

# ARIZONA PUBLIC SAFETY PERSONNEL RETIREMENT SYSTEM SOLVENCY ASSESSMENT & COUNTERFACTUAL REFORM ANALYSIS

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Prepared by:

**Pension Integrity Project at Reason Foundation**

**September 21, 2020 – Preliminary Draft**





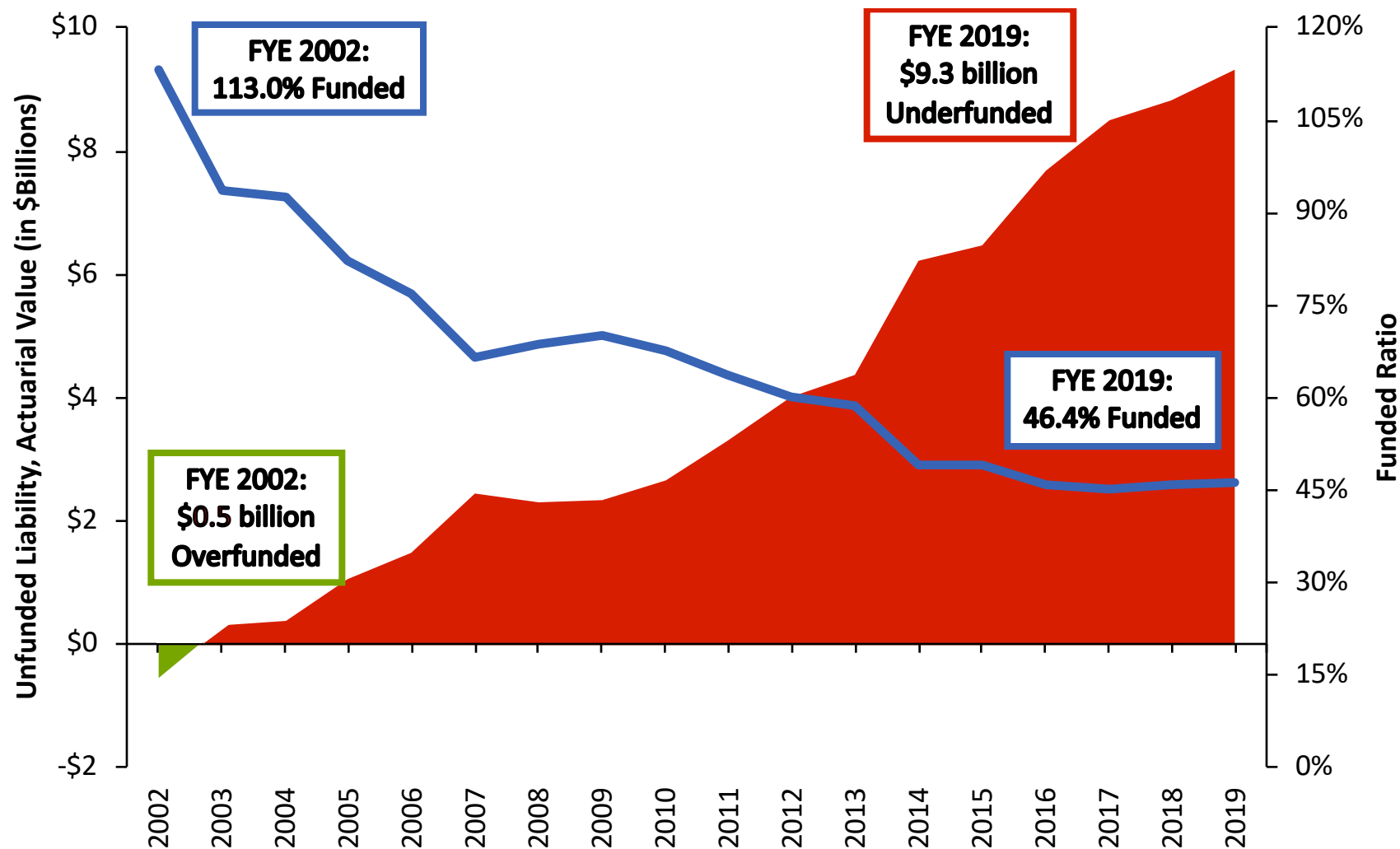
# About the Pension Integrity Project

We offer pro-bono technical assistance to public officials to help them design and implement pension reforms that improve plan solvency and promote retirement security, including:

- *Customized analysis* of pension system design, trends
- *Independent actuarial modeling* of reform scenarios
- Consultation and modeling around *custom policy designs*
- Latest pension reform *research and case studies*
- *Peer-to-peer mentoring* from state and local officials who have successfully enacted pension reforms
- Assistance with *stakeholder outreach*, engagement and relationship management
- Design and execution of *public education programs* and media campaigns



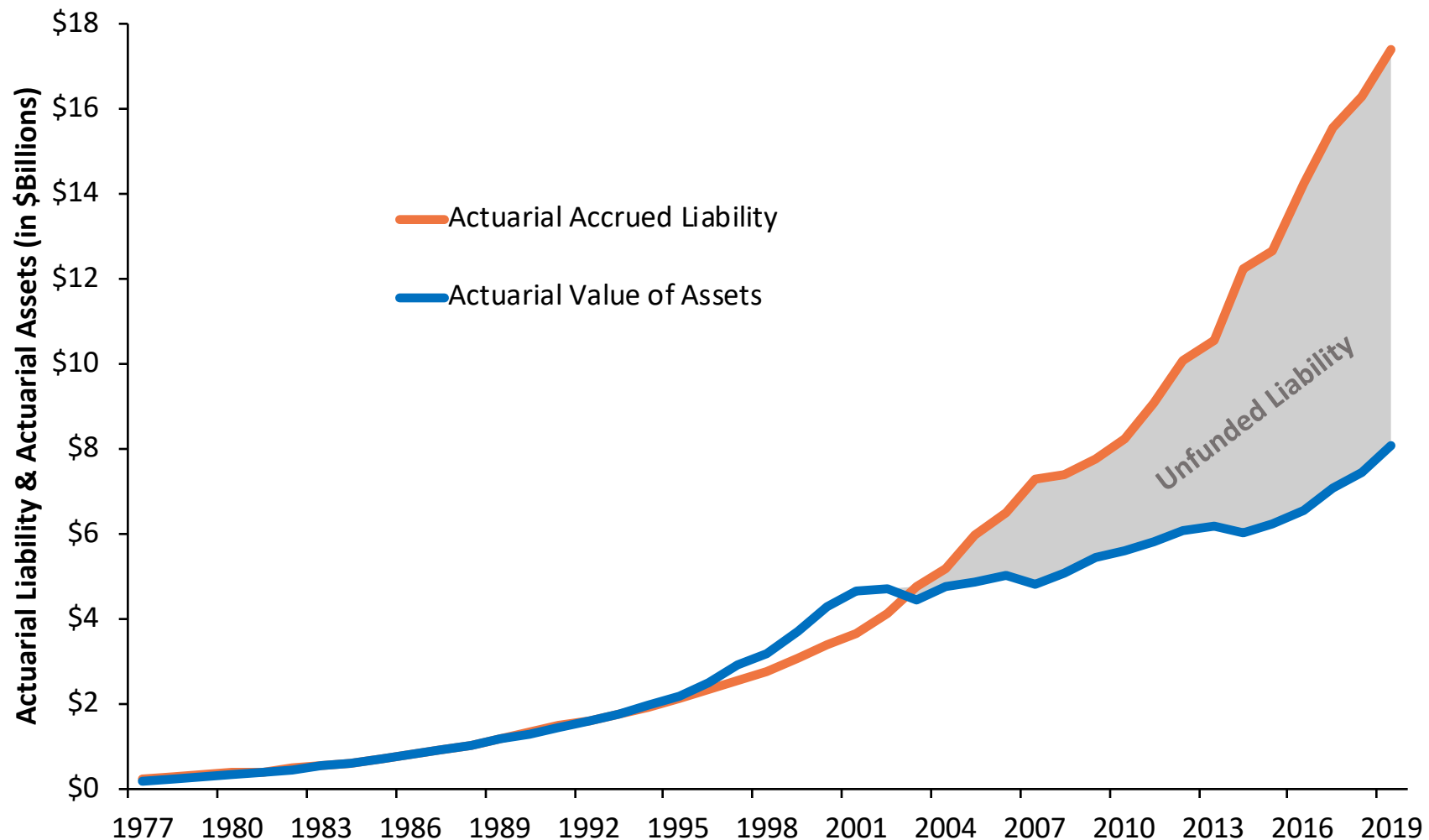
# A History of Weakening Solvency (2002-2019)



Source: Pension Integrity Project analysis of actuarial value of assets and actuarial accrued liability found in Arizona PSPRS actuarial valuation reports and CAFRs



# PSPRS Liabilities are Growing Faster than Assets

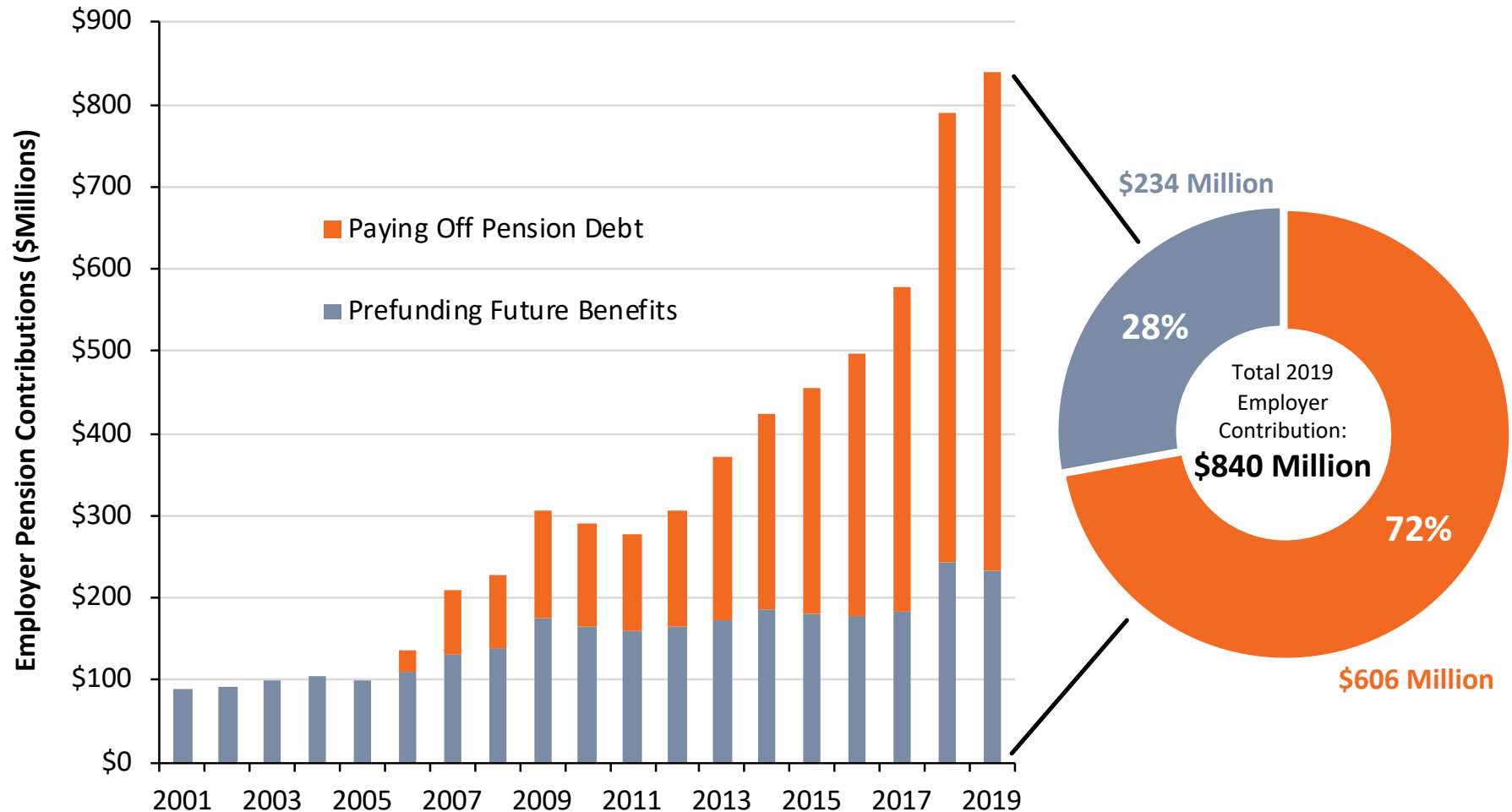


Source: Pension Integrity Project analysis of PSPRS actuarial valuation reports through FY2019.





# Growing Pension Debt Adding to PSPRS Costs



Source: Pension Integrity Project analysis of Arizona PSPRS CAFRs. 2019 normal cost and amortization values estimated using proportional share of projected contribution in 2017 valuation.



# REVIEWING PRIOR REFORMS

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# Major Reforms/Changes for PSPRS

## 2011 – Tier 2

- Senate Bill 1609 effectively resulted in a new benefit tier for new hires starting July 20, 2011
- Increased length of required service and number of months used for benefit calculation, created an unsustainable 25-year vesting policy, and adopted a reduced PBI adjustment
- Contribution rates stepped up over 50% for Tier 1 members

## 2017 – Tier 3 + Shift from PBI to prefunded COLA

- Created a new benefit tier for new hires starting July 1, 2017
- New hires choose between reduced-risk DB (or hybrid for non-SS members) or DC
- New unfunded liabilities for Tier 3 amortized on level-dollar, layered base 10-yr schedules
- Contributions based on 50/50 cost sharing between employers and employees
- Constitutional ballot measure to replace broken PBI with pre-funded COLA
- Changes to board composition to better reflect Tier 3 risk allocation

## 2018 – Hall/Parker Settlement

- Supreme Court ruling retroactively rolled back Tier 1 member contribution rates from 11.65% to 7.65%, requiring employers to reimburse them \$235 million in 2018.

## 2018 – Assumed Return

- PSPRS trustees voted to reduce the assumed rate of return to 7.30%.

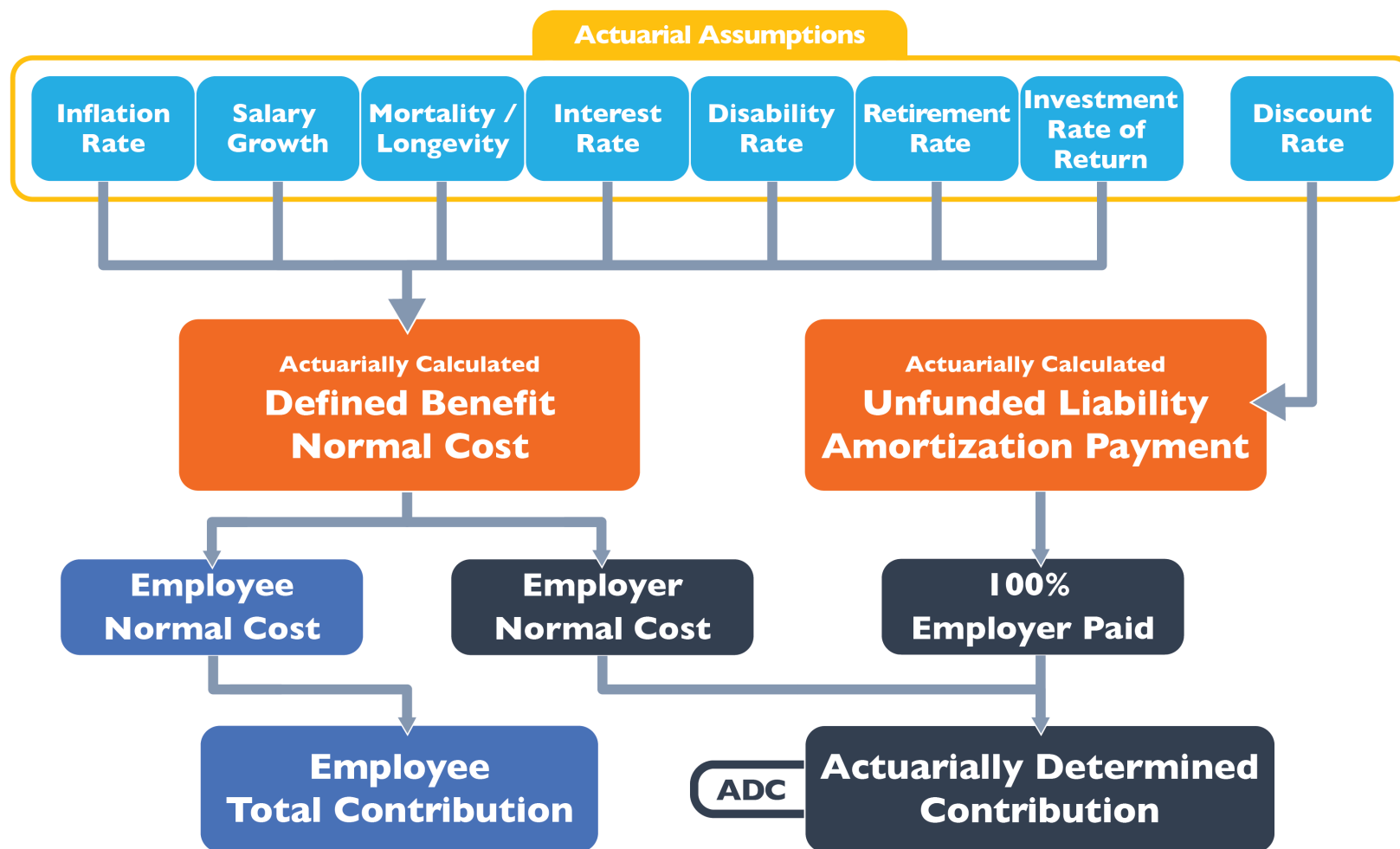


# CHALLENGES CURRENTLY FACING PSPRS

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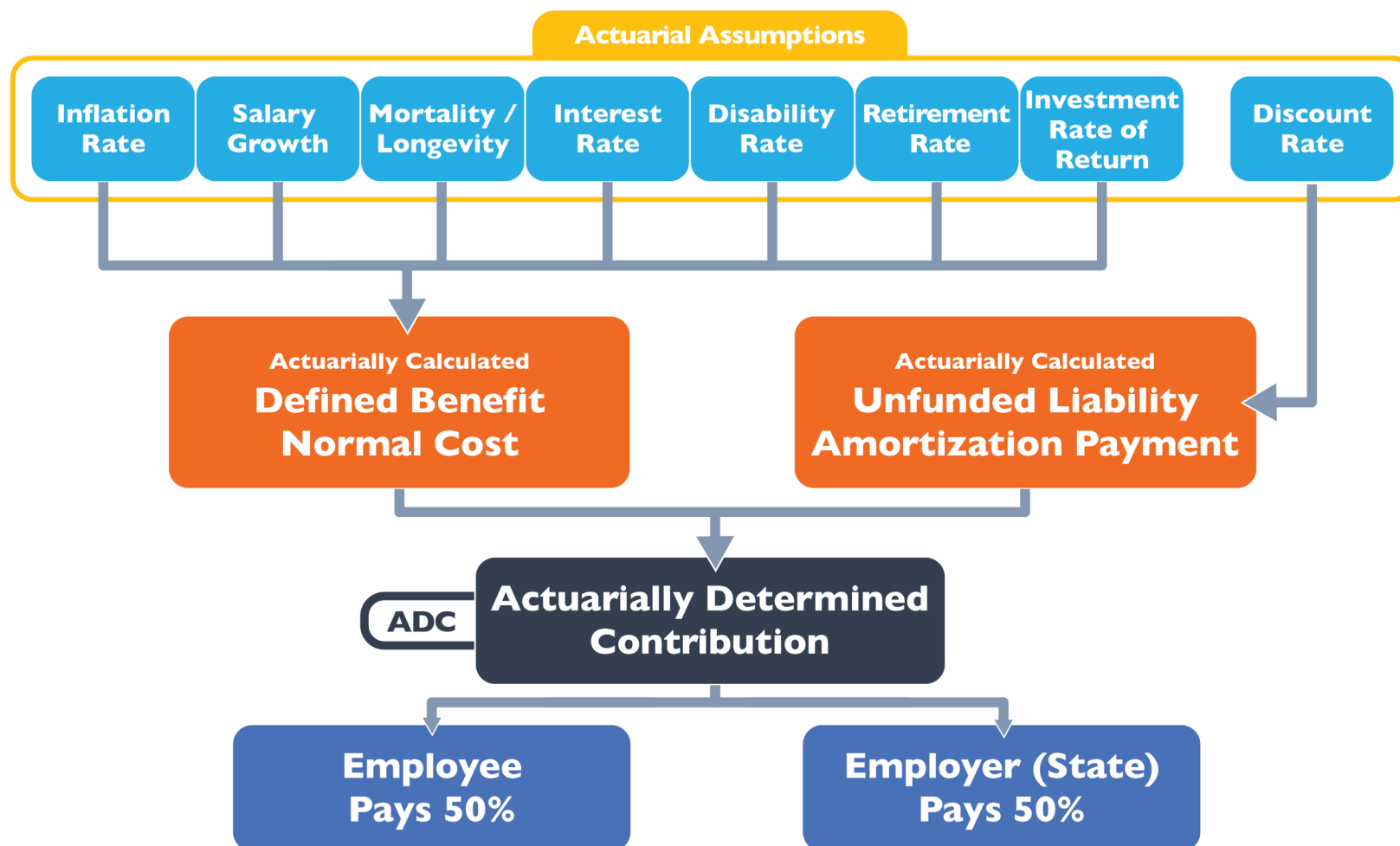


