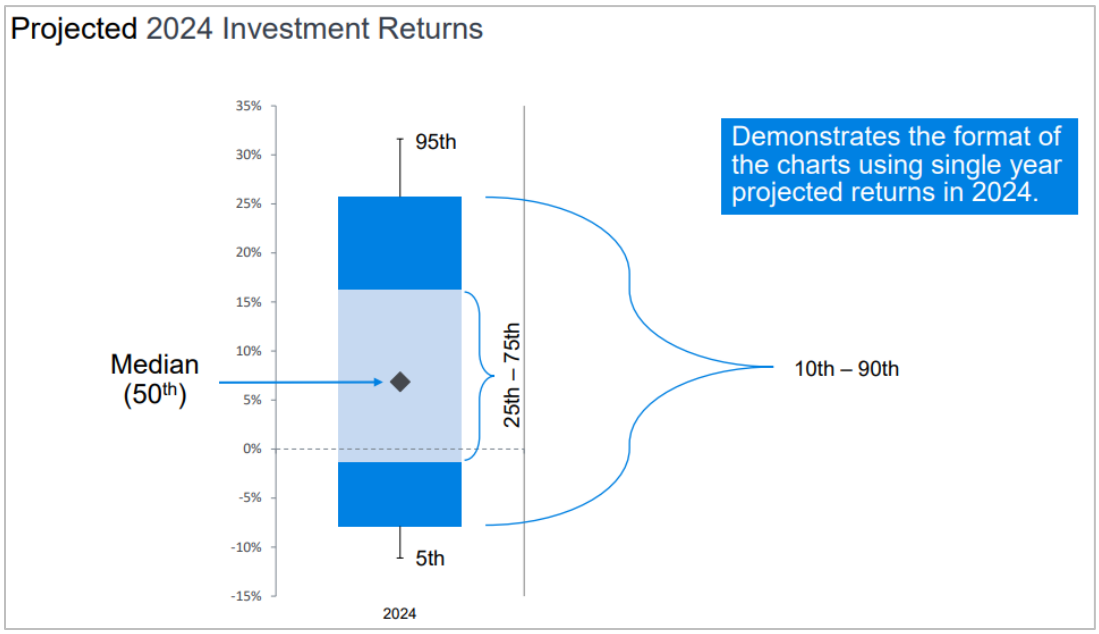

Figure 2: Projected 2024 Investment Returns chart

Average annualized rate of investment return

Projected investment performance has the greatest influence on employer contribution rates. The **assumed rate** is used to calculate all rate components. The assumed rate is portrayed as one number, but it's important to understand that actual experience will vary.

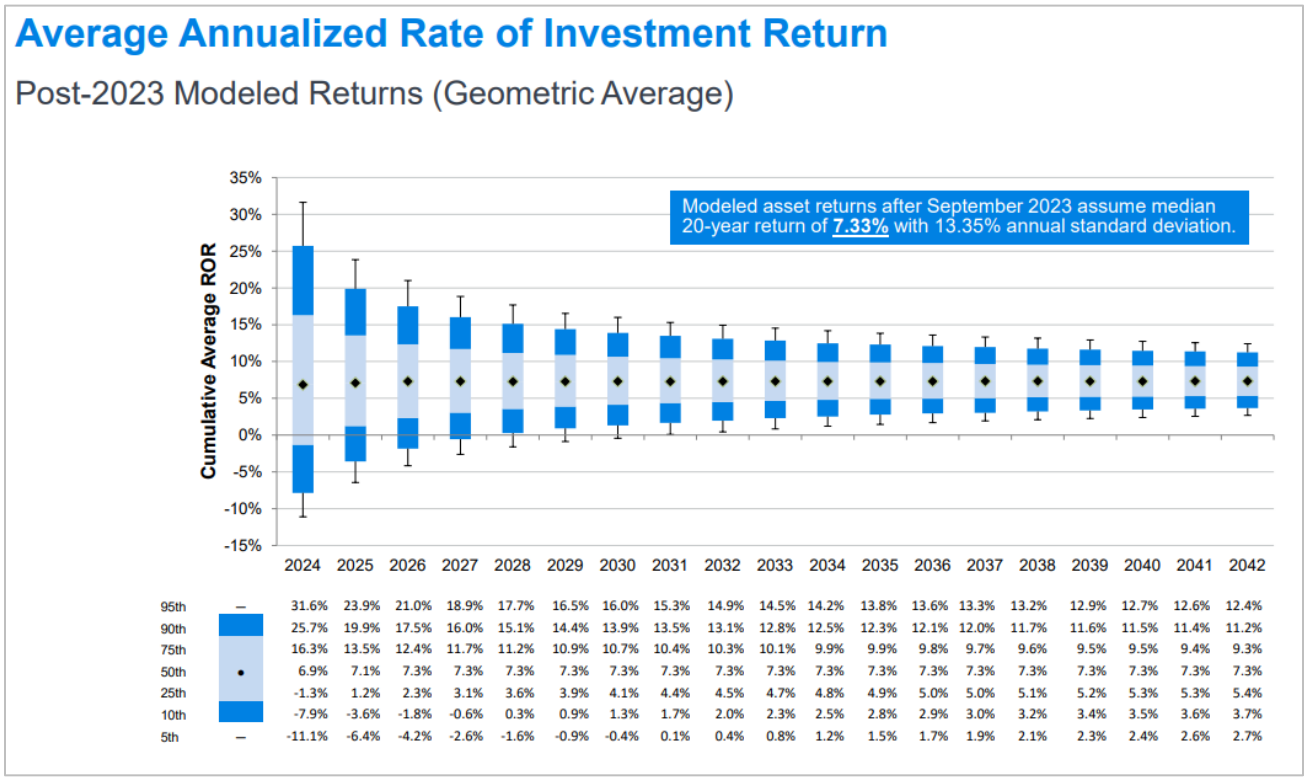

Figure 3: Average Annualized Rate of Investment Return chart

Explanations and key takeaways

- The median assumed rate of return for each year is indicated with the diamond. It is derived from Milliman's financial model estimates and is less than the current assumed rate.
  - The assumed rate is:
    - Used to establish the actuarial accrued liability.
    - Used to establish the UAL.
    - The guaranteed crediting level for regular Tier One member balances.
    - The **annuitization rate** for converting member account balances to lifetime Money Match monthly benefits.*
- The PERS Board members review these results when determining whether they should adjust the assumed rate.
- The actuary will advise the estimated adjustment to projected contribution rates based on new assumed rates, which you can incorporate into your projections.

Any change in assumed rate will not affect your contribution rate until the following **rate-setting valuation** year, but will be reflected in your advisory valuation, which gives an indication of what to expect.

What happens when the assumed rate is lowered

When the assumed rate is lowered, **liabilities** and contribution rates increase as of the actuarial valuation date, and benefits calculated under **Money Match** decrease. **However**, the assumed rate is only guaranteed to Tier One members; all other groups receive *actual* investment returns.

For example, in 2022, the assumed rate was 6.90%, but the actual investment return was negative. Despite the negative return, Tier One **active members** still received the 6.9% assumed rate, which caused a deficit of $215.7 million. This was remedied by allocating funds from the Tier One Rate Guarantee Reserve, which had a remaining balance of $745.0 million after the transfer.

Adjusting the assumed rate to align with projected experience is essential to avoid significant UAL accumulation and to conform to actuarial standards of practice.

To learn more about PERS Tier One, Tier Two, and Oregon Public Service Retirement Plan (OPSRP) plans, read the Plan Definitions webpage.

*At retirement, a Tier One or Tier Two member's retirement is calculated using either a **Full Formula**, **Money Match**, or **Formula Plus Annuity** method — whichever yields the highest result. Under **Money Match** or **Formula Plus Annuity** methods, a Tier One or Tier Two member's account is annuitized based on actuarial equivalency factors (AEF). AEFs convert account balances to monthly payments based on life expectancy and assumed earnings. Annuitizing the account under these calculation methods affects the benefit amount paid.

The basic **Full Formula** benefit is based on final average salary, years of service, and a statutory factor. None of those elements are affected by a change in the assumed rate. However, if the member elects a **survivorship benefit option**, AEFs are applied, and a change to the assumed rate would affect those factors slightly.

Employer rates

Each model in this section includes projections of the *system-average* **base** and **net** employer contribution rates. The system-average rate represents the average rate for all employers; no employer actually pays that rate.

For this guide, we're covering the change in base rates.

Biennial change in employer collared base pension rate

This Milliman slide demonstrates the projected system-wide average of employer base rates (**normal cost** and **unfunded actuarial liability (UAL)**) through the 2039-41 biennium at different investment returns.