# How PSPRS is Funded: Tiers I & 2





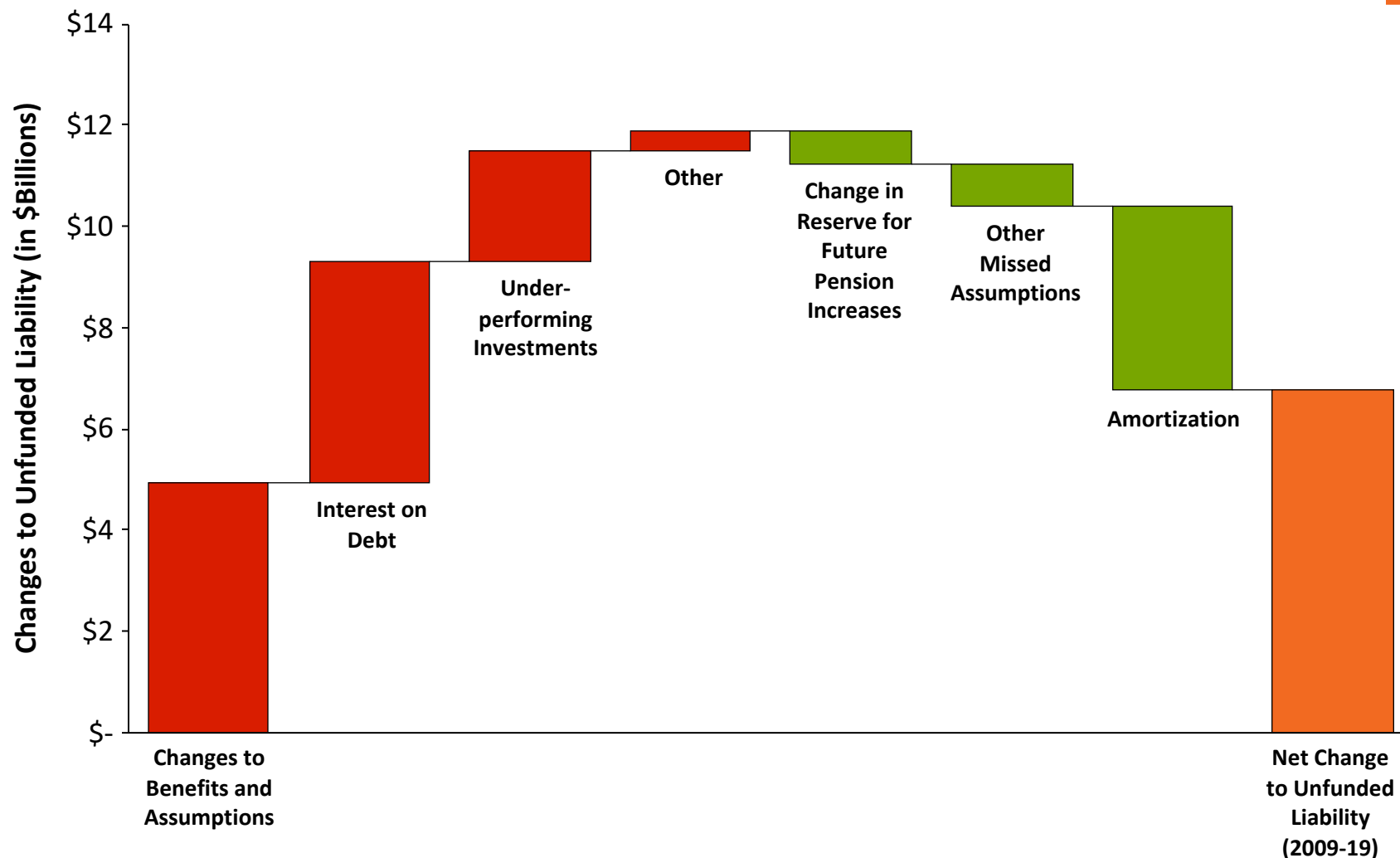
# How PSPRS is Funded: Tier 3





# The Causes of the Pension Debt

## Actuarial Experience of Arizona PSPRS, 2009-2019



Source: Pension Integrity Project analysis of Arizona PSPRS CAFRs. Data represents cumulative unfunded actuarial liability by gain/loss category. Analysis goes back to 2009, at which point PSPRS already had an unfunded actuarial accrued liability of \$2.3 billion.



# Driving Factors Behind Current PSPRS Debt

1. **Prudent Changes in Actuarial Assumptions and Methods** since 2009 to better reflect current market and demographic trends required the recognition of previously unrecognized pension cost and the acknowledgment of \$4.9 billion to the unfunded liability.
2. **Interest on Pension Debt** has added \$4.4 billion to the unfunded liability since 2009
  - *Accumulated interest on unfunded pension liabilities makes a pension more expensive*
3. **Underperforming Investment Returns** have added \$2.2 billion to the unfunded liability since 2009
4. **Undervaluing Debt** through discounting methods that have remained unchanged, leading to an undercalculation of required contributions





# CHALLENGE I: AMORTIZATION METHODS

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- **Amortization Schedule:** Backloading and extended amortization schedules for large employers' Tier 1 and 2 legacy unfunded liabilities are creating negative amortization and higher long-term costs

# Understanding the Current Funding Policy: Negative Amortization



- Tier 1 and 2 contributions made have not always kept up with the interest accruing on the unfunded liabilities
- Most PSPRS employers use an 20-year closed schedule to amortize the fund's unfunded liabilities, with 16 years remaining
- Some municipalities—including Phoenix—have elected to extend their amortization schedule to 30 years with 26 years remaining
- Beginning 2020, all new unfunded liability will be amortized on a 15-year schedule using a level dollar contribution policy

# Understanding the Current Funding Policy: Negative Amortization



- In 11 of the past 12 years, actuarially determined amortization contributions have been less than the interest accrued on the pension debt (i.e. negative amortization).
  - Thus, even though PSPRS received 100% of ADEC contributions, the plan's unfunded liability still grew in absolute terms.
- The Society of Actuaries recommends funding periods of 15 to 20 years. Longer periods result in larger long-term costs.
- By using longer amortization schedules, some employers are taking on higher long-term costs for short-term fiscal relief.

# Understanding the Current Funding Policy: Amortization Schedules for PSPRS Employers



Just 21 jurisdictions opted out of the shortened amortization schedule established in a 2016 reform, but the liabilities of these plans makes up more than half of PSPRS' unfunded liabilities

| Amortization<br>Years Remaining | Number<br>of Plans | Unfunded<br>Liability |
|---------------------------------|--------------------|-----------------------|
| 16 Years                        | 201                | \$4.2 billion         |
| 26 Years                        | 21                 | \$5.0 billion         |
| 27 Years                        | 8                  | \$101.2 million       |

# Understanding the Current Funding Policy: Contribution % of Payroll vs Level Dollar



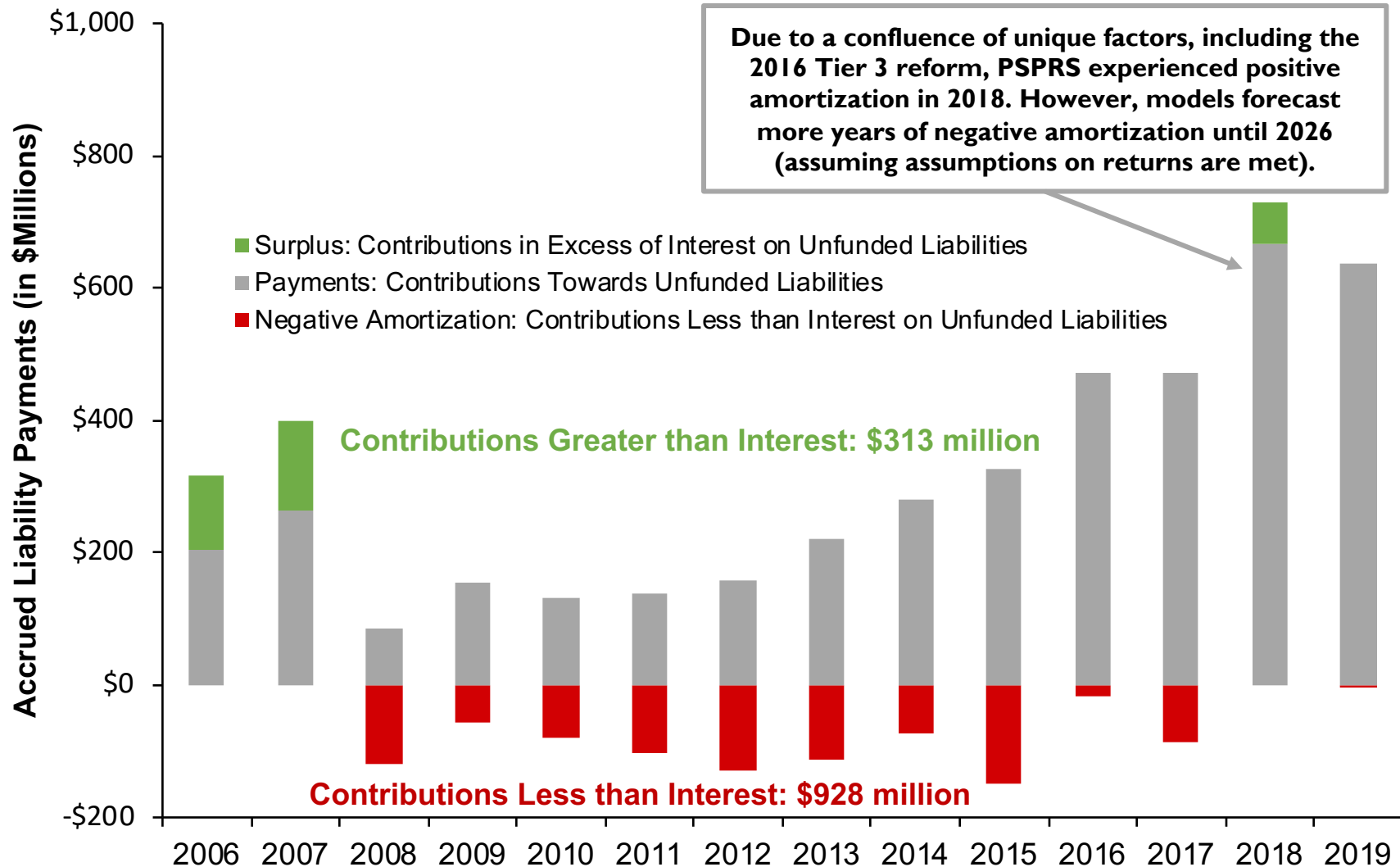
Until recently, PSPRS employers made pension contributions based on the “level percent of payroll” actuarial cost method for Tiers 1 & 2 and on a “layered, level dollar” basis for Tier 3.

- What is level percent of payroll amortization?
  - Sets the amortization payment as a fixed share of total member payroll
  - Very sensitive to missed assumptions
  - Often results in back-loaded pension debt payments, especially if payroll growth slows
- What is level dollar amortization?
  - Sets the amortization payment as a fixed dollar amount
  - Payroll assumptions have no effect on annual amortization payments
  - Reduces long-term costs by front-loading payments

Tier 3's method represents current best practices as it inherently pays down any new unfunded liabilities on short schedules in order to ensure that pension liabilities are fully funded within the average working life of a public employee. PSPRS' newly adopted amortization policy will apply this same method to any newly accrued liabilities throughout the entire system starting 2020.

## Negative Amortization Growth (2006-2019)

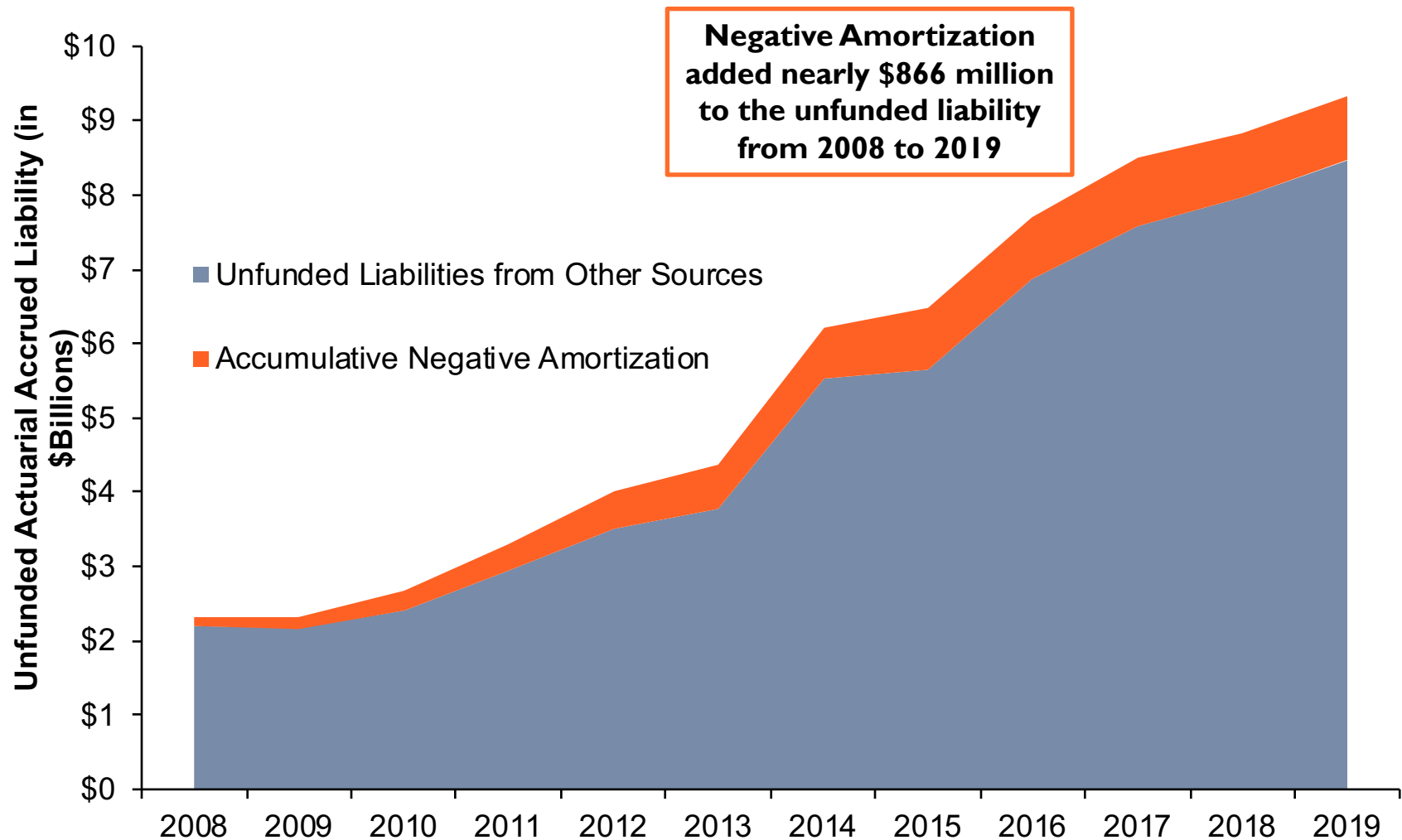
## Interest on the Debt v. Accrued Liability Payments



Source: Pension Integrity Project analysis and forecast of PSPRS Actuarial Valuation Reports and CAFRs. Figures are rounded.

## Negative Amortization Growth (2008-2019)

## Interest on the Debt as a Portion of UAAL



Source: Pension Integrity Project analysis of PSPRS Actuarial Valuation Reports and CAFRs. Figures are rounded.



## CHALLENGE 2: ASSUMED RATE OF RETURN

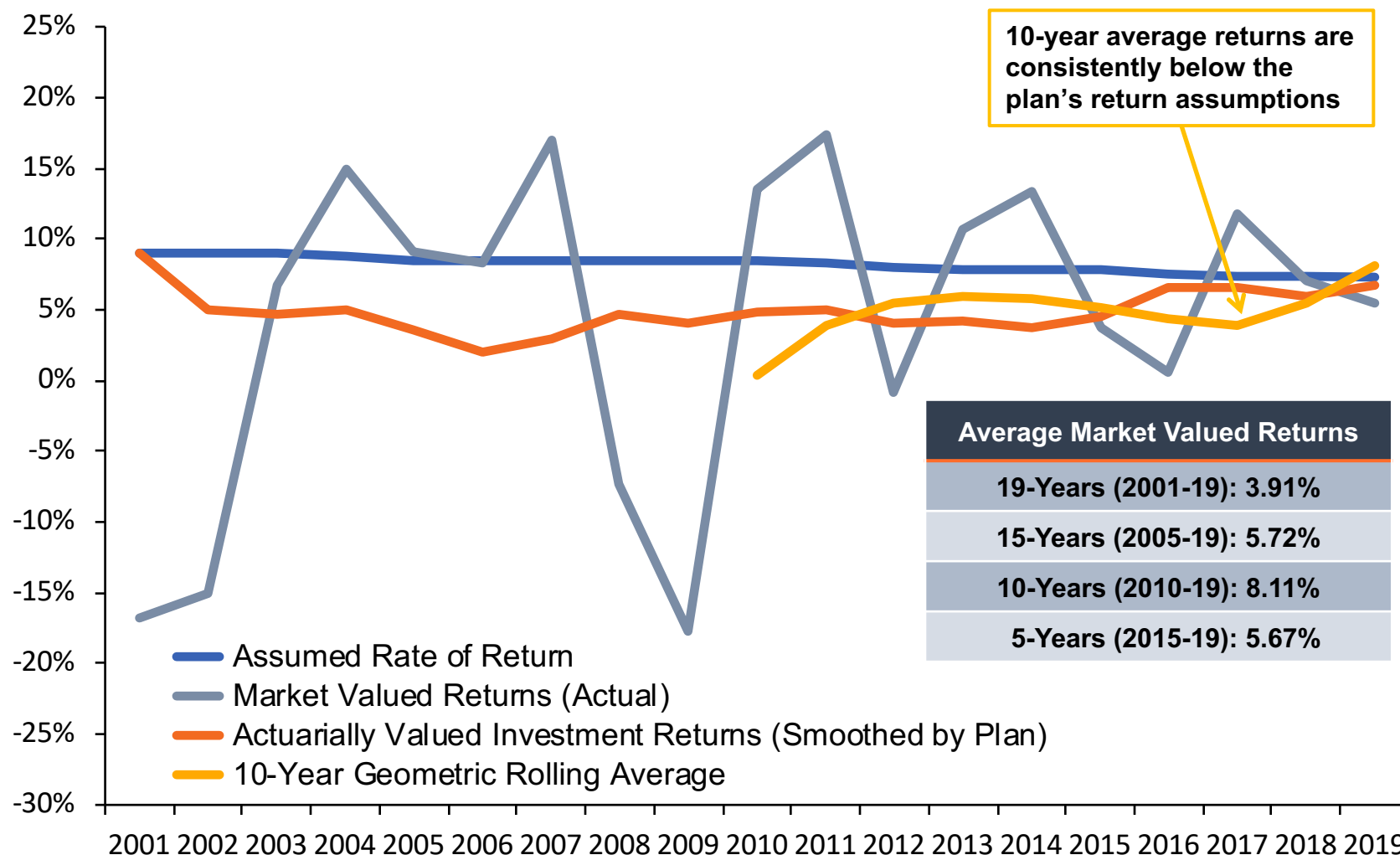
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- **Unrealistic Expectations:** The *Assumed Return* for the PSPRS pension plan is exposing taxpayers to significant investment underperformance risk
- **Underpricing Contributions:** The use of an unrealistic *Assumed Return* has likely resulted in underpriced *Normal Cost* and an undercalculated *Actuarially Determined Contribution*



# Arizona PSPRS Problem: Underperforming Assets

## Investment Return History, 2001-2019



Source: Pension Integrity Project analysis of Arizona PSPRS actuarial valuation reports and CAFRs.