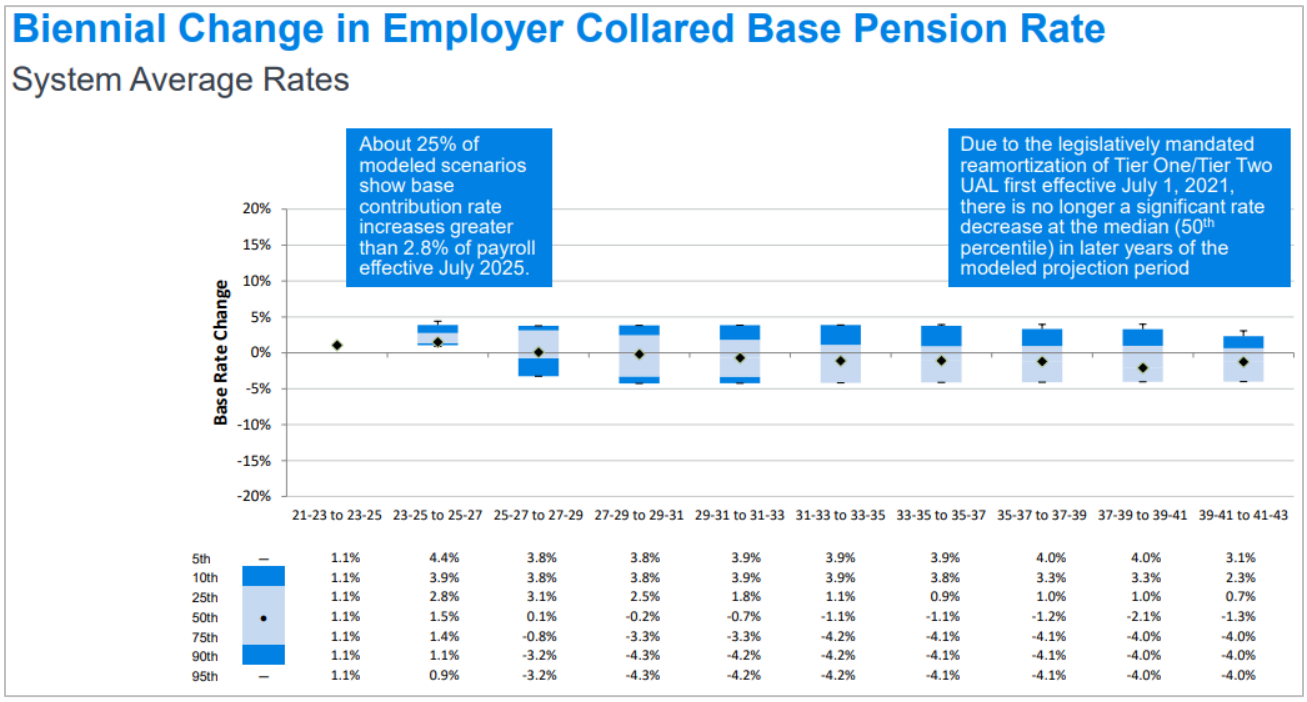

Figure 4: Biennial Change in Employer Collared Base Pension Rate chart

Explanations and key takeaways

- 2023 does not have a range because those rates were already adopted.
- There is an increase for 2023-25 that is due to poor projected investment results.
- Of the 10,000 trials run, nearly half showed a base contribution rate increase above 3% of payroll for 2023-25. Under current collaring guidelines*, this would trigger the rate collar.
- For projection purposes, if you do not have a **side account** or other offset/liability rate, you can add these increases and reductions to your current contribution rate to estimate your future projections.

*As of fall 2023.

Employer collared net pension rates

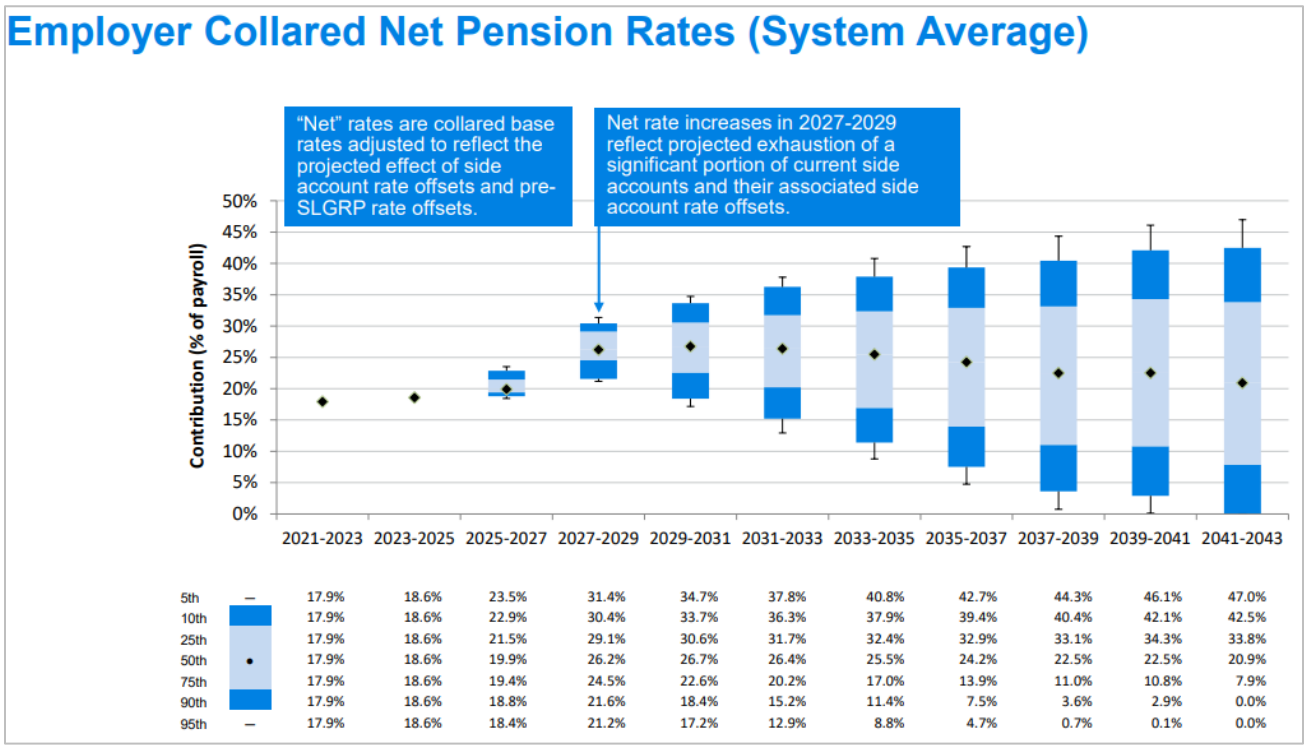

Figure 5: Employer Collared Net Pension Rates chart

Explanations and key takeaways

- After 2027, net rates are almost the same as base rates because of the elimination of most side accounts, transition surplus/liabilities, and other UAL-modifying factors.
- If you rely on a **side account** or a **transition surplus** to reduce your rate, consider modifying your budgeting approach after 12/31/2027 when these rates expire.
- Similarly, if you have a transition or pre–State and Local Government Rate Pool (SLGRP) liability, this impact to your rates will likely be eliminated on or before 12/31/2027.

Variable return model stress test — employer contribution rates

The actuary conducts a "stress test" to determine the likelihood that funded status percentage, base rate percentage, and collared increases exceed the specified threshold. This is based on the results of conducting 10,000 scenarios.

Base rate increase

Likelihood of Event Occurring in at Least One Biennium in Next 20 Years	
Employer Collared Base Rate (Excluding Retiree Healthcare) < 10% of Pay	30%
Employer Collared Base Rate (Excluding Retiree Healthcare) > 30% of Pay	57%
Employer Collared Base Rate (Excluding Retiree Healthcare) > 40% of Pay	17%

Figure 6: Likelihood of collared base rate increase in 20 years

Explanations and key takeaways

- Of the 10,000 scenarios 57% included a base rate (normal cost and UAL rate only) that at some point exceeded 30% of payroll.
- The **reamortization** of the Tier One/Tier Two payroll for 2019 kept future rates relatively stable over time.
- Knowing the estimated likelihood of rate range, you can budget accordingly. Refer to figure 4 to determine when this increase is likely to happen and decide the best course of action to address the increase.

2025 rate increase

Likelihood of the Employer Collared Base Rate Increase Exceeding Threshold		
Threshold Increase	July 2025	July 2027
2% of Pay	40%	32%
3% of Pay	21%	26%
4% of Pay	9%	<1%
5% of Pay	<1%	<1%

Figure 7: Likelihood of collared base rate increasing from 2% to 5%

Explanations and key takeaways

- These results indicate the likelihood that 2025-27 rate increases will exceed specified thresholds of **combined valuation payroll**.
- Consider applying these different threshold increases to your projected payroll to determine the potential increase in your rates.
- Changes in net rates will vary by employer depending on the size and amortization schedule of any side account(s) the employer may have.

Funded status

The funded status indicates PERS' ability to pay all past and current benefits that are due to members as of a certain date and time. It is a measure of the financial health of the system. The PERS Board directs the actuary to create funding plans that will improve our funded status by reducing the UAL, thus increasing the health and stability of the PERS system.

Funded status is shown with and without **side accounts**. Side account rates are only used for the benefit of the employer who made that payment. However, because the payment is part of the PERS Trust, it is counted as an asset of the system.

Funded status with side accounts is used to determine an employer's eligibility to receive the member redirect offset. Also, if the funded status is above 90%, the member redirect will stop.

Funded status (excluding side accounts)