## Arizona PSPRS Problem: Underperforming Assets

# Investment Returns Have Underperformed



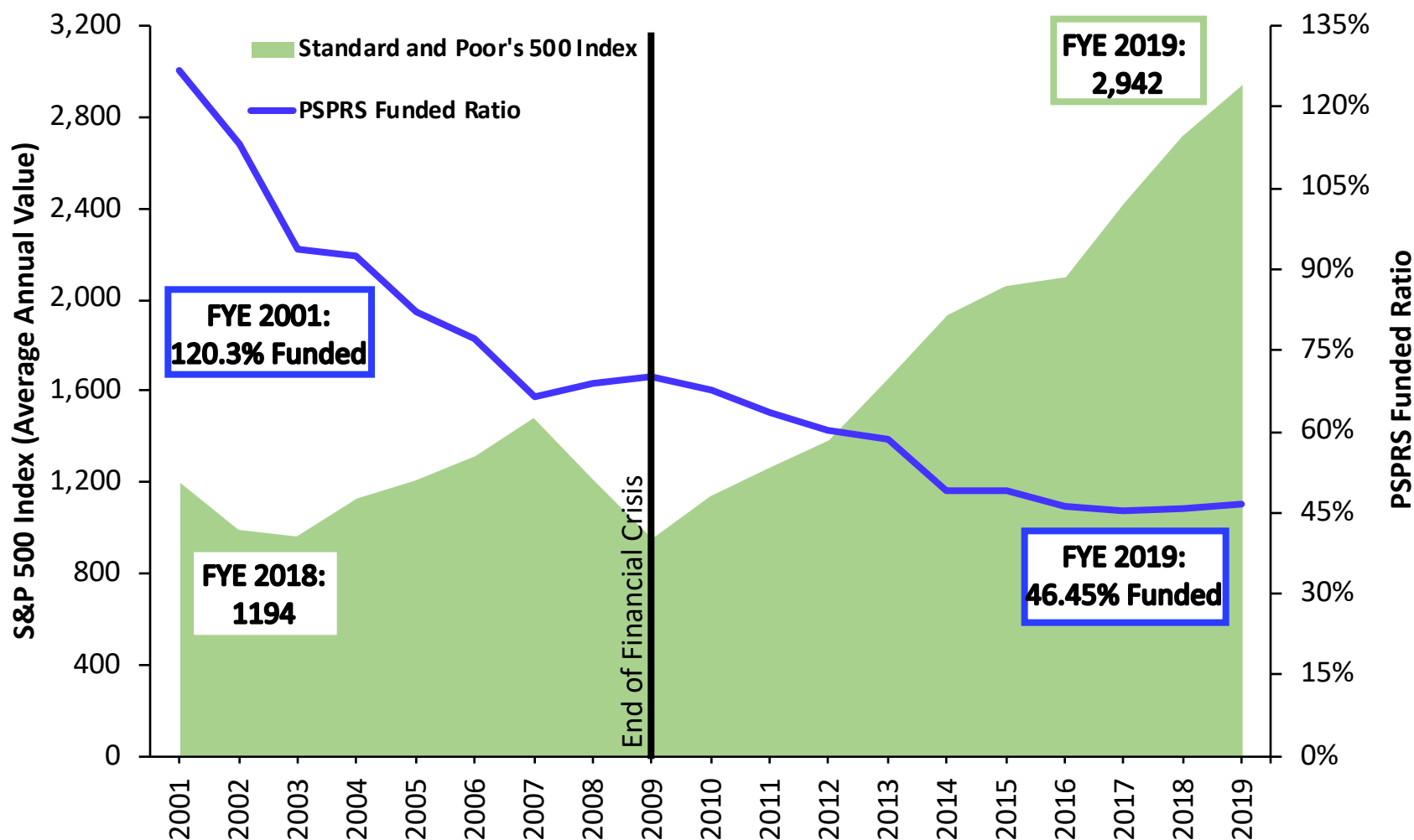
- Arizona PSPRS used above an 8% assumed rate of return on assets until 2013, despite significant market changes
- PSPRS has expanded its equity holdings in a search for greater investment returns (i.e. greater yields) over the past decade
- The investment portfolio's average returns have not matched the long-term assumptions:

| Average Market Valued Returns | Average Actuarial Valued Returns |
|-------------------------------|----------------------------------|
| 19-Years (2001-19): 3.91%     | 19-Years (2001-19): 5.17%        |
| 15-Years (2005-19): 5.72%     | 15-Years (2005-19): 4.62%        |
| 10-Years (2010-19): 8.11%     | 10-Years (2010-19): 5.21%        |
| 5-Years (2015-19): 5.67%      | 5-Years (2015-19): 6.06%         |

Note: past performance is not the best measure of future performance, but it does help provide some context to the problem created by having an excessively high assumed rate of return.



# New Normal: Markets Have Recovered Since the Crisis—PSPRS Funded Ratio Has Not



Source: Pension Integrity Project analysis of Arizona PSPRS actuarial valuation reports and Yahoo Finance data.

Funded ratios are the actuarial value of assets divided by the actuarially accrued liability.

# New Normal: The So-Called Recovery Has Already Happened, the Market Has Changed

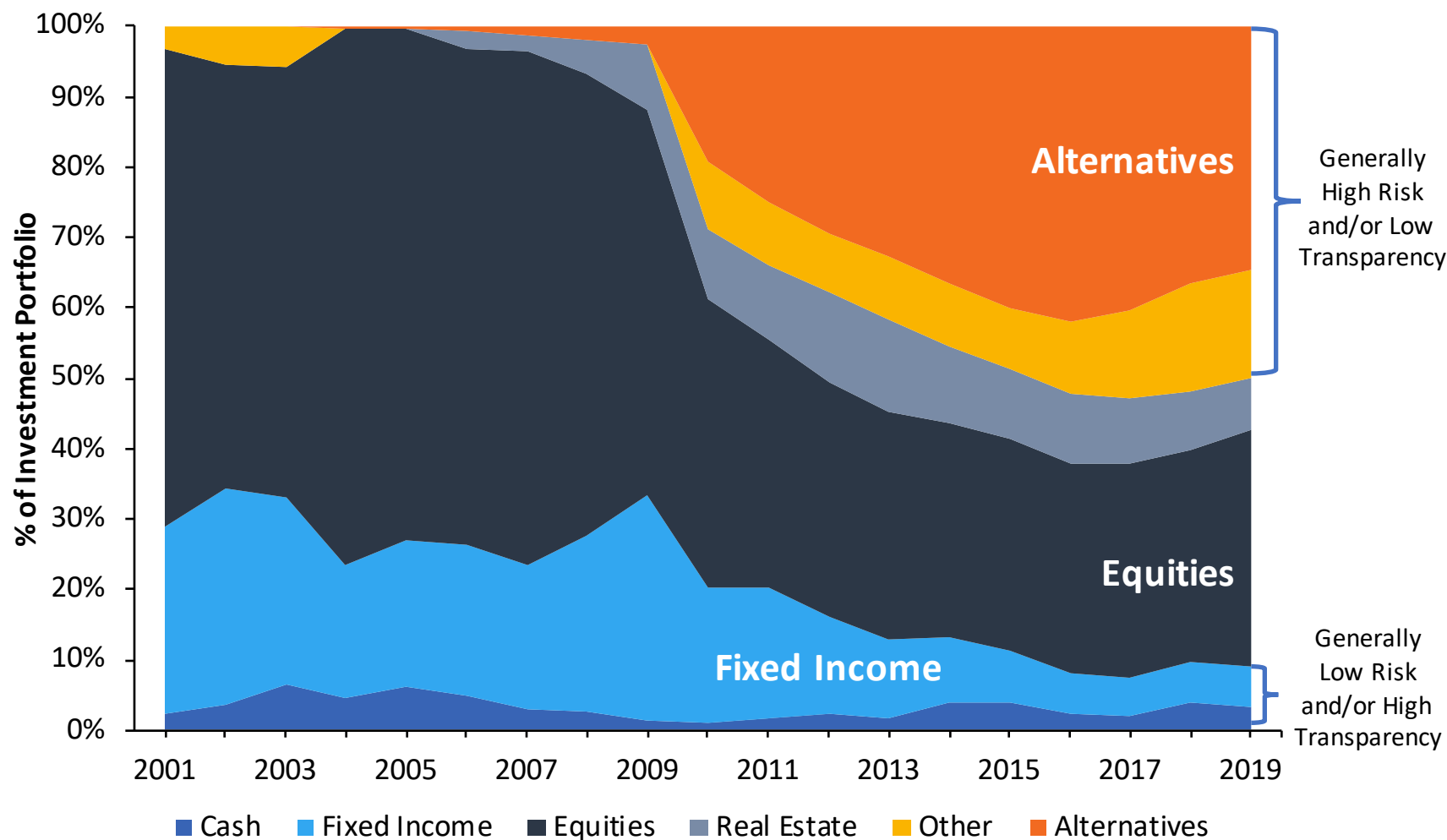


The “new normal” for institutional investing suggests that achieving even a 6% average rate of return is optimistic.

1. Over the past two decades there has been a steady change in the nature of institutional investment returns.
  - 30-year Treasury yields have fallen from around 8% in the 1990s to consistently less than 3% today.
  - Globally, interest rates are at ultralow historic levels, while market liquidity continues to be restrained by financial regulations.
2. McKinsey & Co. forecast the returns to equities will be 20% to 50% lower over the next two decades compared to the previous three decades.
3. As PSPRS waits for the “recovery” its unfunded liabilities continue to grow.

## Arizona PSPRS Asset Allocation (2001-2019)

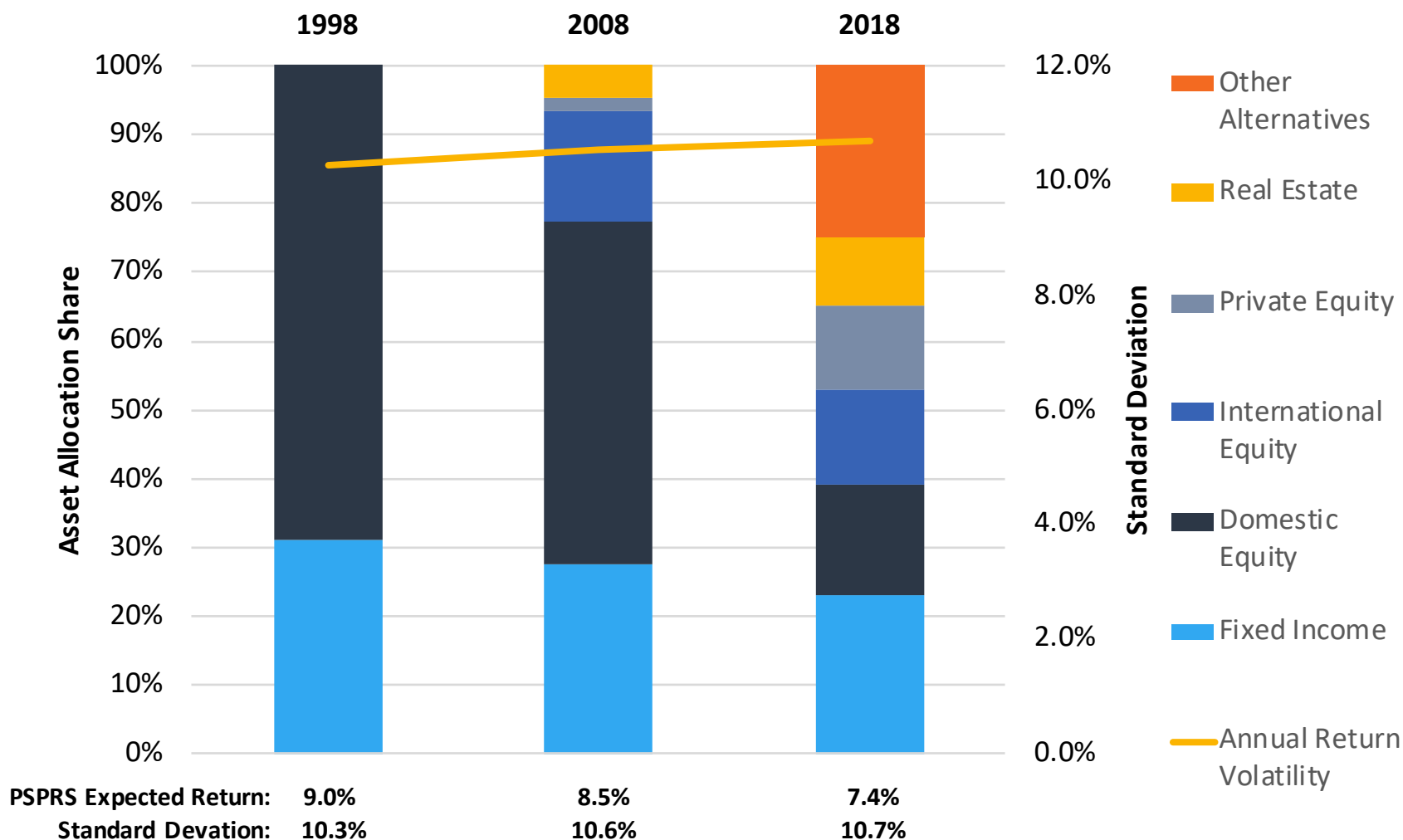
## Expanding Alternatives in Search for Yield



Source: Pension Integrity Project analysis of Arizona PSPRS actuarial valuation reports and CAFRS.

# Changes in Investment Allocation

Despite changes in asset allocation, the standard deviation of PSPRS investment returns has remained relatively stable



Source: Pension Integrity Project Monte Carlo model based on PSPRS asset allocation and reported expected of returns by asset class.

# Probability Analysis: Measuring the Likelihood of PSPRS Achieving Various Rates of Return



| Possible Rates of Return | Probability of PSPRS Achieving A Given Return Based On: |                          |                             |                               |                                      |                                 |                            |                                 |
|--------------------------|---|--------------------------|-----------------------------|-------------------------------|--------------------------------------|---------------------------------|----------------------------|---------------------------------|
|                          | PSPRS Assumptions & Experience                          |                          | Short-Term Market Forecast  |                               |                                      |                                 | Long-Term Market Forecast  |                                 |
|                          | Based on PSPRS Assumptions                              | PSPRS Historical Returns | BNY Mellon 10-Year Forecast | JP Morgan 10-15 Year Forecast | Research Affiliates 10-Year Forecast | Horizon 10-Year Market Forecast | BlackRock 20-Year Forecast | Horizon 20-Year Market Forecast |
| 8.0%                     | 36.8%   | 10.1%                    | 21.1%                       | 17.4%                         | 11.9%                                | 25.0%                           | 41.3%                      | 41.7%                           |
| 7.3%                     | 45.9%   | 15.9%                    | 31.1%                       | 25.5%                         | 18.6%                                | 34.5%                           | 52.0%                      | 53.0%                           |
| 7.0%                     | 50.3%   | 18.8%                    | 36.4%                       | 30.1%                         | 22.2%                                | 39.1%                           | 56.6%                      | 57.6%                           |
| 6.5%                     | 57.7%   | 24.6%                    | 45.0%                       | 37.9%                         | 28.4%                                | 47.4%                           | 64.4%                      | 65.2%                           |
| 6.0%                     | 64.8%   | 30.9%                    | 53.5%                       | 46.2%                         | 36.1%                                | 55.8%                           | 71.1%                      | 72.4%                           |
| 5.5%                     | 71.0%   | 37.8%                    | 61.7%                       | 54.4%                         | 44.1%                                | 63.2%                           | 77.3%                      | 78.5%                           |
| 5.0%                     | 76.7%   | 45.2%                    | 69.6%                       | 63.1%                         | 52.4%                                | 70.2%                           | 82.7%                      | 84.2%                           |
| 4.5%                     | 81.8%   | 53.1%                    | 76.8%                       | 70.5%                         | 60.8%                                | 76.8%                           | 87.3%                      | 88.5%                           |

Source: Pension Integrity Project Monte Carlo model based on PSPRS asset allocation and reported expected returns by asset class. Forecasts of returns by asset class generally by BNYM, JPMC, BlackRock, Research Affiliates, and Horizon Actuarial Services were matched to the specific asset class of PSPRS. Probability estimates are approximate as they are based on the aggregated return by asset class. For complete methodology contact Reason Foundation.

# Probability Analysis: Measuring the Likelihood of PSPRS Achieving Various Rates of Return



## PSPRS Assumptions & Experience

- A probability analysis of PSPRS historical returns over the past 20 years (1999-2018) indicates only a modest chance (16%) of hitting the plan's 7.30% assumed return.
- PSPRS actuaries calculate a 46% chance of achieving their investment return target each year.

## Short-Term Market Forecast

- Returns over the short to medium term can have significant negative effects on funding outcomes for mature pension plans with large negative cash flows like PSPRS.
- Analysis of capital market assumptions publicly reported by the leading financial firms (BlackRock, BNY Mellon, JPMorgan, and Research Affiliates) suggests that over a 10-15 year period, PSPRS returns are likely to fall short of assumptions.

## Long-Term Market Forecast

- Longer-term projections typically assume PSPRS investment returns will revert back to historical averages.
  - ✓ The “reversion to mean” assumption should be viewed with caution given historical changes in interest rates and a variety of other market conditions that increase uncertainty over longer projection periods, relative to shorter ones.
- Forecasts showing long-term returns near 7.30% being likely also show a significant chance that the actual long-term average return will fall far shorter than expected.
  - ✓ For example, according to the BlackRock's 20-year forecast the probability of achieving an average return of 7.30% or higher is about 52%, the probability of earning a rate of return below 5% is about 17%.





# RISK ASSESSMENT

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- How resilient is PSPRS to volatile market factors?



# Important Funding Concepts

## All-in Employer Cost

- The true cost of a pension is not only in the annual contributions, but also in whatever unfunded liabilities remain. The "All-in Employer Cost" combines the total amount paid in employer contributions and adds what unfunded liabilities remain at the end of the forecasting window

## Baseline Rates

- The baseline describes PSPRS current assumptions using the plan's existing contribution and funding policy and shows the status quo before the 2020 market shock

## Employee Rates

- The scenarios in this analysis assume that employee contribution will be between 7.65% and 11.65% for Tiers 1&2 and half of the actuarially required contribution for Tier 3.

### Quick Note:

With actuarial experiences of public pension plans varying from one year to the next, and potential rounding and methodological differences between actuaries, projected values shown onwards are not meant for budget planning purposes. **For trend and policy discussions only.**

# Stress Testing PSPRS Using Crisis Simulations



## Stress on the Economy:

- Market watchers expect dwindling consumption and incomes to severely impact near-term tax collections – applying more pressure on state and local budgets.
- Revenue declines are likely to undermine employers' ability to make full pension contributions, especially for those relying on more volatile tax sources (e.g., sales taxes) and those with low rainy-day fund balances.
- Many financial advisors project double-digit drops in U.S. GDP for Q2 2020. In Q1 2020 alone the S&P500 dropped by 20%, while the Federal Reserve lowered federal funds rate virtually to zero.

## Methodology:

- The stress testing scenarios in this section assume a crash comprised of one year of -24% returns in 2020, followed by three years of 11% average returns.
- Recognizing expert consensus regarding a diminishing capital market outlook, the scenarios assume a long-term investment return on 6% once markets rebound.
- Given the increased exposure to volatile global markets and rising frequency of Black Swan economic events, we include a scenario incorporating a second Black Swan crisis event in 2035.