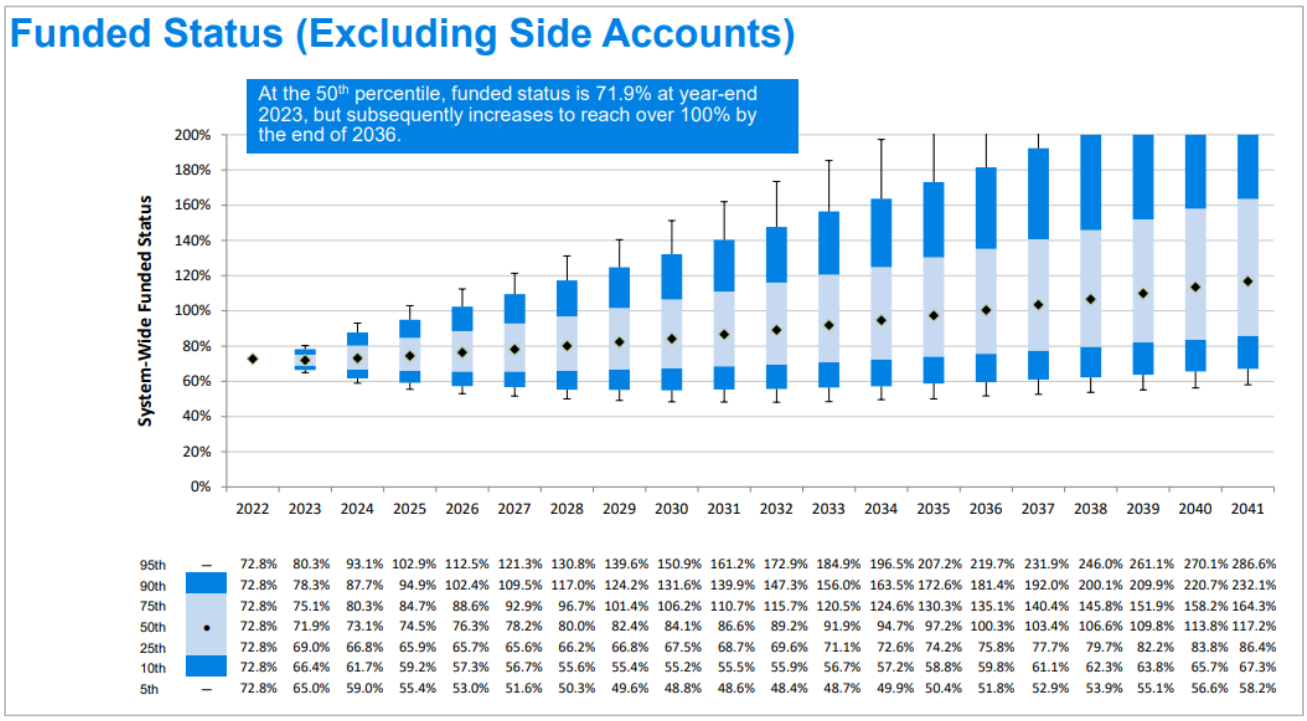

Figure 8: Projected funded status 2024–2041

Explanations and key takeaways

- When reporting to media, the PERS Board, or the Legislature, PERS employees tend to report the UAL without side accounts. Side accounts are intended for the sole benefit of the employer who made the payment and are not available assets.
- Because **Senate Bill 1049** required a one-time **reamortization** of the Tier One/Tier Two UAL from 20 years to 22 years, it will take longer to reduce the UAL and improve funded status. Essentially, the reamortization spreads the same amount of UAL over a longer period of time, which means employers pay more interest. However, because they pay that amount over a longer period of time, the amount employers pay biennially is less.

Funding status (including side accounts)

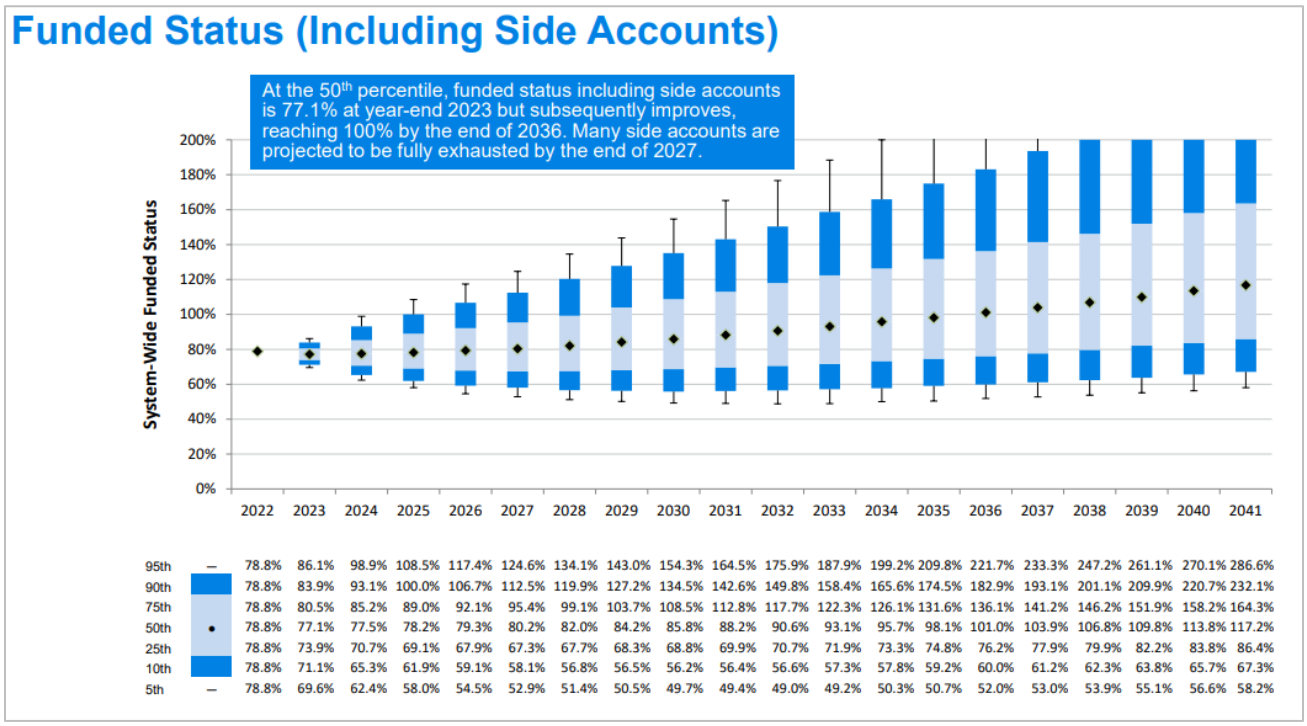

Figure 9: Projected funded status (including side accounts) 2024–2041

Explanations and key takeaways

- By the end of 2027, most existing side accounts will have fully amortized. The funded status with side accounts will more closely match the funded status without side accounts.
- We still track funded status including side accounts because they do represent additional assets in the fund. If we reach 90% funded status (including side accounts), the member redirect will discontinue unless and until funding falls below 90%.

Variable Return Model Stress Test

- As in recent years, we also used the variable return model to do a "stress test" of the likelihood of certain events in the 10,000 scenarios modeled
  - Testing is done at a system-average level; results for individual rate pools or employers may vary
- The percentage of modeled scenarios with funded status above a specified threshold at the end of the projection period is shown below
  - Median projected funded status excluding side accounts at year-end 2023 is 71.9%

Likelihood of Funded Status Level as of 12/31/2041	
Funded Status (Excluding Side Accounts) > 100%	63%
Funded Status (Excluding Side Accounts) > 90%	72%
Funded Status (Excluding Side Accounts) > 80%	80%
Funded Status (Excluding Side Accounts) > 70%	88%
Funded Status (Excluding Side Accounts) > 60%	94%

Figure 10: Variable-return-model likelihood of various funded statuses by 2041

Unfunded actuarial liability (UAL)

UAL projection modeling is a result of the previous reports. It demonstrates how those results will get us closer to closing the UAL gap and where issues may arise.