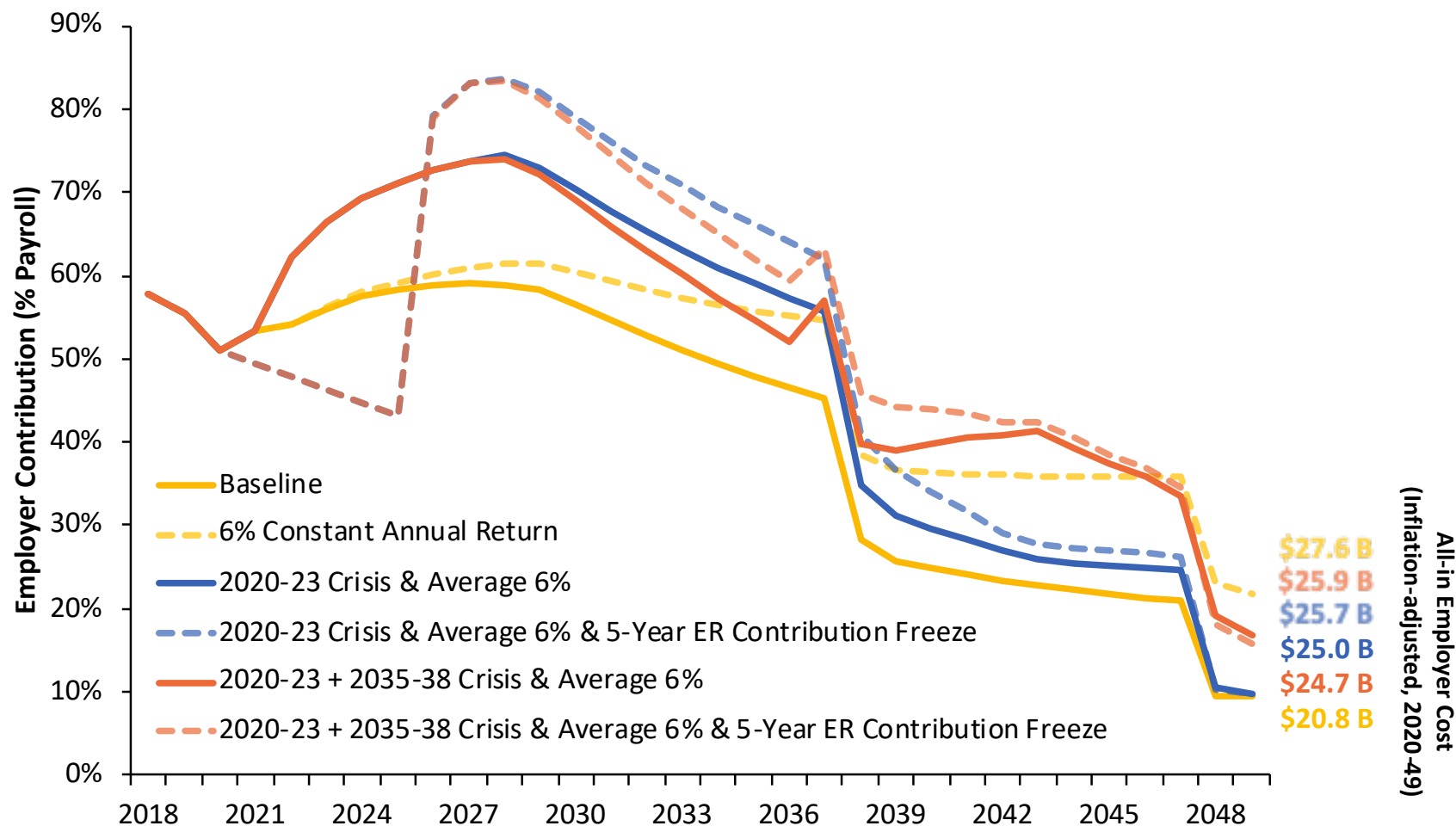
## Stress Testing Scenarios:

1. 6% Constant Annual Return
2. 2020-23 Crisis + Average 6.0% Long-Term
3. 2020-23 Crisis + 2035-38 Crisis + Average 6.0% Long-Term
4. Scenario 2 + 5-Year Employer Contribution Freeze
5. Scenario 3 + 5-Year Employer Contribution Freeze

## PSPRS Stress Testing: All-in Employer Cost Projections

## How a Crisis Increases PSPRS Costs

Discount Rate: 7.3%, Assumed Return: 7.3%, Actual Return: Varying



Source: Pension Integrity Project actuarial forecast of PSPRS. Values are rounded and adjusted for inflation. State is assumed to make 100% actuarially required contributions. The "All-in Cost" includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by the end of the forecast period.



# Scenario Comparison of Employer Costs

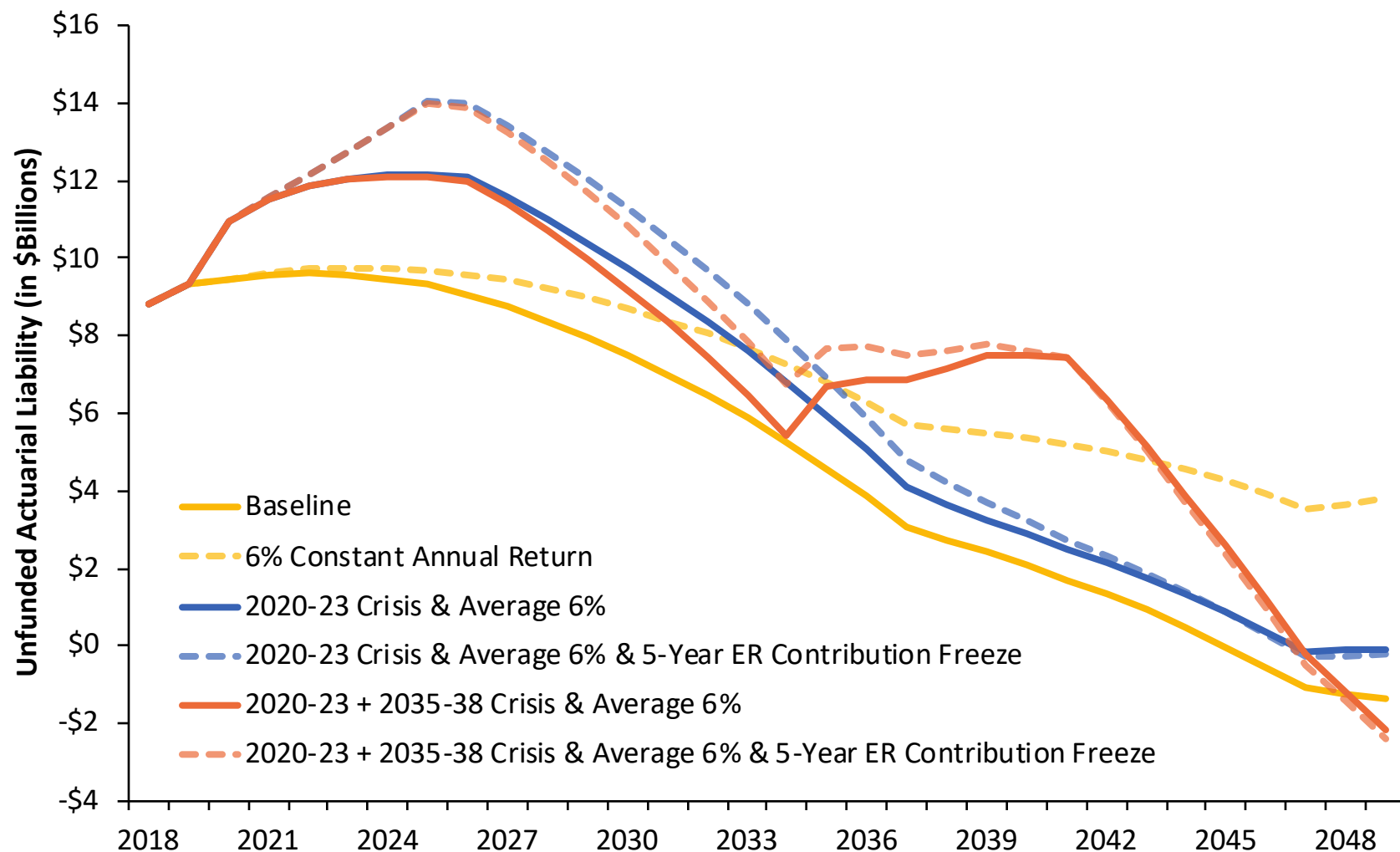
| Scenarios  | 30-Year Employer Contributions | 2049 Unfunded Market Liability | Total All-in Employer Costs |
|--|--------------------------------|--------------------------------|-----------------------------|
| <b>Pre-Crisis Baseline</b>                               | \$21.3 B                       | \$(0.5) B                      | \$20.8 B                    |
| <b>6% Constant Annual Return</b>                         | \$25.4 B                       | \$2.2 B                        | \$27.6 B                    |
| <b>2020-23 Crisis + Average 6%</b>                       | \$25.5 B                       | \$(0.5) B                      | \$25.0 B                    |
| <b>Two Crises + Average 6%</b>                           | \$27.6 B                       | \$(0.3) B                      | \$25.3 B                    |
| <b>2020-23 Crisis + Average 6% + 5-Year Cont. Freeze</b> | \$26.2 B                       | \$(0.6) B                      | \$25.7 B                    |
| <b>Two Crises + Average 6% + 5-Year Cont. Freeze</b>     | \$28.2 B                       | \$(2.3) B                      | \$25.9 B                    |

Source: Pension Integrity Project actuarial forecast of PSPRS. Values are rounded and adjusted for inflation. State is assumed to make 100% actuarially required contributions. The "All-in Cost" includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by the end of the forecast period.

## PSPRS Stress Testing: Unfunded Liability Projections

# Crisis Scenarios Slow Progress to Full Funding

Discount Rate: 7.3%, Assumed Return: 7.3%, Actual Return: Varying

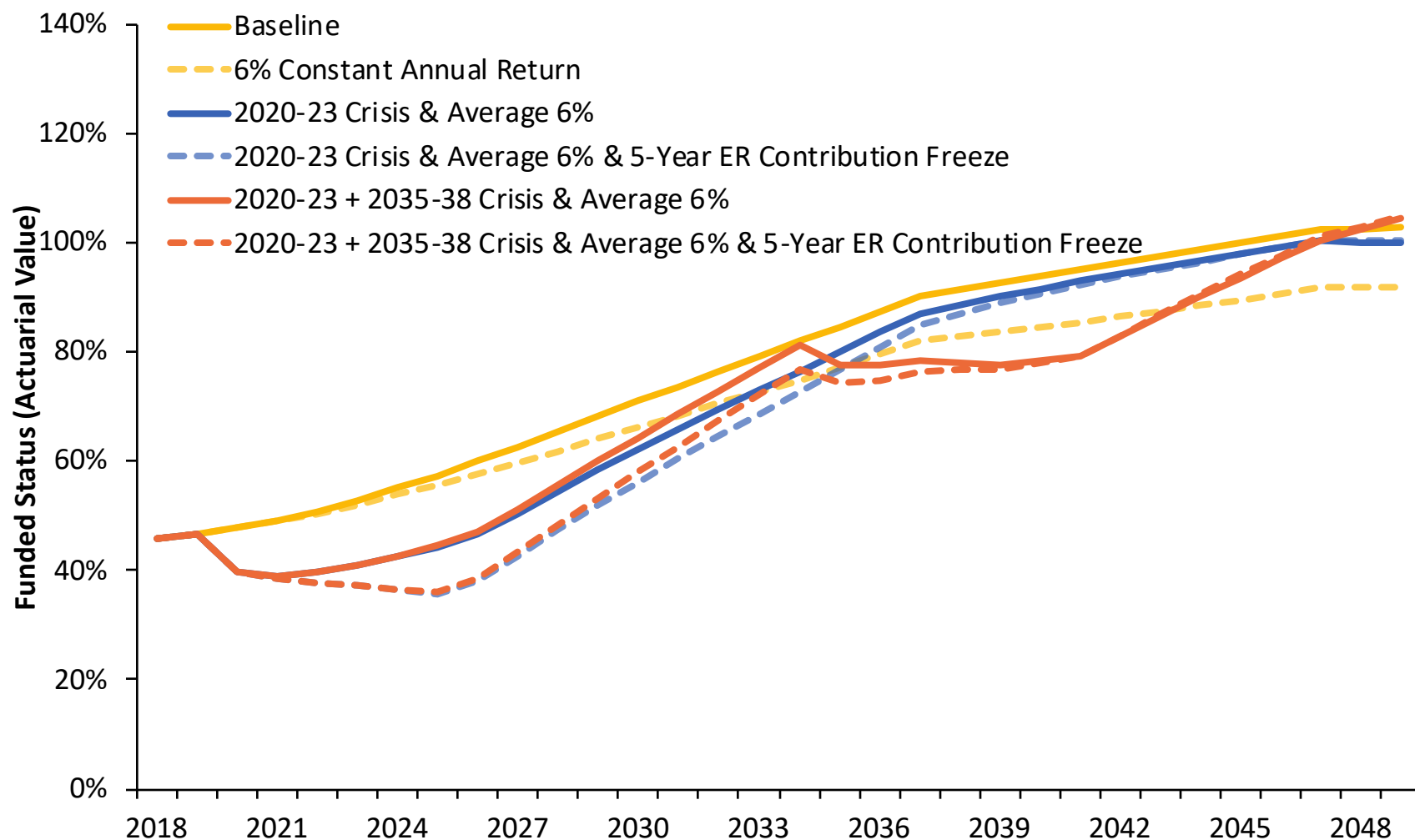


Source: Pension Integrity Project actuarial forecast of PSPRS. State is assumed to make 100% actuarially required contributions. The "All-in Cost" includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by the end of the forecast period.

## PSPRS Stress Testing: Funded Ratio Projections

# Crisis Scenarios Slow Progress to Full Funding

Discount Rate: 7.3%, Assumed Return: 7.3%, Actual Return: Varying

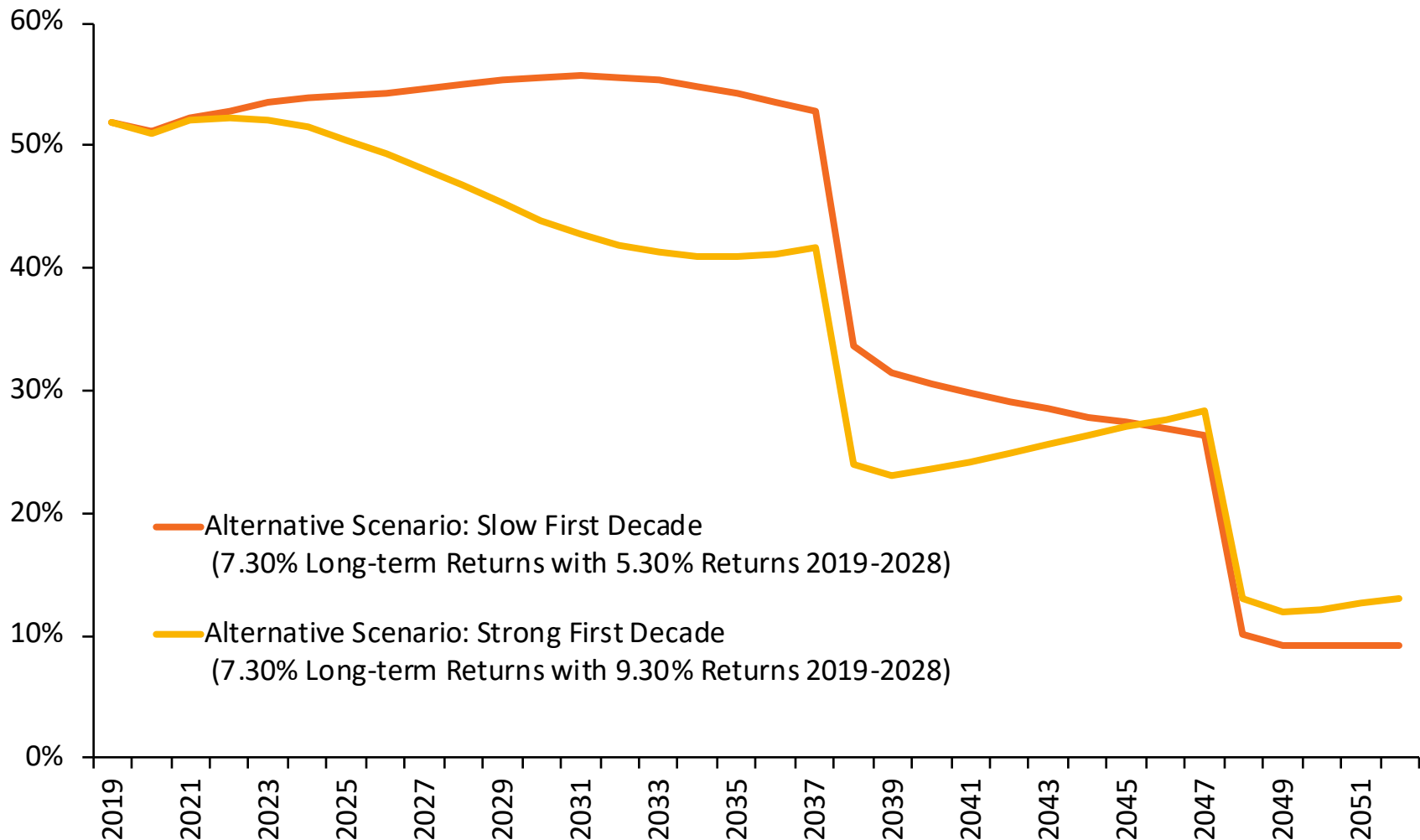


Source: Pension Integrity Project actuarial forecast of PSPRS. State is assumed to make 100% actuarially required contributions. The "All-in Cost" includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by the end of the forecast period.

## 30-year Employer Contribution Forecast

## Timing of Returns Affects What PSPRS Employers Pay

Long-Term Average Returns of 7.30%



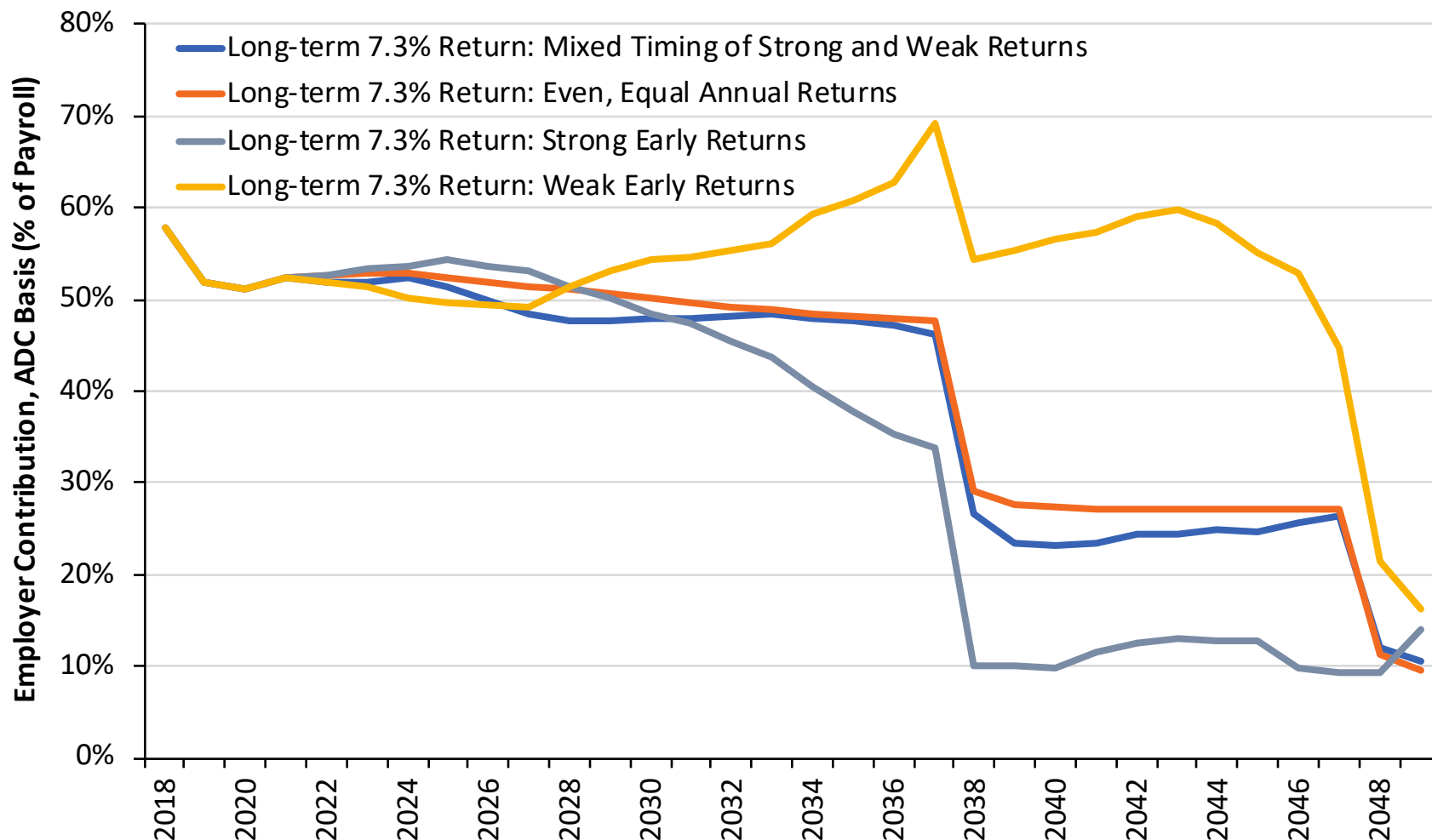
Source: Pension Integrity Project actuarial forecast of PSPRS.





## 30-year Employer Contribution Forecast

## All Paths to a 7.30% Average Return Are Not Equal



Source: Pension Integrity Project actuarial forecast of PSPRS plan. Constant Returns = 7.3%, Strong early returns (TWRR = 7.3%, MWRR = 8.8%), Weak early returns (TWRR = 7.3%, MWRR = 6.4%), Mixed timing of strong and weak returns (TWRR = 7.3%, MWRR = 7.3%). Years are plan's fiscal years.



# Forecasting the Impact of Market Volatility

## Random Investment Return Analysis

### What is it?

- Model generates 10,000 different random investment return scenarios, creating ranges in required contributions and funding outcomes
- The analysis displays 50 percent of all outcomes that are closest to the median outcome

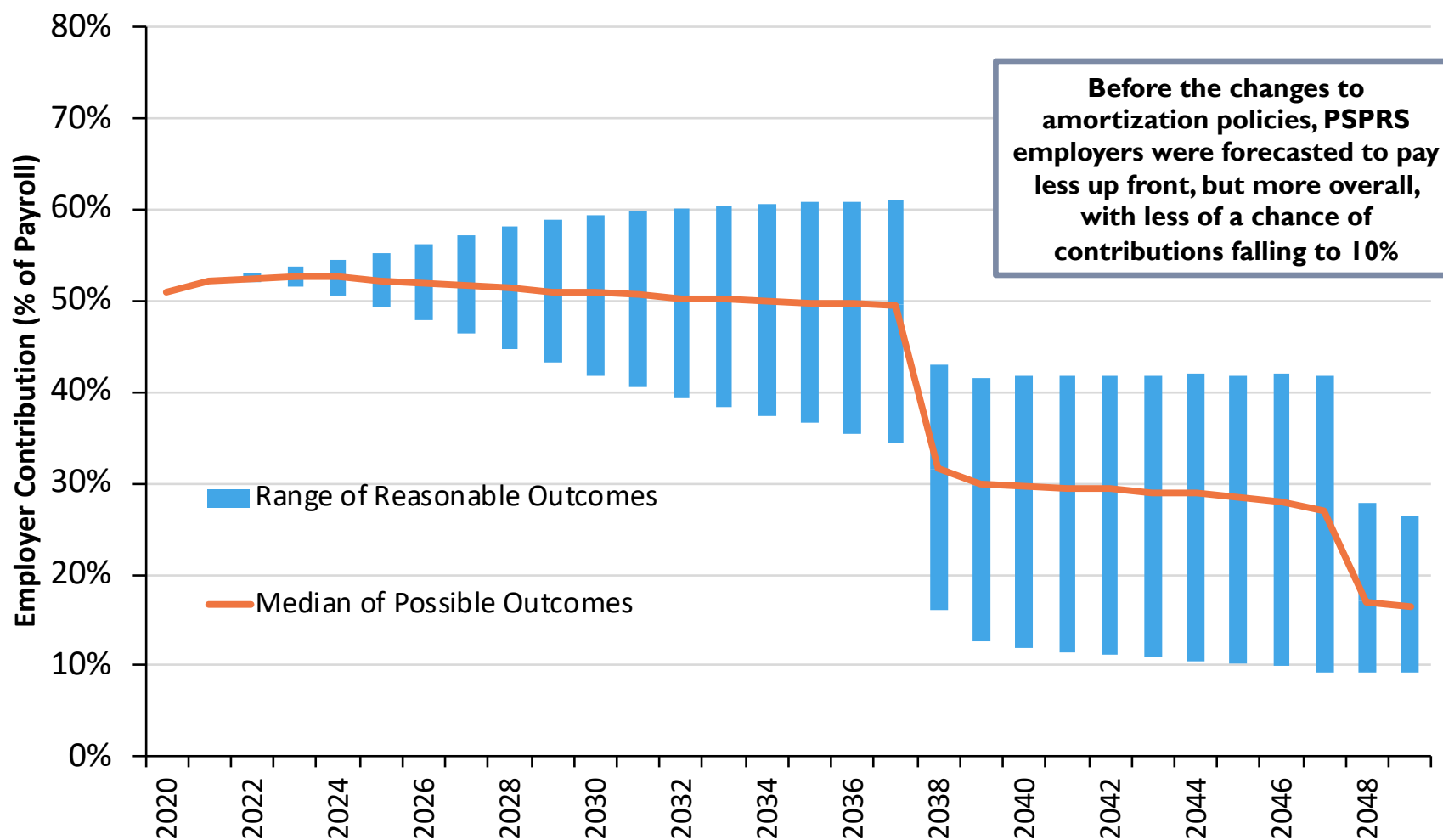
### Why use it?

- Using a large sample of potential 30-year return scenarios can show the differences in how plan's funding will react to high or low investment fluctuations.
- The cone of displayed outcomes and the median illustrates the level of risk placed on the plan
- A narrow cone suggests a plan is more resilient—and has less investment risk—than that of a wider cone

## 30-year Employer Contribution Forecast

## PSPRS Contribution Forecast: Pre-Amortization Change

Based on Long-term Average Returns of 7.30%



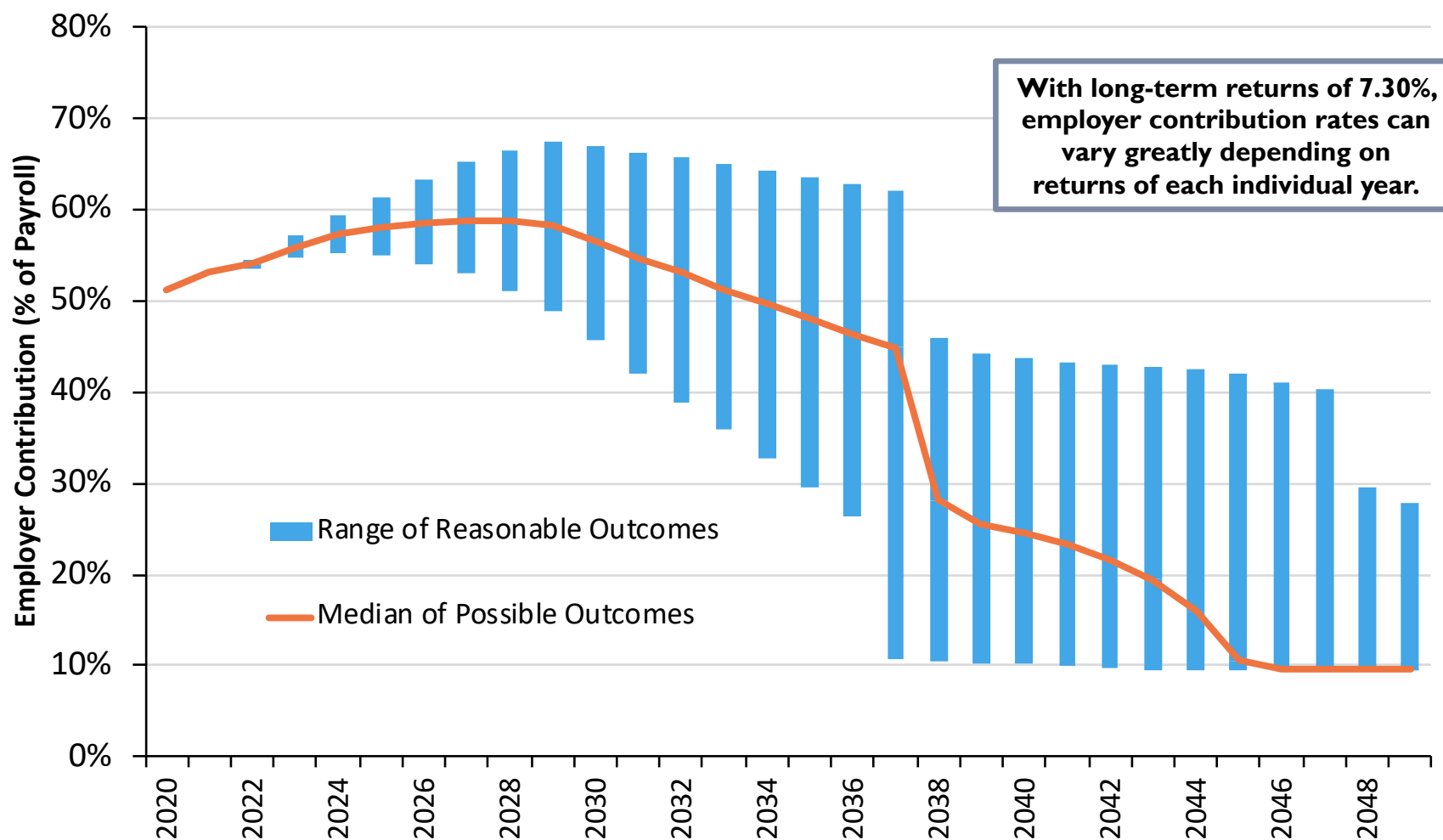
Source: Pension Integrity Project actuarial forecast of PSPRS plan based on PSPRS return and risk assumptions.

Range of Reasonable Outcomes represents the 50% of possible outcomes closest to the median.

## 30-year Employer Contribution Forecast

## If PSPRS Performs as Expected, Rates Can Still Vary

Based on Long-term Average Returns of 7.30%



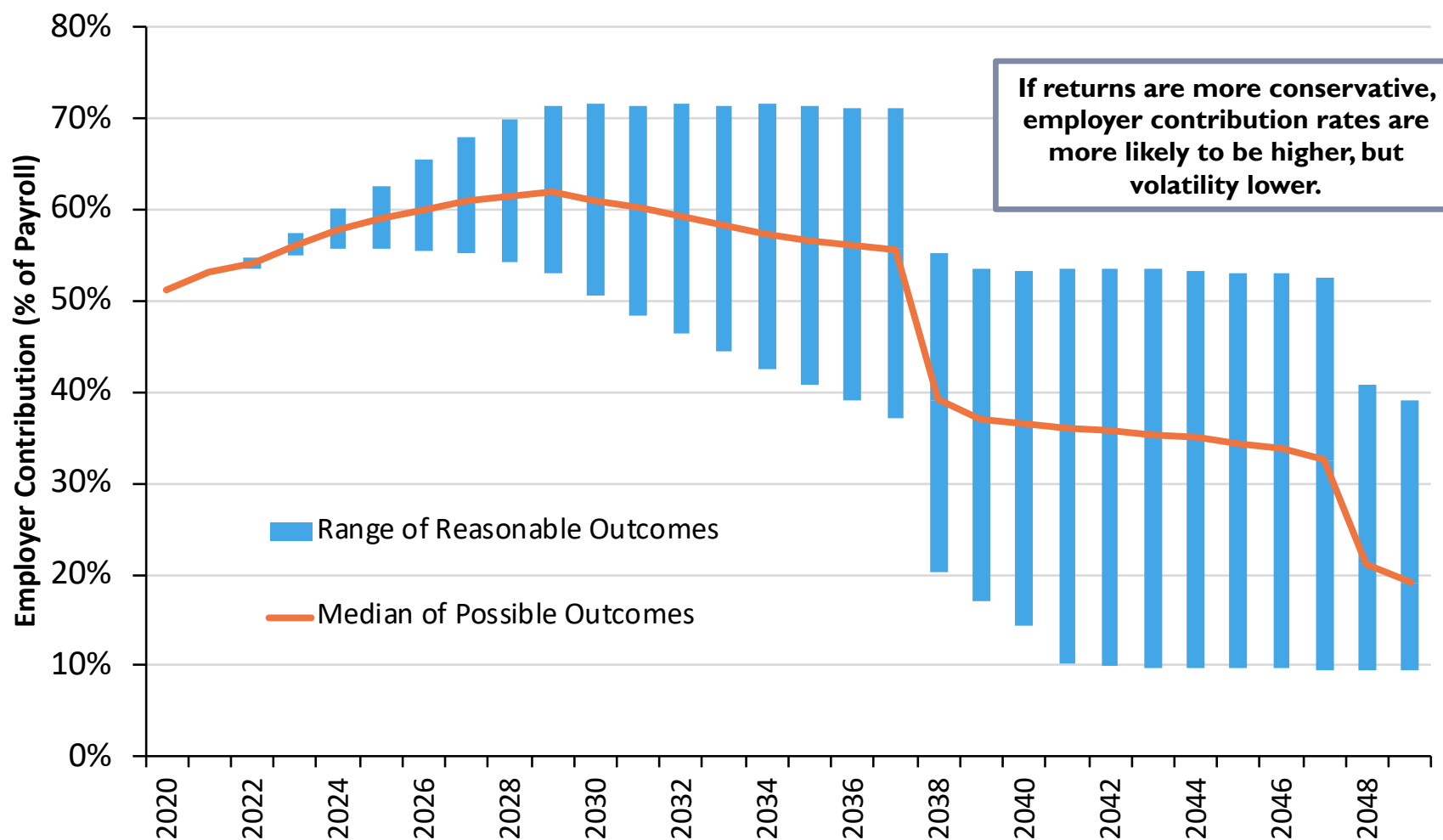
Source: Pension Integrity Project actuarial forecast of PSPRS plan based on PSPRS return and risk assumptions.

Range of Reasonable Outcomes represents the 50% of possible outcomes closest to the median.

## 30-year Employer Contribution Forecast

## If PSPRS Underperforms, Expect Higher Contribution Rates

Based on More Conservative Long-term Average Returns



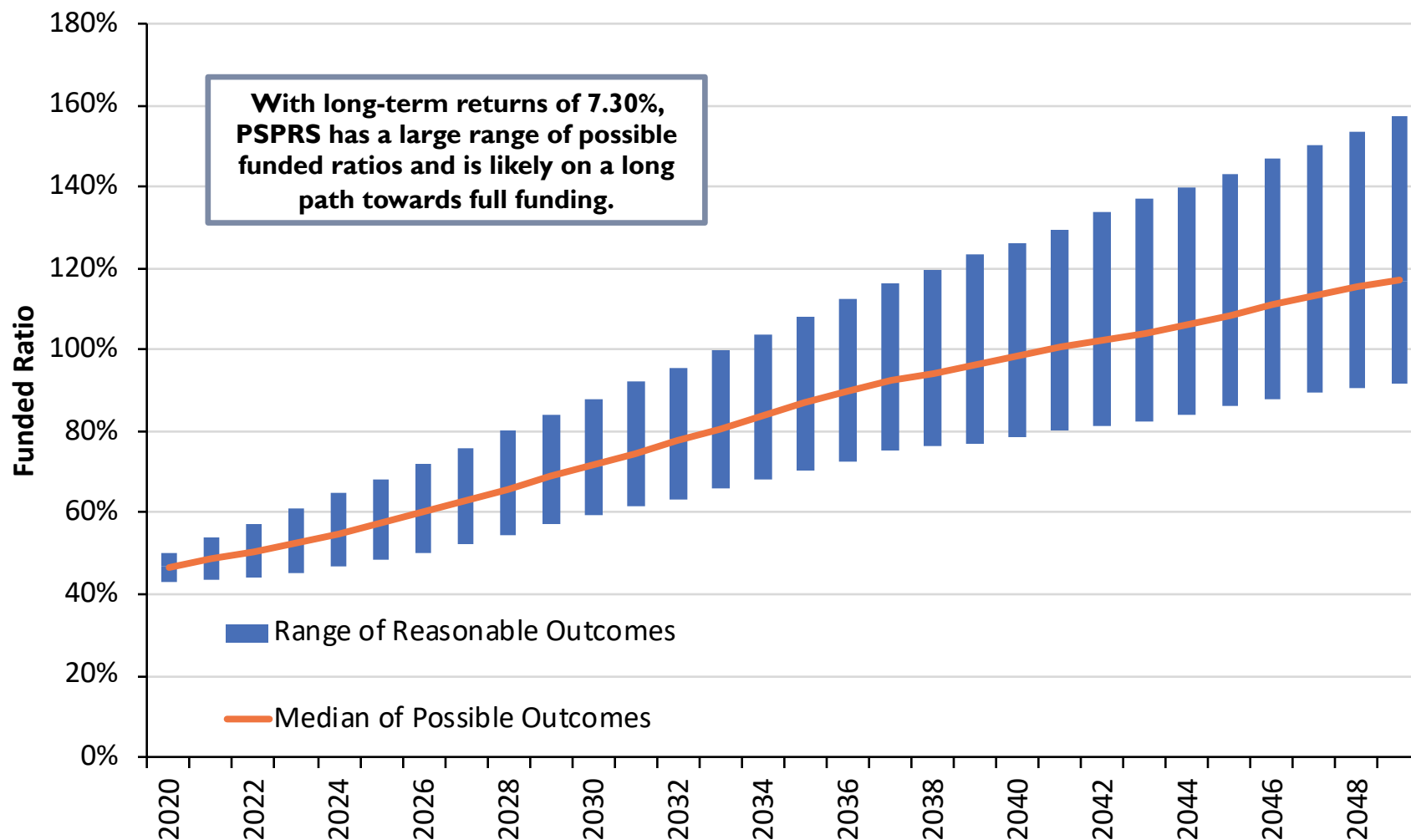
Source: Pension Integrity Project actuarial forecast of PSPRS plan based on PSPRS return and risk assumptions.