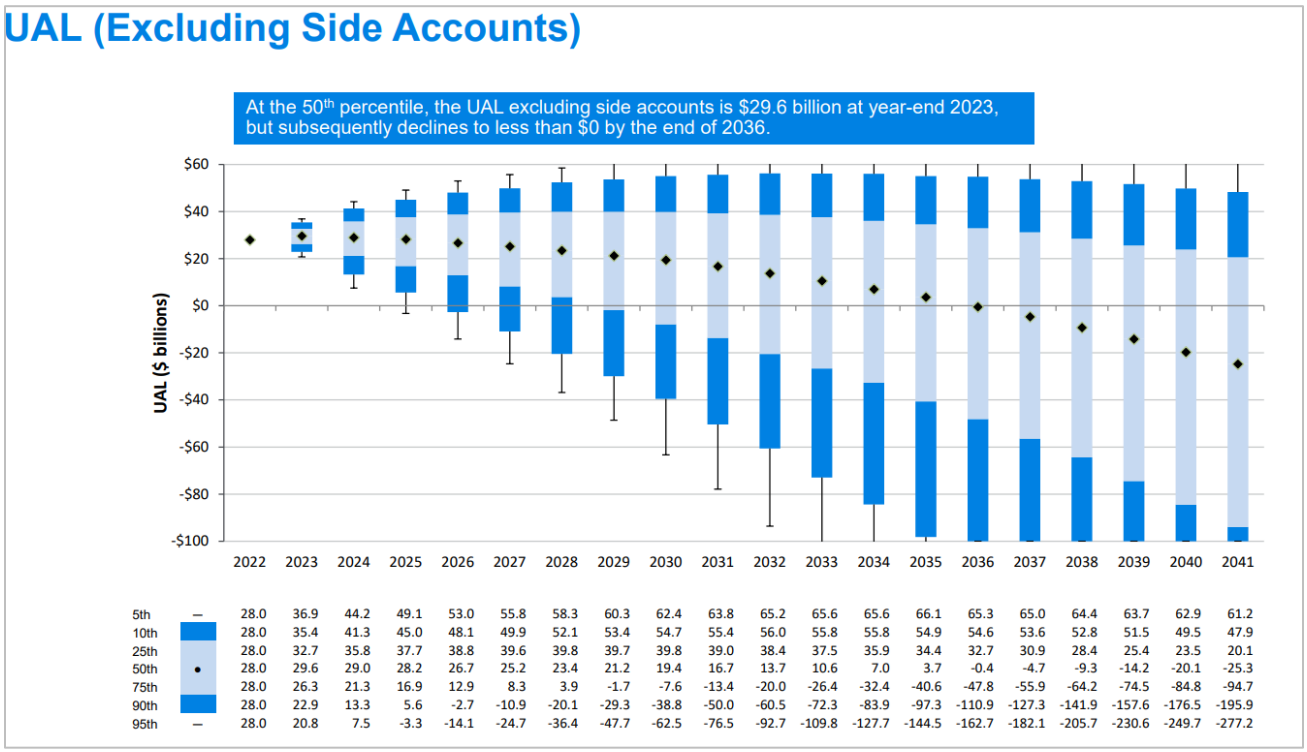

Figure 11: Projected UAL (excluding side accounts) 2022–2041

Explanations and key takeaways

- Figure 11 is provided for informational purposes. The next chart includes side accounts and is more realistic.