Conservative returns are 6.40%, which are the result of combining the long-term capital market assumptions from four prominent financial firms (see slide 24)

## 30-year Funded Ratio Forecast

# Funded Ratios are Expected to Improve

Based on Long-term Average Returns of 7.30%



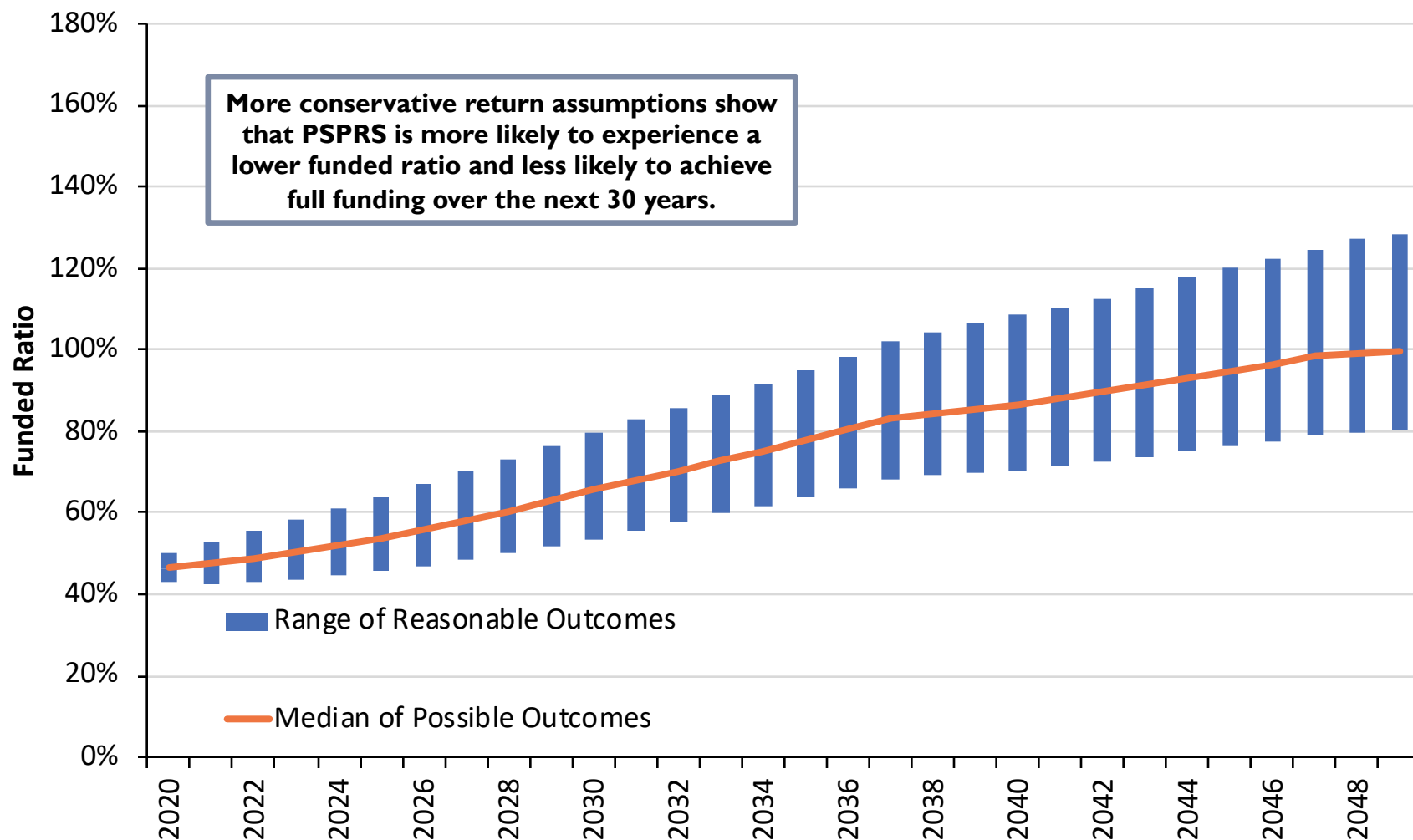
Source: Pension Integrity Project actuarial forecast of PSPRS plan based on PSPRS return and risk assumptions.

Range of Reasonable Outcomes represents the 50% of possible outcomes closest to the median.

## 30-year Funded Ratio Forecast

# How Do Missed Returns Impact Funded Ratios?

Based on More Conservative Long-term Average Returns



Source: Pension Integrity Project actuarial forecast of PSPRS plan using the return and risk assumptions of the Monte Carlo analysis.

Conservative returns are 6.40%, which are the result of combining the long-term capital market assumptions from four prominent financial firms (see slide 24)

# Sensitivity Analysis: Normal Cost Comparison Under Alternative Assumed Rates of Return



(Amounts to be Paid in 2018-19 Contribution Fiscal Year, % of projected payroll)

|  | Tier 1            |                      |                      |
|--|-------------------|----------------------|----------------------|
|  | Gross Normal Cost | Employer Normal Cost | Employee Normal Cost |
| <b>7.4%</b><br>Assumed Return<br>(FYE 2018 Baseline) | 22.60%            | 14.95%               | 7.65%                |
| <b>7.3%</b><br>Assumed Return<br>(FYE 2019 Baseline) | 23.09%            | 15.44%               | 7.65%                |
| <b>7.0%</b><br>Assumed Return                        | 24.63%            | 16.98%               | 7.65%                |
| <b>6.0%</b><br>Assumed Return                        | 30.54%            | 22.89%               | 7.65%                |

Note: These alternative gross normal cost figures should be considered approximate guides to how much more normal cost should be under different discount rates. Any policy changes should be based on more precise normal cost forecasts using detailed plan data. Alternative normal cost rates based on reported liability sensitivity from the FYE 2018 PSPRS CAFR.

Source: Pension Integrity Project forecasting analysis based on PSPRS actuarial valuation reports





# CHALLENGE 3: DISCOUNT RATE AND UNDERVALUING DEBT

- 
- The discount rate undervalues the measured value of existing pension obligations

# PSPRS Discount Rate

## Methodology is Undervaluing Liabilities



1. The “discount rate” for a public pension plan should reflect the risk inherent in the pension plan’s liabilities:
  - Most public sector pension plans — including Arizona PSPRS — use the assumed rate of return and discount rate interchangeably, even though each serve a different purpose.
  - The **Assumed Rate of Return** (ARR) adopted by PSPRS estimates what the plan will return on average in the long run and is used to calculate contributions needed each year to fund the plans.
  - The **Discount Rate** (DR), on the other hand, is used to determine the net present value of all of the already promised pension benefits and supposed to reflect the risk of the plan sponsor not being able to pay the promised pensions.

# PSPRS Discount Rate

## Methodology is Undervaluing Liabilities



- 2. Setting a discount rate too high will lead to undervaluing the amount of pension benefits actually promised:**
  - If a pension plan is choosing to target a high rate of return with its portfolio of assets, and that high assumed return is then used to calculate/discount the value of existing promised benefits, the result will likely be that the actuarially recognized amount of accrued liabilities is undervalued.
- 3. It is reasonable to conclude that there is almost no risk that PSPRS employers would pay out less than 100% of promised retirement income benefits to members and retirees.**
  - Arizona Constitution—Article 29
- 4. The discount rate used to account for this minimal risk should be appropriately low.**
  - The higher the discount rate used by a pension plan, the higher the implied assumption of risk for the pension obligations.

# PSPRS Tiers 1 & 2 Pension Debt Sensitivity

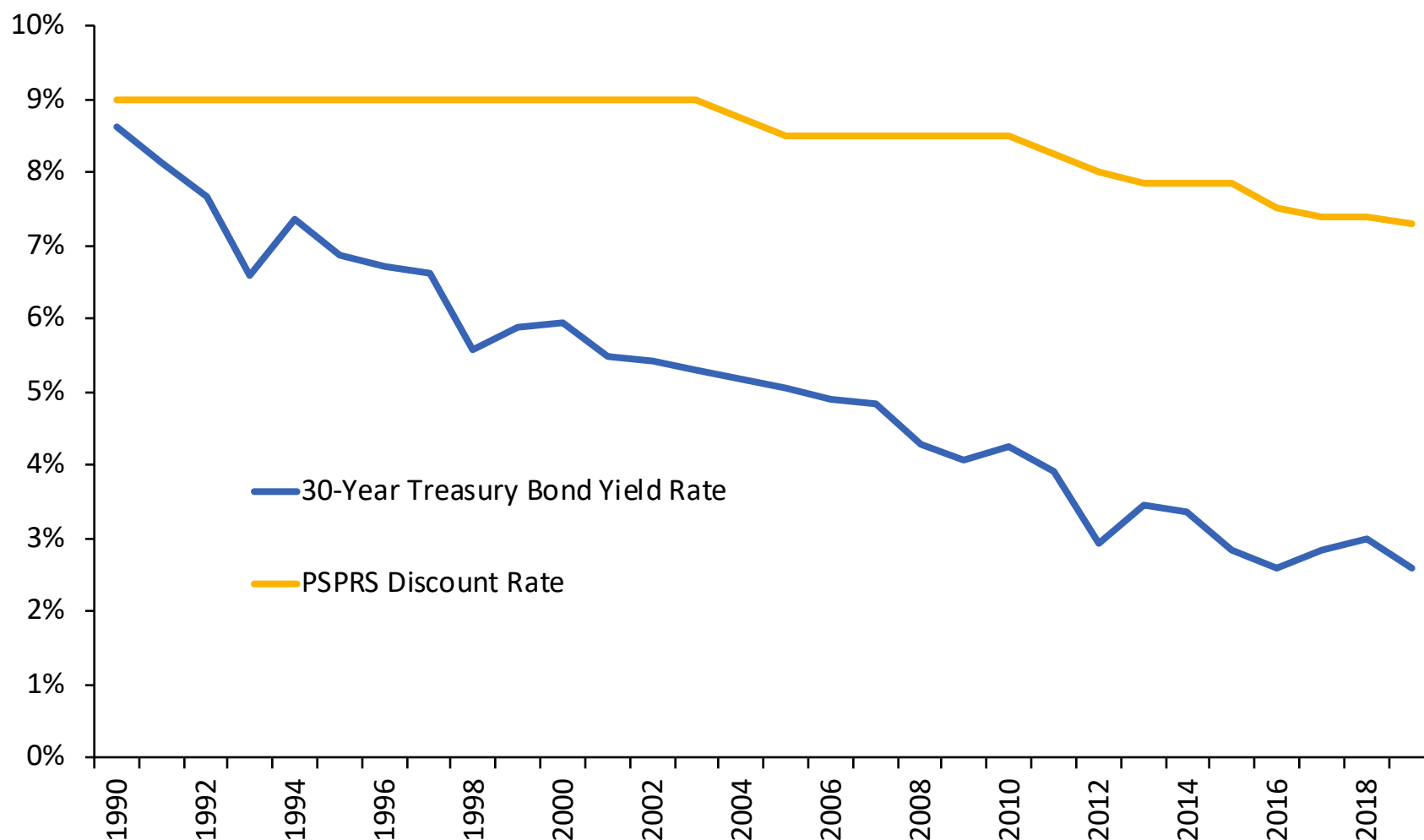
FYE 2018 Liability Under Varying Discount Rates



|   | Funded Ratio<br>(Actuarial Value) | Unfunded Liability<br>(Actuarial Value) | Actuarial Accrued<br>Liability |
|---|-----------------------------------|---|--------------------------------|
| <b>7.4% Discount Rate</b><br>(Current Baseline) | 45.8%                             | \$8.8 billion                           | \$16.3 billion                 |
| <b>7.3% Discount Rate</b><br>(New Baseline)     | 45.3%                             | \$9.0 billion                           | \$16.4 billion                 |
| <b>7% Discount Rate</b>                         | 43.8%                             | \$9.6 billion                           | \$17.0 billion                 |
| <b>6% Discount Rate</b>                         | 39.3%                             | \$11.5 billion                          | \$19.0 billion                 |

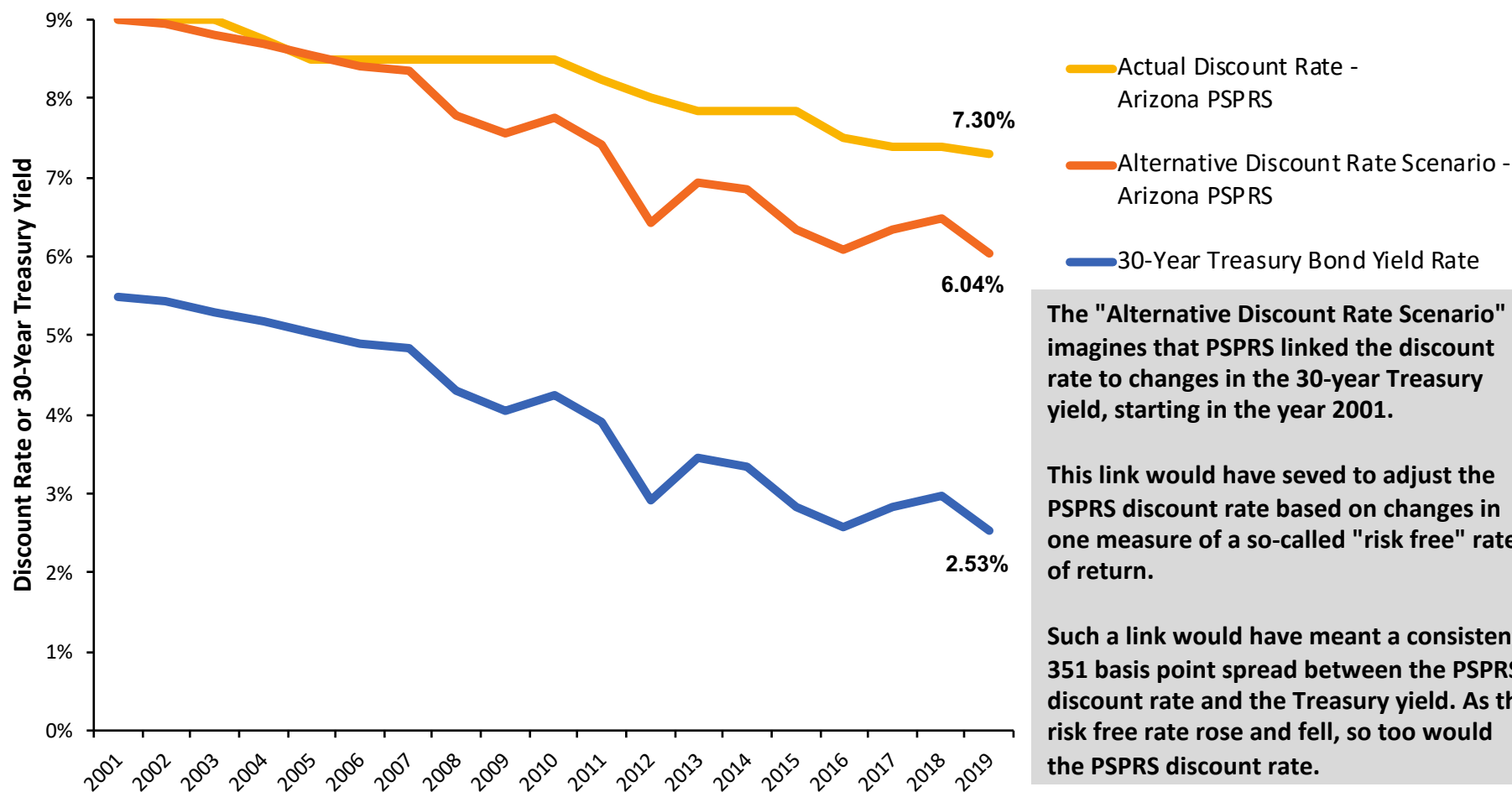
Source: Pension Integrity Project analysis of PSPRS GASB Statements. Figures are rounded.

# Change in the Risk-Free Rate Compared to PSPRS Discount Rate (1990-19)



Source: Pension Integrity Project analysis of Arizona PSPRS actuarial reports and Treasury yield data from the Federal Reserve

# Change in the Risk-Free Rate Compared to PSPRS Discount Rate (2001-19)



Source: Pension Integrity Project analysis of Arizona PSPRS actuarial reports and Treasury yield data from the Federal Reserve



# COUNTERFACTUAL ANALYSIS OF 2016 REFORM

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- In 2016, PSPRS undertook major reforms to relieve runaway accrual of unfunded liabilities and provide more reliable, risk managed benefits
- Now with a few years of experience, it is possible to analyze where PSPRS would have been if reforms had not passed, comparing it to the system's current status



# PSPRS 2016 Reform: Analysis Overview

- The reforms established a more consistent, pre-funded COLA benefit to PSPRS retirees and created a new, risk-managed and choice-based benefit tier (Tier 3)
- While actual results will depend on market outcomes, the most likely expected scenario is that the reforms will save PSPRS employers \$141 million over the studied 30-year window
- The changes will save employers even more in high-return scenarios, but could end up costing more in low-return scenarios
- The introduction of a low-risk tier for new members will reduce risk, but it will take decades to realize this benefit





# COUNTERFACTUAL ANALYSIS

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- 2016 Reform Summary



# PSPRS 2016 Reforms

## Why?

- Underperforming investment returns
- Permanent benefit increase (PBI) program was skimming investment returns and destabilizing asset growth
- The PBI benefit wasn't prefunded, which means PSPRS was missing out on compounding interest and was facing unnecessary risks in variable costs
- Prior reforms (2011) had negative effect on growth in unfunded liabilities and vesting requirements; reforms making retroactive benefit changes found unconstitutional by AZ Supreme Court



# PSPRS 2016 Reforms

## What?

- New choice-based retirement system for new hires (DB or DC)
  - New amortization method, cost-sharing contribution rate policy, and graded multiplier for new-hire DB plan
- Constitutional ballot measure to change the PBI to a pre-funded COLA that adjusts based on inflation
- Retroactive benefit improvement for post-2011 employees
- Change board composition to align with risks within the system and incentivize better future funding policy



# PSPRS 2016 Reforms

## Costs and Benefits to Changes

The 2016 reforms involve several different changes, each with its own benefit and cost

- Establishment of pre-funded COLA:
  - Recognition of cost previously hidden under PBI (pre-funding this benefit means adding the cost to long-term forecasts)
  - More reliable benefit adjustments for retirees
- Reduced-risk Tier 3
  - Cost sharing, a lower assumed rate of return, shorter amortization schedules and the introduction of a DC option all reduce the long-term risk and costs on PSPRS employers
  - Shorter amortization schedules mean higher up-front costs to accrued pension debt, but a reduction in long-term costs and risk



# Objectives of PSPRS 2016 Reforms

- **Keeping Promises:** Ensure PSPRS is able to maintain the same benefits promised to members
- **Retirement Security:** Improve the security of retirees by establishing more consistent COLA benefits
- **Predictability:** Introduce new tier for new workers to stabilize annual and long-term costs
- **Risk Reduction:** Gradually reduce exposure to market volatility through the new reduced-risk tier
- **Affordability:** The new tier stabilizes long-term costs for employers/taxpayers and employees
- **Attractive Benefits:** Establish more options for future workers to ensure the ability to recruit 21st Century employees
- **Good Governance:** Improve PSPRS governance and transparency through new structure and requirements



# COUNTERFACTUAL ANALYSIS

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- Fiscal Analysis



# 2016 Reforms: Fiscal Analysis

- Now with three years of data on hand following the passage of the 2016 reforms, we have developed actuarial forecast models of PSPRS before and after the changes
- Comparative actuarial modeling uncovers some of the long-term fiscal effects of the 2016 reforms
- The analysis shows that the 2016 reforms established a more consistent COLA structure for PSPRS retirees while remaining relatively cost-neutral in long-term contributions when compared to the previous structure
- The following effects of the reduced-risk Tier 3 plan will start off as small, but will amplify well beyond this 30-year forecast
  - Stabilized employer contributions through new cost-sharing policy
  - Fund Resilience to Market Volatility
  - Reduced risk of pension debt accrual and underfunding



# Changes in Funding

- Changes from a PBI to a pre-funded COLA revealed liabilities that existed prior but were previously left as unaccounted
- A lower discount rate for new hires—Tier 3's rate is capped by board policy at 7.0%—also adds to the forecast of liabilities
- Switching to a 10-year amortization policy will accelerate pension debt payments, resulting in a quicker path to full funding relative to the current Tier 1 and Tier 2 policy
- The reform's impact is muted by Phoenix—the largest PSPRS employer—opting to use the higher 30-year amortization policy





# Changes in Employer Contributions

- The total normal cost payments saw an increase due to the addition of a pre-funded COLA benefit
  - The former pay-as-you-go Permanent Benefit Increase (PBI) structure wasn't included in the accounting of costs and liabilities
  - The newly established pre-funding structure appears as an added cost, but it is more accurately understood as a more transparent accounting of costs that already existed
- A lower discount rate in Tier 3 (7.0% instead of 7.3%) also increases the forecast of the total normal cost



# Comparison in Employer Cost

- To best compare the outcomes of the PSPRS plan before and after the reforms, we use a simulation of 10,000 possible investment return scenarios over the next 30 years
- This enables us to compare not only the most likely outcomes, but also any changes in costs during high or low return scenarios
- Most importantly, it allows us to see outcomes that accurately portray the costs associated with the old PSPRS structure for the PBI, which gave increases only in years when investments returned higher than 9%



# Comparison in Employer Cost

- The average 30-year cost of the 10,000 simulations best portrays the expected outcome scenario for how much the reforms will save PSPRS employers

## Average All-in 30-year Employer Cost (forecast of contributions + ending unfunded liability)

| Pre-Reforms                 | Post-Reforms                | Difference   |
|-----------------------------|-----------------------------|--|
| <b>\$15.207<br/>billion</b> | <b>\$15.066<br/>billion</b> | The expected outcome is that the reforms will save PSPRS employers<br><b>\$141 million</b><br>over the next 30 years |

Source: Pension Integrity Project actuarial forecast of PSPRS outcomes before and after 2016 reforms. All figures adjusted for inflation. The "All-in Cost" includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by the end of the forecast period.

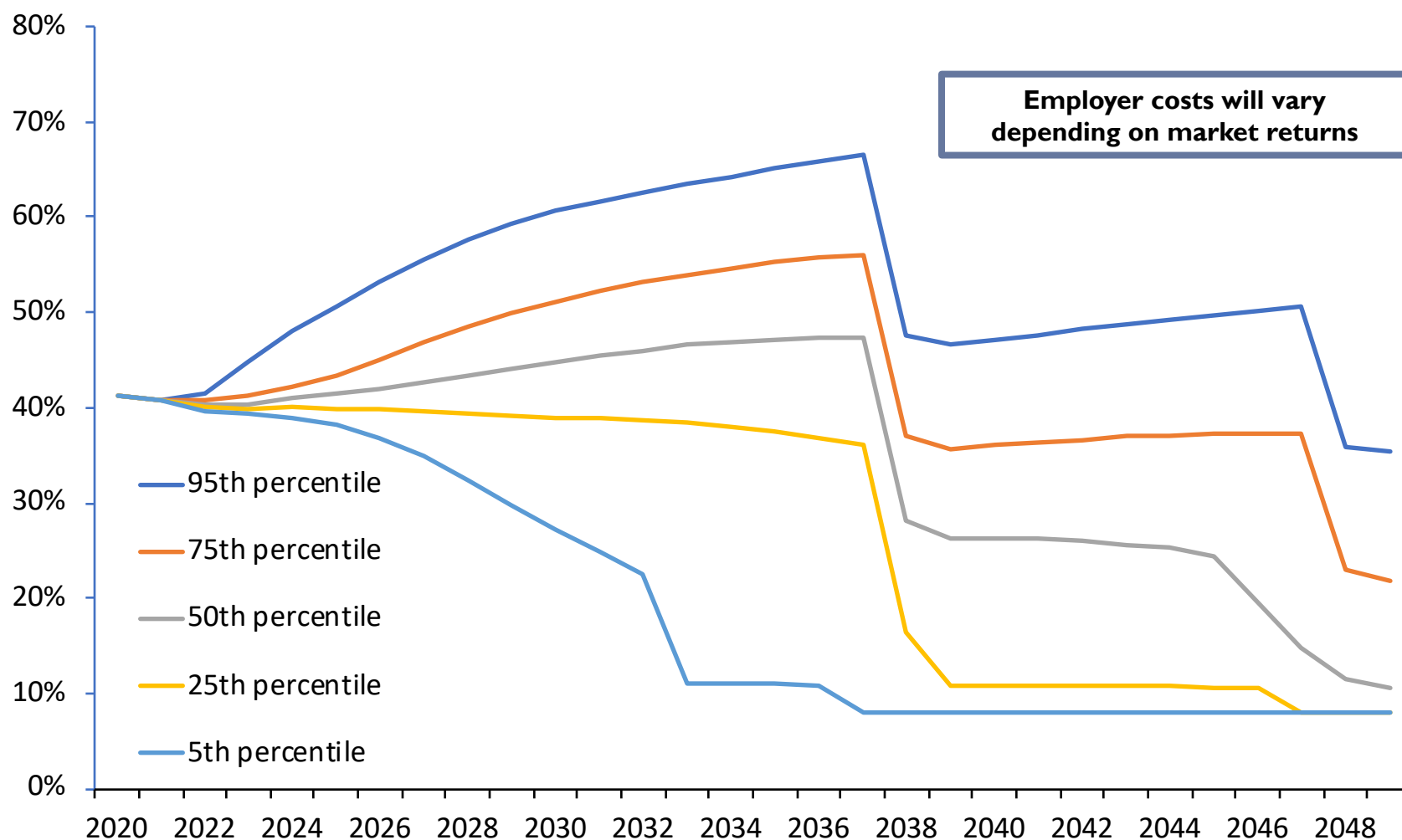


# Comparison in Employer Cost

- The actual 30-year results of the reform will depend greatly on several unpredictable factors, with market returns being the largest driver
- Comparing total 30-year costs under different return scenarios shows the differences in how the fund will react to high or low market outcomes
- Dividing the 10,000 outcomes into percentiles shows that when compared to the old plan, the newly structured PSPRS is likely to see higher costs under low-return scenarios and lower costs under high-return scenarios
- Most of the difference can be explained by the effect on Tier 1 and 2 of a prefunded and predictable COLA benefit that consistently pays out in both high- and low-return scenarios, relative to the former PBI mechanism that created unstable accruals and fiscal effects, prompting multiple reform efforts.

# Employer Contribution Scenarios: pre-reforms

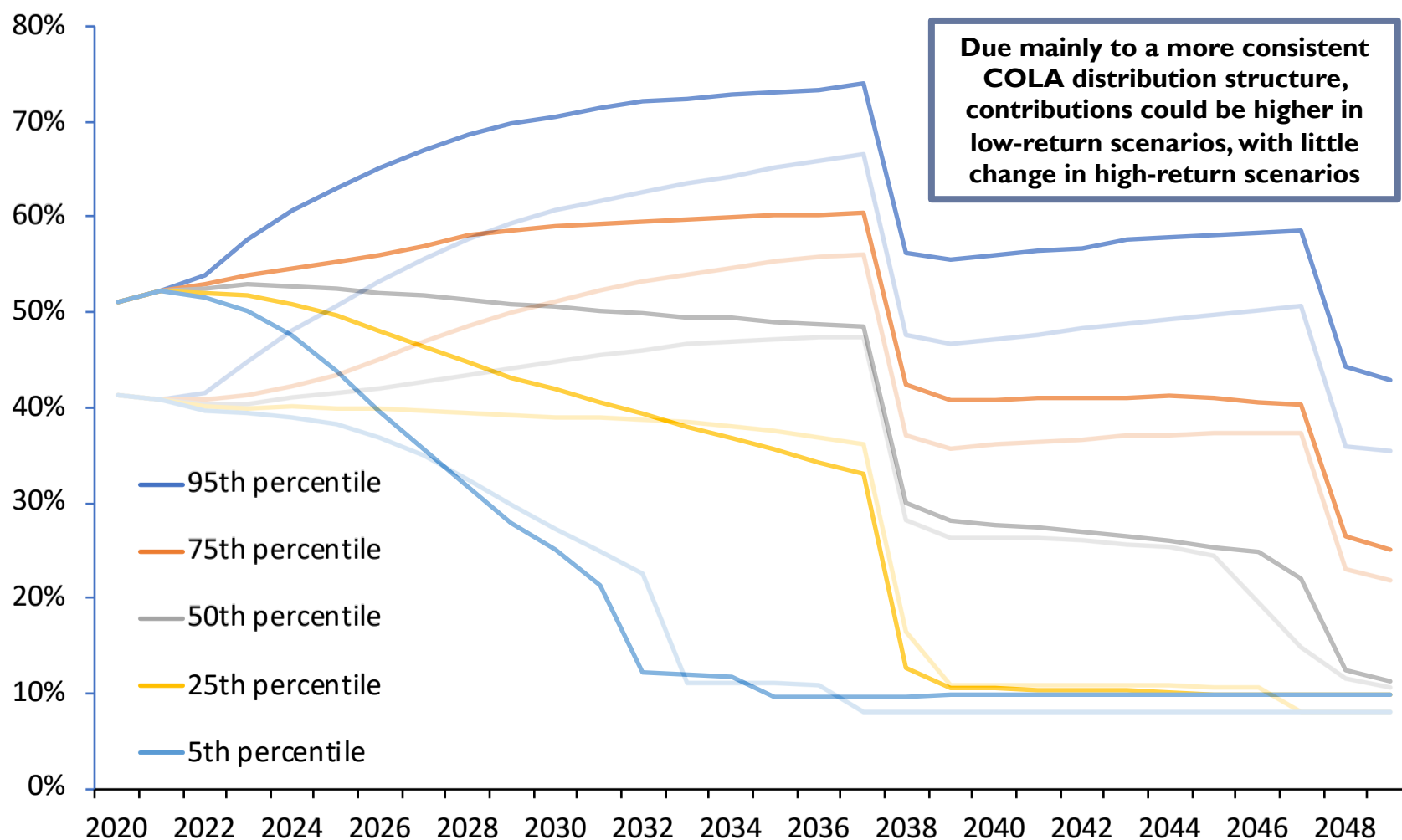
## Shown as a Percentage of Payroll



Source: Pension Integrity Project actuarial forecast of PSPRS outcomes before and after 2016 reforms.

# Employer Contribution Scenarios: post-reforms

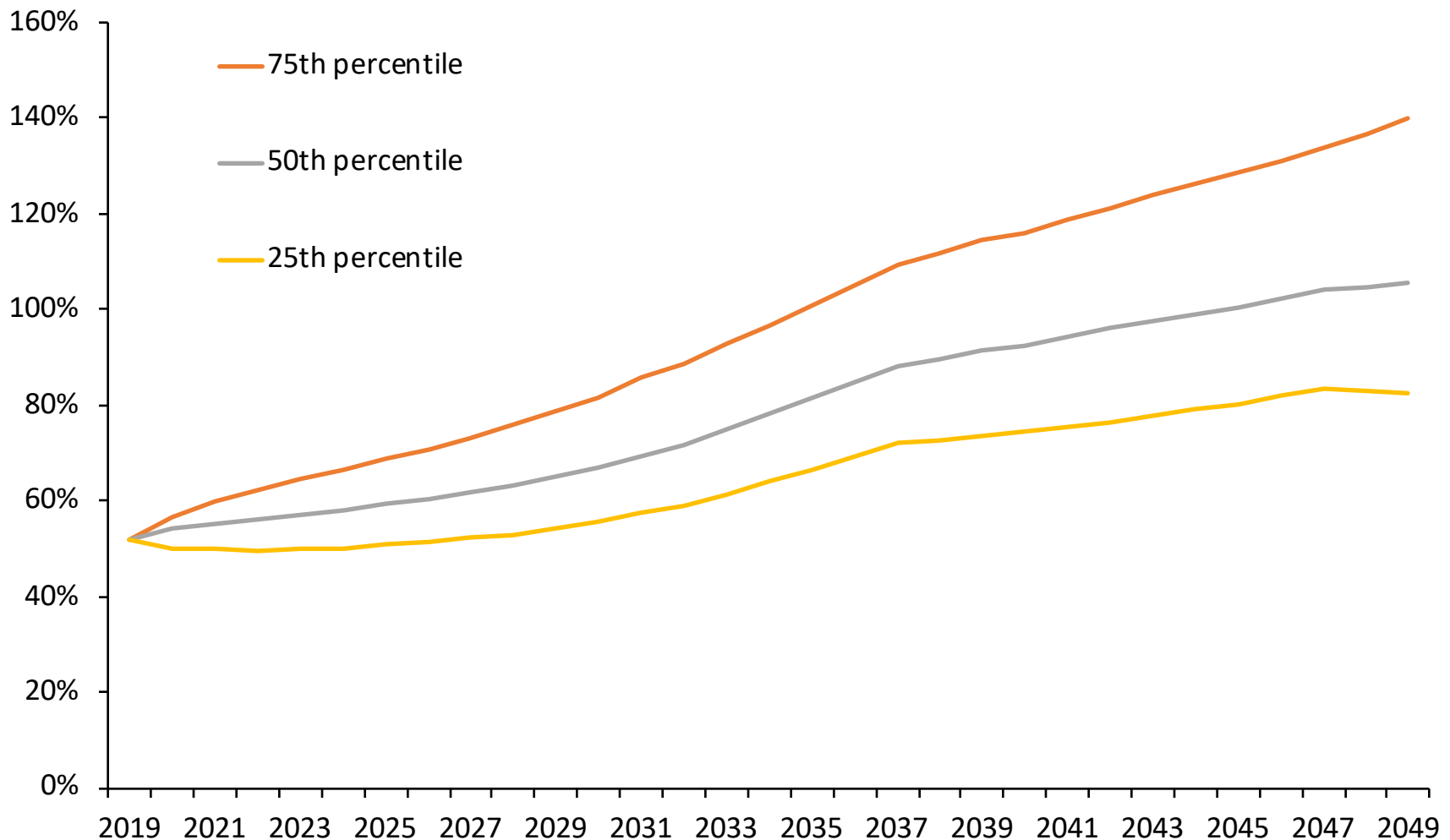
## Shown as a Percentage of Payroll



Source: Pension Integrity Project actuarial forecast of PSPRS outcomes before and after 2016 reforms.



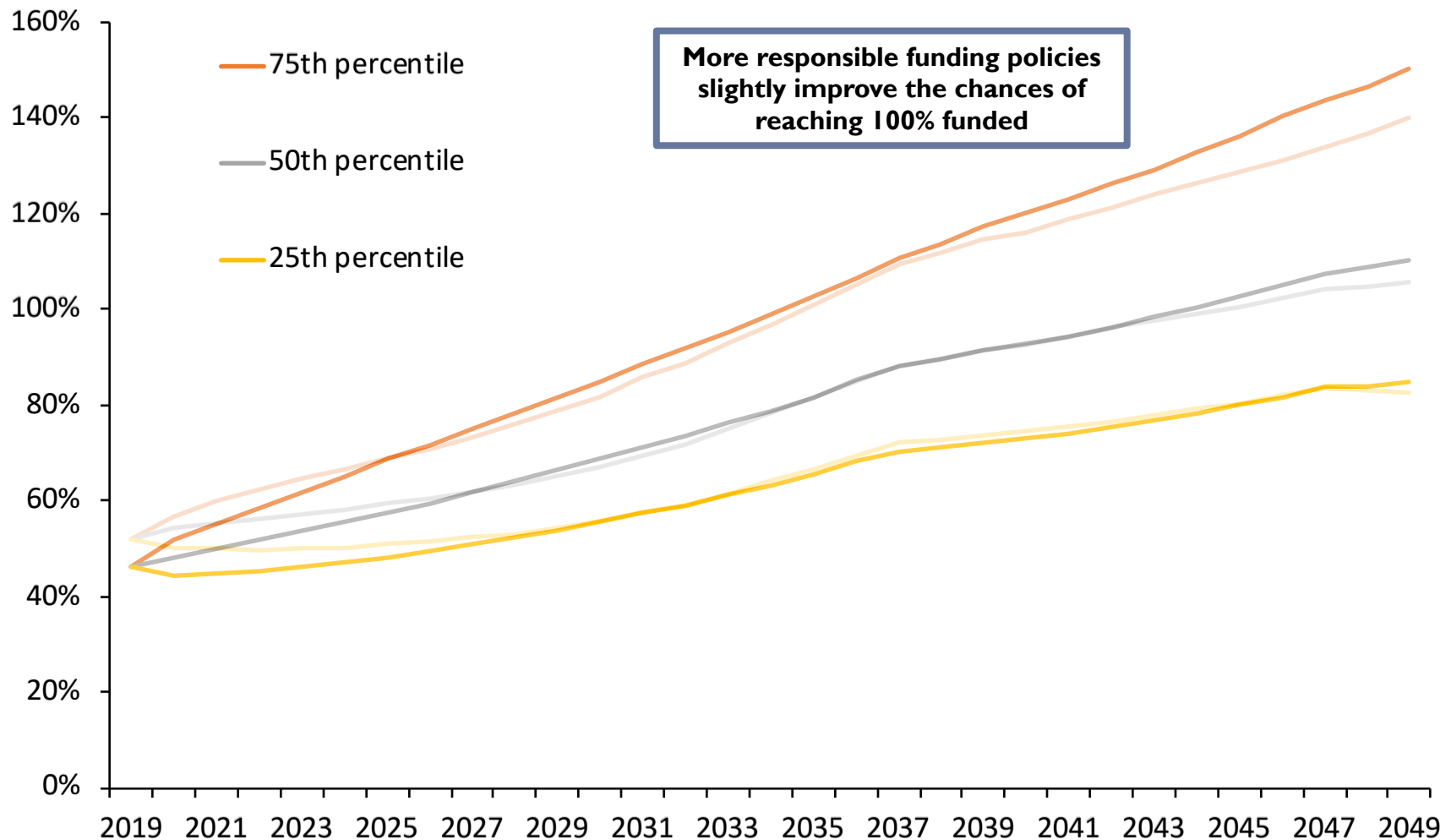
# PSPRS Funding Scenarios: pre-reforms



Source: Pension Integrity Project actuarial forecast of PSPRS outcomes before and after 2016 reforms.



# PSPRS Funding Scenarios: post-reforms



Source: Pension Integrity Project actuarial forecast of PSPRS outcomes before and after 2016 reforms.





# COUNTERFACTUAL ANALYSIS

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- Comparative Risk Analysis

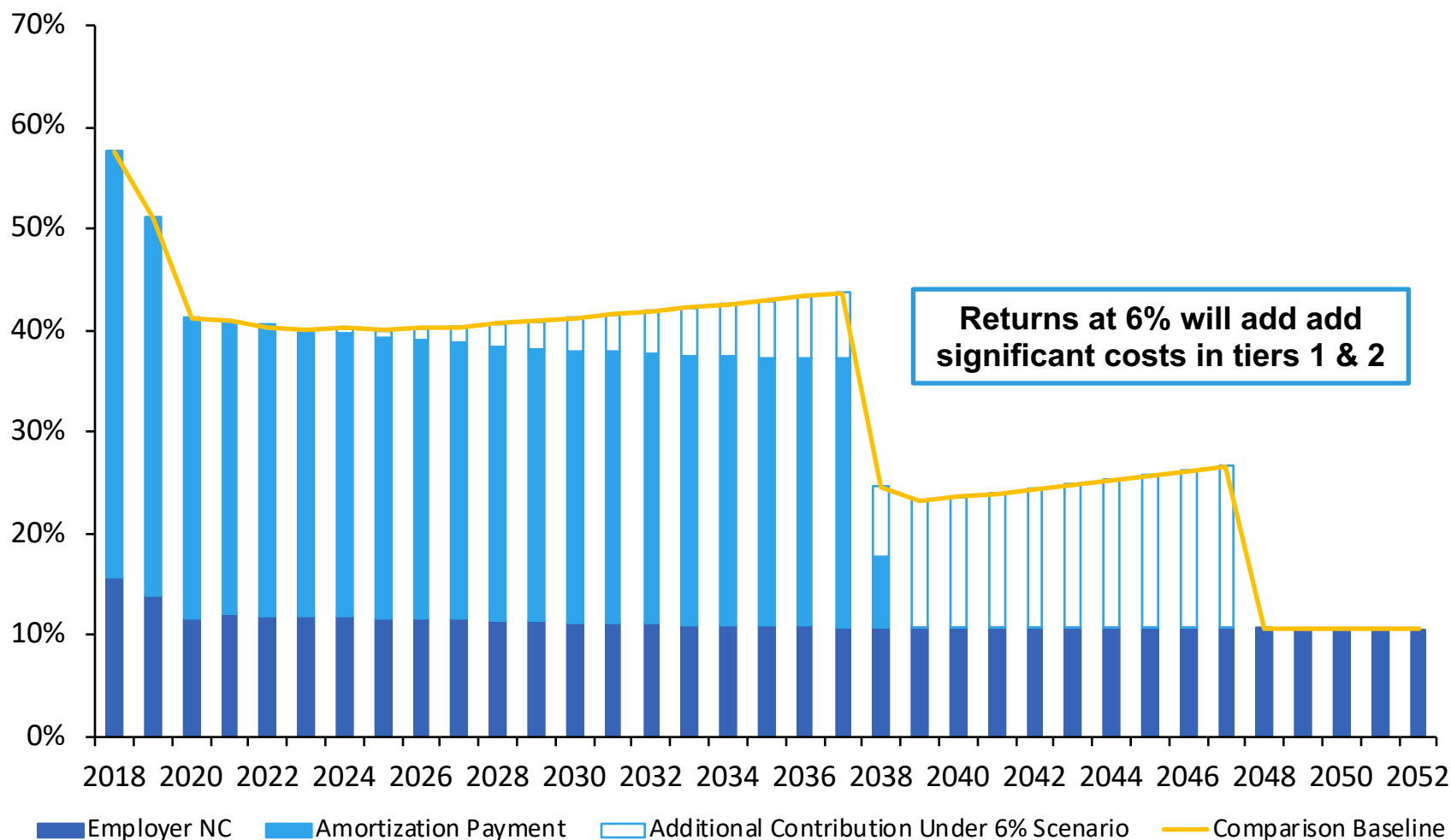


# Changes in Employer Risk

- The retirement benefits of Tier 3 are comparable in value to Tiers 1 & 2, but the new risk sharing policy significantly reduces both financial and appropriation (fiscal) risk for employers in the new tier
  - **This reduction in risk will grow as Tier 3 takes on a larger share of the member pool over time, bringing long term financial sustainability**
- The lower, capped 7.0% discount rate used for Tier 3 reduces the risk both of future underfunding and increased employer contributions:
  - The 7.0% Tier 3 discount rate creates less financial risk with every single new hire and every retirement, relative to the riskier 7.5% discount rate used by ASRS and the 7.3% used for PSPRS Tiers 1 & 2
  - For some employers, this rate differential means that the annual fiscal cost of underperformance with ASRS is greater than with PSPRS in terms of *appropriated dollars*, despite PSPRS generally having higher percent-of-pay based *contribution rates*.