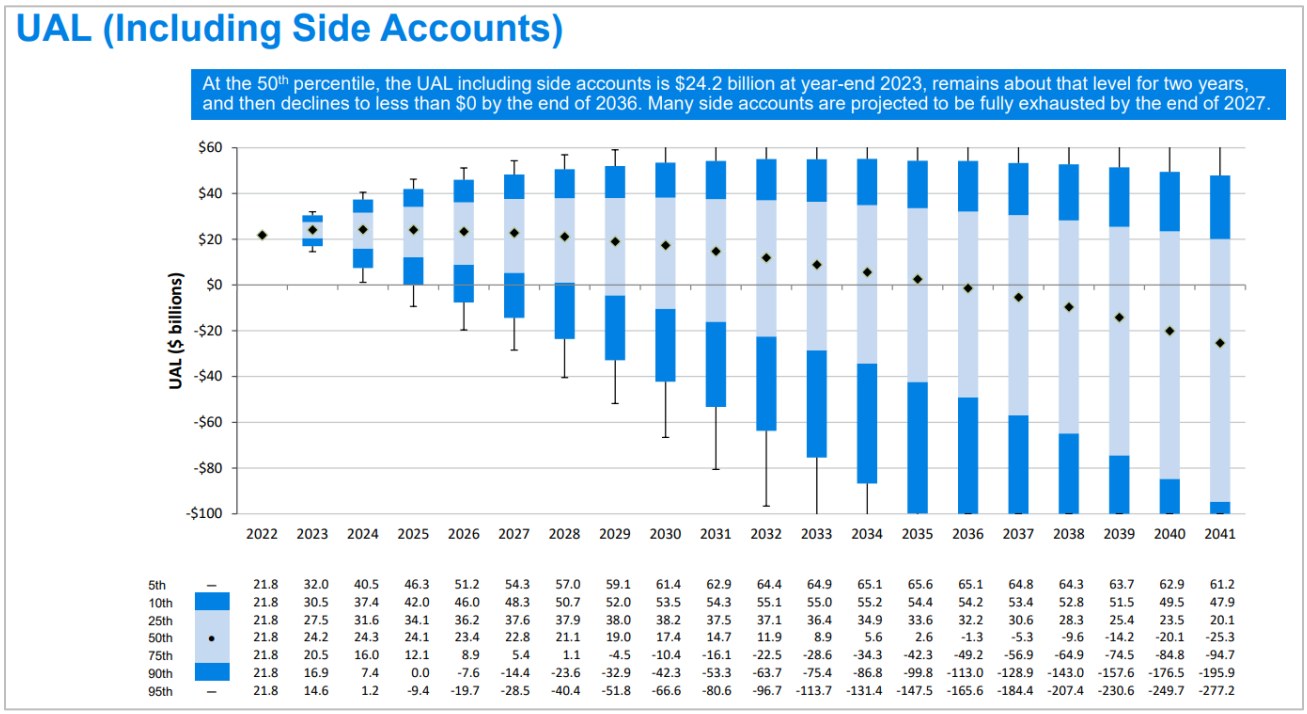

Figure 12: Projected UAL (including side accounts) 2022–2041

Explanations and key takeaways

- The PERS Board's goal is to eliminate the UAL by 2041. Figure 12 shows that this goal is feasible.
- We anticipate a steady decline in the median UAL, which typically means the Tier One/Tier Two UAL rate is also decreasing.
- The range increases over time because of the greater variability of investment scenarios as we look farther into the future.

Using financial modeling to budget and forecast

You can find the financial modeling presentation in its entirety on the Actuarial Presentations and Reports webpage under 2023. The graphs may be useful when reporting to your board on the overall health of PERS as a system and as validation points for your own forecasting and budgeting tools.

If you have not created a budgeting or forecasting tool, many employers report basing theirs on the PERS Employer Rate Projection Tool.

If you would like to learn more about budgeting or financial planning for pensions, consider local finance groups. The Oregon Government Finance Officers Association frequently has PERS-specific topics. The association posted this video from its spring 2021 conference: "Effective Forecasting for Budgets."

Remember that the financial modeling presentation is an annual presentation. If you can, attend the annual December PERS Board meeting for the chance to hear the explanations straight from the actuary and ask questions of either the actuary or PERS actuarial staff. You can access the PERS December 1, 2023, Board presentation online to access the original audio recording.

Glossary of actuarial terms

Active members

Active members, also called nonretired members, are PERS members who are still working for a PERS-participating employer. PERS members who are no longer working for a PERS employer or who work fewer than 600 hours a year are *inactive* members. Members who have retired are called *retired* members.

Actuarial accrued liability

Accrued liabilities are the present value of a member's promised pension benefits minus their normal cost for the future year as of December 31 of the valuation year.

Actuarial valuation

An actuarial valuation is an appraisal of a pension fund's assets and liabilities. The consulting actuary calculates the valuation using information about past and present trends and assumptions about future economic and demographic conditions.

Actuary

An actuary uses math, statistics, and financial theory to study uncertain future events, especially those of concern to insurance and pension programs.

Advisory rate

In the fall of odd-numbered years, the PERS actuary produces advisory employer contribution rates for all employers for the upcoming biennium. These rates represent actual experience but do not affect your rate.

Amortize/amortization

Amortization is an accounting technique used to spread costs over a set period of time.

Annuitization

The process of converting an annuity investment into a series of periodic payments.

Annuitization rate

The percentage by which an annuity grows each year.

Assets

Assets are the funds going into the system, such as employer contributions and earnings on investments. For valuation purposes, assets include employer contributions and investment returns minus benefit payments.

Assumed rate

The assumed rate is the rate of investment return (including inflation) that the PERS Fund's regular account is expected to earn over the long term.

The PERS Board approves the assumed rate based on:

- The long-term projection of investment returns based on the asset allocations of the Oregon Investment Council and the related capital market expectations.
- PERS' actuary's independent analysis of the projected returns from that asset allocation over a long-term investment horizon.

The current assumed rate is 6.9%, which has been in effect since October 1, 2021. The assumed rate is reviewed, adopted, and incorporated into Oregon Administrative Rule by the PERS Board every two years as part of the system's Experience Study (found on the Actuarial Reports webpage under each odd year).

Base employer contribution rate

The percentage of payroll you pay to PERS to fund the pension benefits of your employees. The base rate includes your normal cost and UAL rate, minus a member redirect offset. Learn more about the Member Redirect program.

Combined valuation payroll

Projected payroll as calculated by the PERS consulting actuary for the calendar year following the valuation date for Tier One, Tier Two, and OPSRP active members. This payroll is used to calculate UAL rates and is based on the actual payroll reported by the employer.

Contribution rate

An employer's contribution rate is the percentage of payroll you pay to PERS to fund the pension benefits of your employees. It does not include the 6% employee (member) Individual Account Program (IAP) contribution, even if you are paying it on your employees' behalf.

Funded status

The actuarial value of assets expressed as a percentage of the accrued liability. In other words, how close an employer, pool, or the PERS system is to being able to pay all of the benefits it owes to past and current members. As of December 31, 2022, the system-wide PERS' funded status was 72.8% without side accounts and 78.8% including side accounts.

Investment return (aka investment earnings or performance)

The PERS Fund is invested by the Oregon Investment Council and overseen by the Oregon Treasury. The return or performance of an investment is the measure of the income it pays during a specific period, typically a year, divided by the investment's price. This is called an annualized percent return.

If the price of an investment drops during the period the PERS Fund is invested in it, and PERS has a loss instead of a profit, the return may be negative if income from the investment hasn't offset the loss in value.

Liabilities

For PERS' actuarial purposes, liabilities represent pension obligations such as normal cost, benefit payments, demographic experience changes, or plan changes.

Member redirect offset

Redirected member contributions under Senate Bill 1049 (2.50% of Tier One/Tier Two and 0.75% of OPSRP) offset employer contribution rates. Redirect only applies to members who earn monthly pay above the threshold in effect for that calendar year. Learn more about Member Redirect program.

Money Match

A retirement option for Tier One and Tier Two members. This calculation takes the member's account balance and a matching employer amount and converts it to an actuarially equivalent annuity.

Monte Carlo simulation

Monte Carlo simulation is a mathematical technique that uses repeated random sampling to obtain the likelihood of a range of results that could occur. The variable return model is a type of Monte Carlo simulation.

Net employer contribution rate

The percentage of payroll you pay to PERS to fund the pension benefits of your employees. The net rate includes the member redirect offset, any rate offset adjustments from side accounts, and any SLGRP charges or offsets (e.g., transition liability/surplus).

Normal cost

The normal cost is the value of benefits for an employer's current members for the next year of service. If all current actuarial assumptions were met, the normal cost would be the only rate an employer would pay.

Normal cost rate

Your normal cost divided by your applicable payroll is your normal cost rate.

Rate collar

A method of stabilizing employer contribution rates. The current methodology, which was implemented in 2021, limits the permissible change to UAL rates. The calculation of the collar will depend on the tier (Tier One, Tier Two, or OPSRP), rate pool (SLGRP, School District, or Independent), and system-wide funded status. The use of a rate collar allows interest rate increases to be more stable, which is a priority for the PERS Board in setting rates.

(Continued next page.)

PERS Board policy on UAL rate increases

Pool	Maximum increase to UAL rate as percentage of payroll
Tier One/Tier Two State and Local Government Rate Pool (SLGRP) and Tier One/Tier Two School District Rate Pool	3.0%
OPSRP	1.0%
Tier One/Tier Two Independent employers	Greater of 4.0% or one-third of the difference between collared and uncollared UAL rate.

The collared UAL rate cannot be less than 0.0% unless the funded status (excluding side accounts) is at least 100%.

The collared UAL rate for cannot decrease for any pool unless the plan funded status is at least 87%.

Rate-setting valuation

Actuarial valuations are conducted annually. They alternate between rate-setting years (odd years) and advisory years (even years). A rate-setting valuation results in new rates that begin the following July (of an even year).

Reamortization

A UAL is amortized, meaning it is paid off in installments over a specified period of time. If that period of time is changed, then the debt is reamortized.

Senate Bill (SB) 1049

A bill passed by the Oregon Senate in 2019 that directed several changes to the PERS plan aimed at reducing employers' rising contribution rates. Learn more on the PERS employers SB 1049 webpage.

Side account

When an employer makes a lump-sum payment to prepay all or part of its pension unfunded actuarial liability (UAL), the money is placed in a special account called a "side account." This account is attributed solely to the employer making the payment and is held separate from other employer reserves. The side account reduces the employer's pension obligation, which reduces its contribution rates over time.

Steady return model

A forecasting model that assumes investment returns will be consistent year to year.

Transition liability or surplus rate

When an employer joins the State and Local Government Rate Pool (SLGRP), a transition liability or surplus is calculated to ensure that each employer enters the pool on a comparable basis.

The individual employer's funded status is compared to the funded status of the pool at the time of the employer's entry.

- If the employer is better funded than the pool, the employer will have a transition **surplus**. This protects the individual employer by ensuring that it does not lose assets to the pool.

The transition surplus for each employer is maintained separately from the SLGRP and is amortized over a fixed period via contribution rate offsets as a percentage of the employer's combined valuation payroll.

- If the employer is less well-funded than the pool, the employer will have a transition **liability**. This protects the other participants in the pool by ensuring the pool does not take on a newly pooled employer's excess liability.

The transition liability is amortized over a fixed period and is expressed as a percentage of the employer's combined (Tier One/Tier Two plus OPSRP) valuation payroll.

Unfunded actuarial liability (UAL)

In simple terms, an unfunded actuarial liability (UAL) exists when a pension plan's liabilities (i.e., money the system owes to current and future retirees) are greater than its assets (i.e., money coming into the plan). In other words, it is how much money a plan would be short if all benefits for members past and present had to be paid today.

An unfunded actuarial liability can occur any time something unexpected happens that measurably affects a plan's costs or earnings. Maintaining a reasonable UAL is a normal part of a pension plan, and having a UAL does not necessarily mean that a plan isn't financially healthy.

UAL rate

The UAL rate is determined by dividing next year's projected UAL payment by combined valuation payroll. For the State and Local Government Rate Pool, The School Districts Pool, and OPSRP, this is done at a pool level; for independent employers, the Tier One/Tier Two UAL rate is based on their individual results.

Variable return model

This model is used to demonstrate the likelihood of outcomes using a Monte Carlo simulation of 10,000 trials