# PSPRS Tiers 1 & 2 Employer Contributions

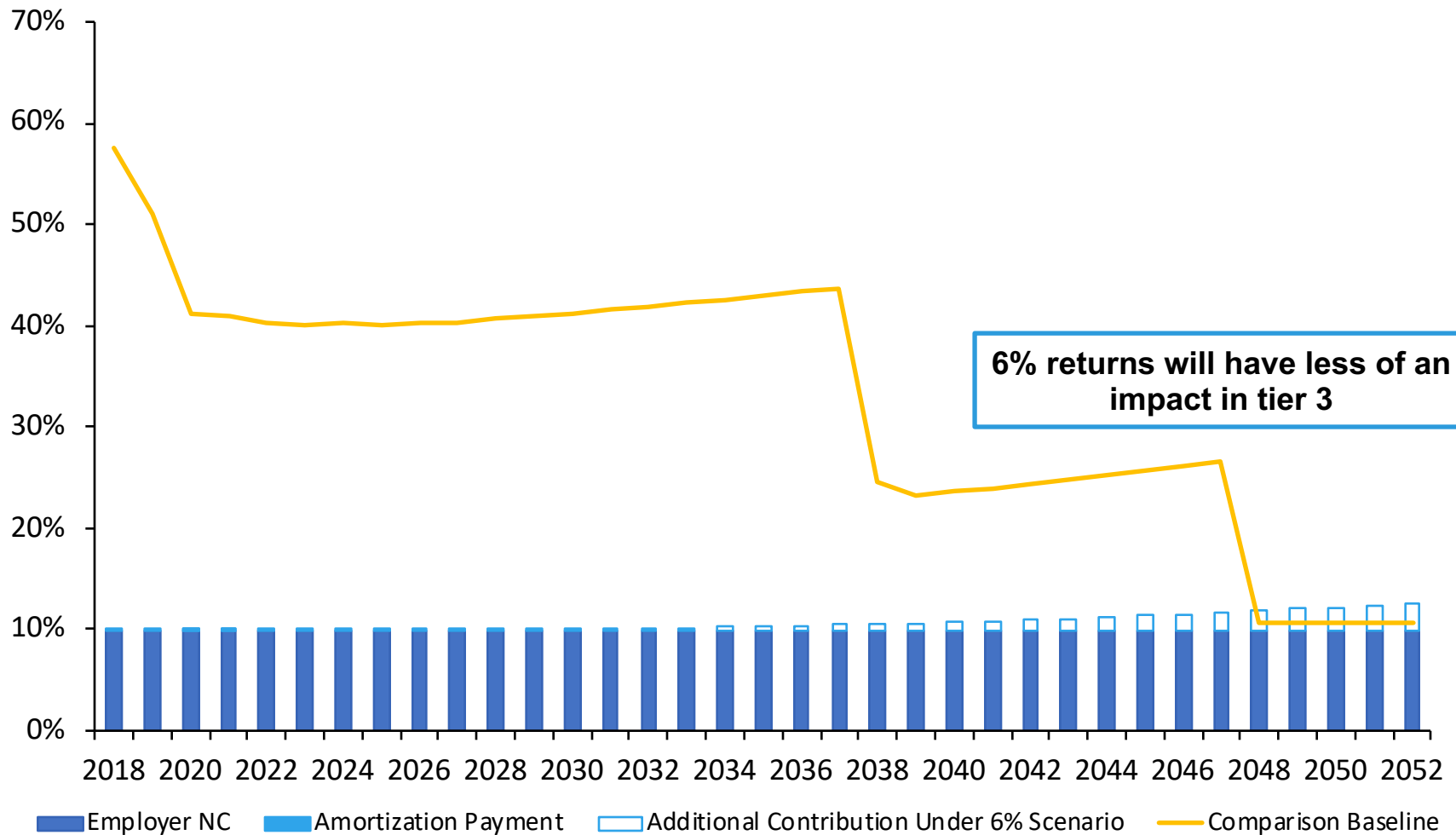
Comparison between 7.3% (plan expectations) and 6.0% returns



Source: Pension Integrity Project actuarial forecast of Arizona PSPRS.

# PSPRS Tier 3 Employer Contributions

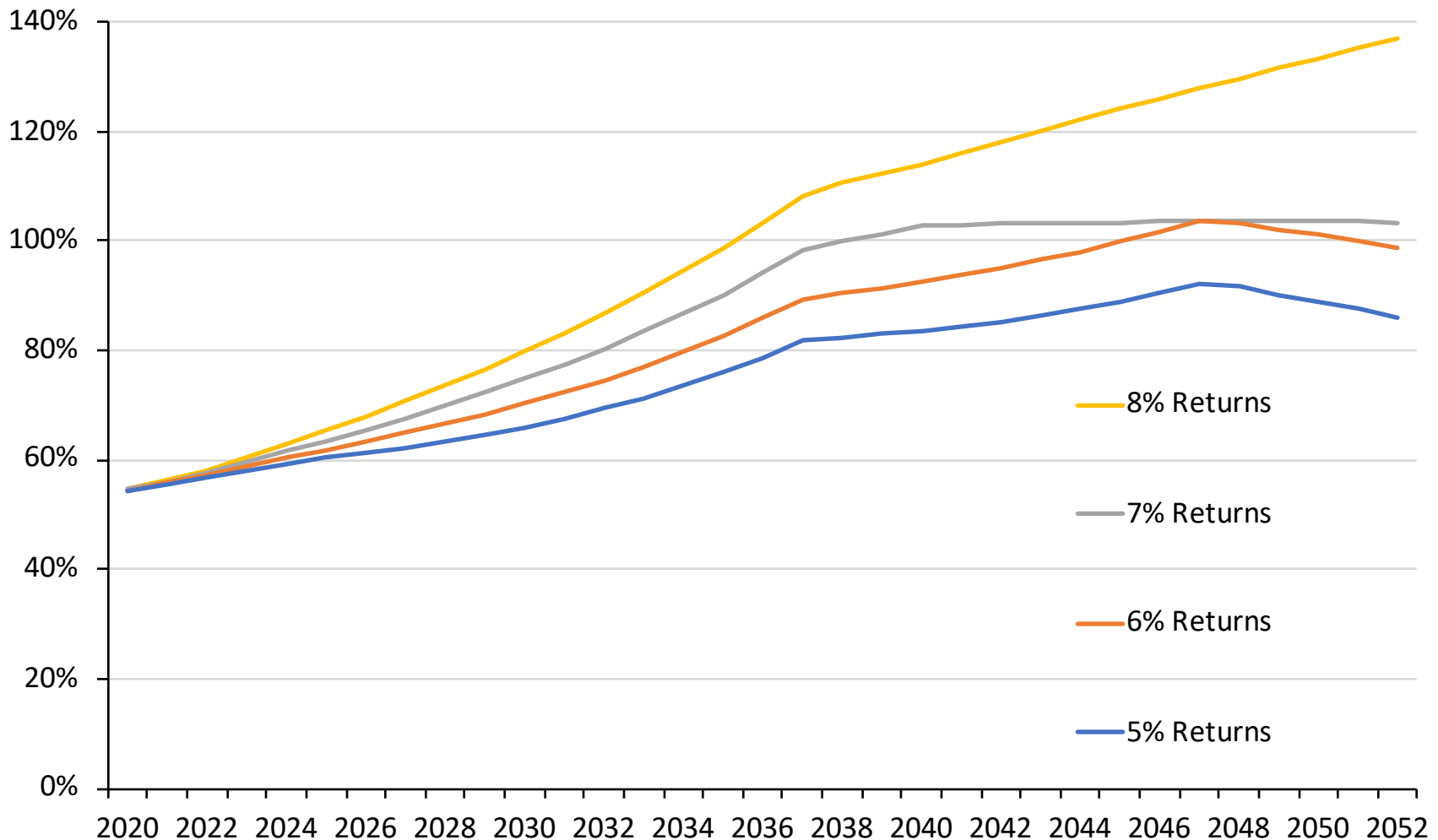
Comparison between 7.3% (plan expectations) and 6.0% returns



Source: Pension Integrity Project actuarial forecast of Arizona PSPRS.

# PSPRS Tiers 1 & 2 Funding Stress Test

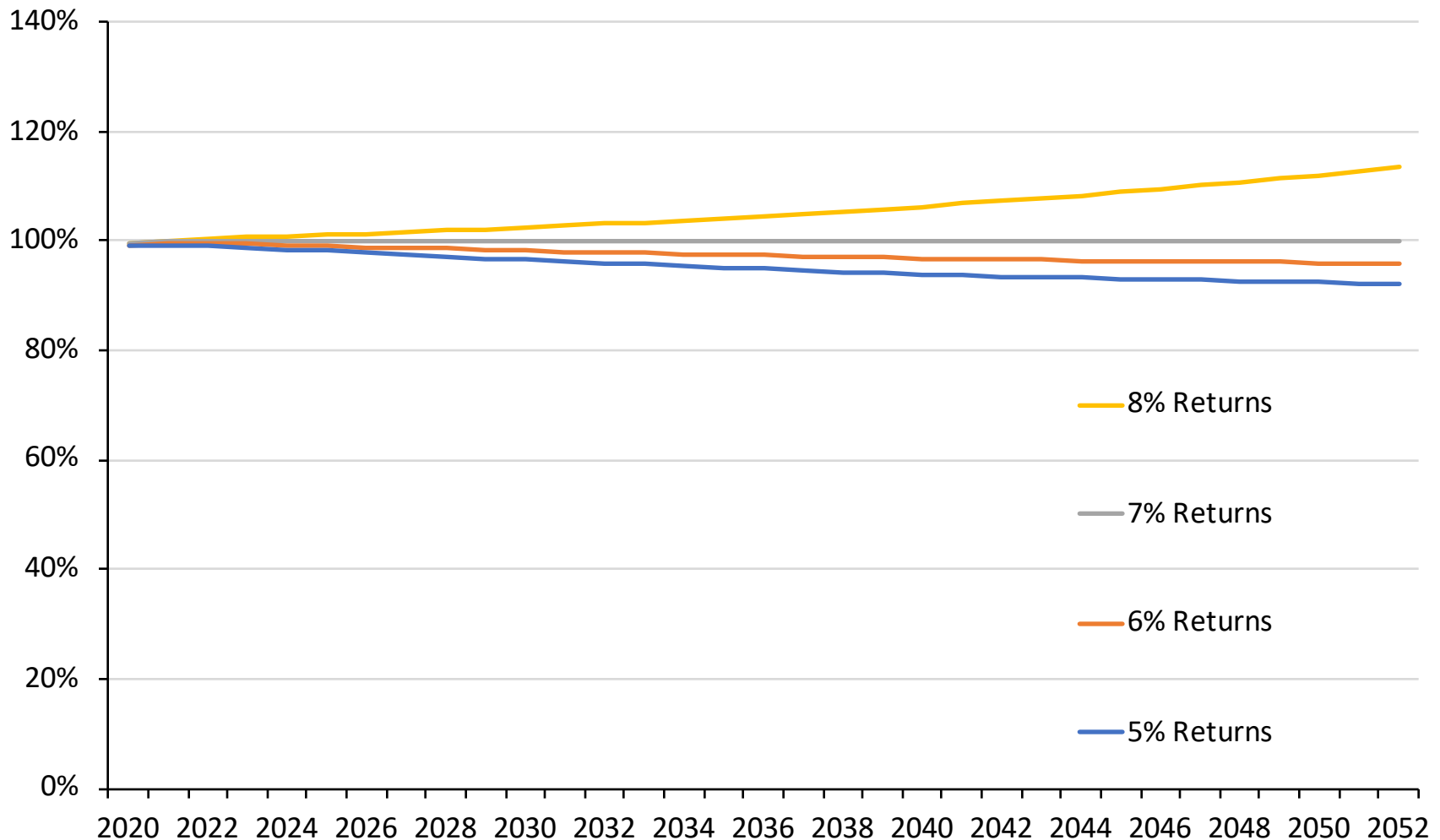
Forecasted funded ratios under various return scenarios



Source: Pension Integrity Project actuarial forecast of Arizona PSPRS.

# PSPRS Tier 3 Funding Stress Test

Forecasted funded ratios under various return scenarios



Source: Pension Integrity Project actuarial forecast of Arizona PSPRS.



# FRAMEWORK FOR SOLUTIONS & REFORM

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# Objectives of Good Reform

- **Keeping Promises:** Ensure the ability to pay 100% of the benefits earned and accrued by active workers and retirees
- **Retirement Security:** Provide retirement security for all current and future employees
- **Predictability:** Stabilize contribution rates for the long-term
- **Risk Reduction:** Reduce pension system exposure to financial risk and market volatility
- **Affordability:** Reduce long-term costs for employers/taxpayers and employees
- **Attractive Benefits:** Ensure the ability to recruit 21st Century employees
- **Good Governance:** Adopt best practices for board organization, investment management, and financial reporting





# Practical Policy Framework

1. Establish a plan to pay off the unfunded liability as quickly as possible.
  - The Society of Actuaries Blue Ribbon Panel recommends amortization schedules be no longer than 15 to 20 years
  - *STATUS: Complete for Tier 3, Still Needed for Tiers 1 & 2*
2. Adopt better funding policy, risk assessment, and actuarial assumptions
  - Changes should aim at minimizing risk and contribution rate volatility for employers and employees
  - *STATUS: Some Progress, but Improvements Needed for All Tiers*
3. Create a path to retirement security for all participants
  - Members that won't accrue a full pension benefit should have access to options for other plan designs, like cash balance or DC
  - *STATUS: Complete (Tier 3 DC Choice)*



# I. Continue to Update Investment Return Assumption

- **Tier 3 has a rate of return assumption set at 7%. Legacy Tiers 1 and 2 still assume 7.3%.**
  - PSPRS should continue the prudent step-down in the assumed rate adopted by the Board in recent years—given that investment underperformance was a major contributor to the rapid spike of debt.
  - Actuarially valued returns from 2002-2016 were 5% or less.
  - Adopting a more conservative investment return assumption for Tiers 1 and 2 will add some short-term costs but will greatly reduce future market risk exposure.
  - A lower assumed rate of return will mean the system is less likely to fall short in both market returns and contributions going forward, establishing a more secure and stable retirement plan for all involved.

## 2. Establish a Realistic Plan to Pay Off the Unfunded Liability



- **Legacy tiers are still using the level percentage of payroll method**
  - Produces smaller payments up front that gradually increase over the length of the amortization period. The increase amount depends on the payroll growth assumption rate.
  - The problem is that actual payroll growth has been considerably lower than the assumption: 1.13% experienced vs 3.50% assumption.
  - This gap between assumption and experience means that contributions tied to payrolls will not be sufficient to pay off the pension debt as anticipated.
- **Adopting a level dollar amortization method for the legacy tiers will save PSPRS money in the long-term by paying off its pension debt sooner**
  - But, if level dollar amortization is not politically feasible for Tiers 1 and 2, then the concept of variable, locally-calculated payroll growth assumptions should be adopted to more accurately price the plan on a level percent of payroll amortization basis.



# Questions?

## Pension Integrity Project at Reason Foundation

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# ARIZONA STATE RETIREMENT SYSTEM SOLVENCY ANALYSIS

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Prepared by:

**Pension Integrity Project at Reason Foundation**

**September 21, 2020 – Preliminary Draft**



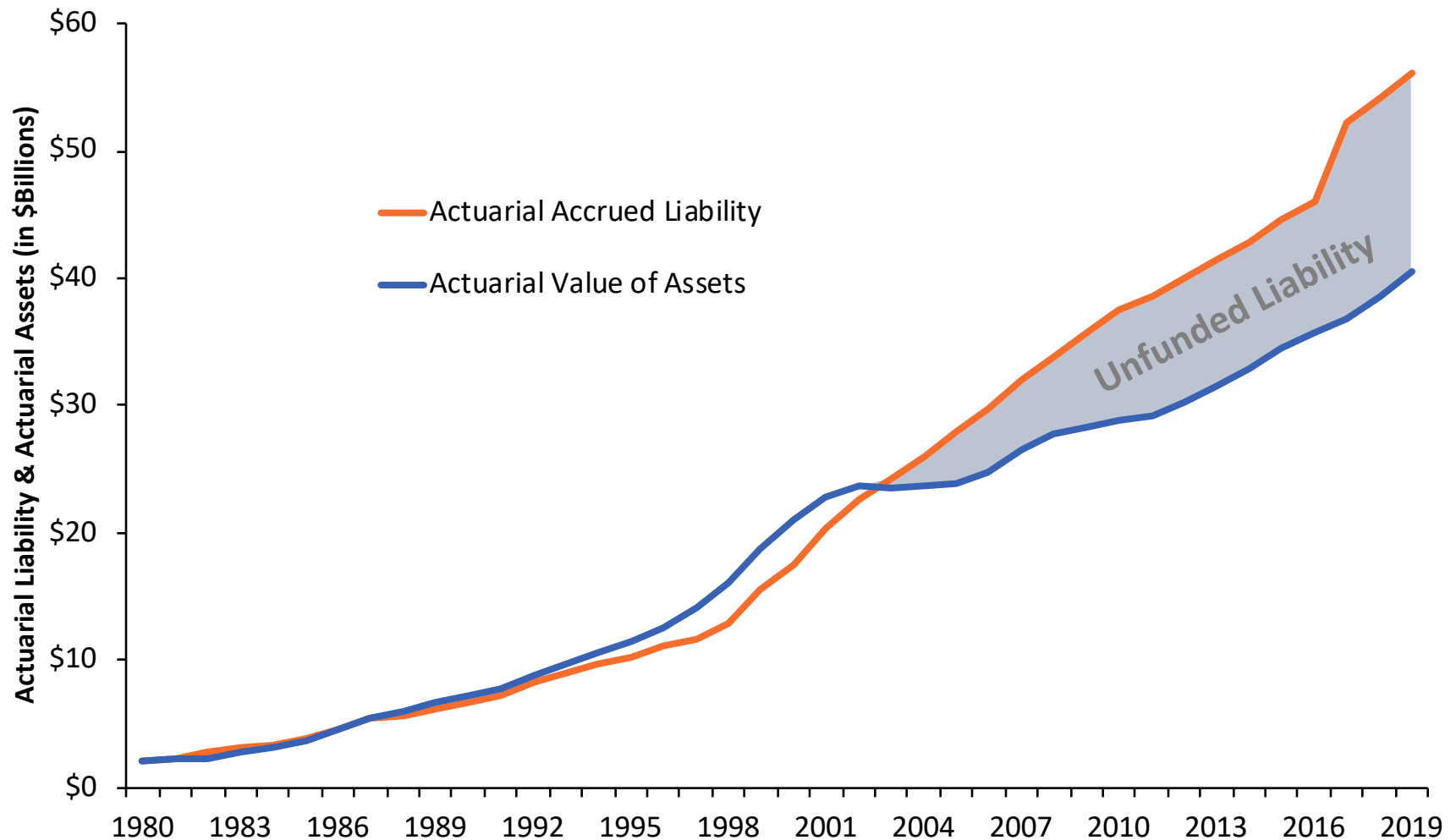


# About the Pension Integrity Project

We offer pro-bono technical assistance to public officials to help them design and implement pension reforms that improve plan solvency and promote retirement security, including:

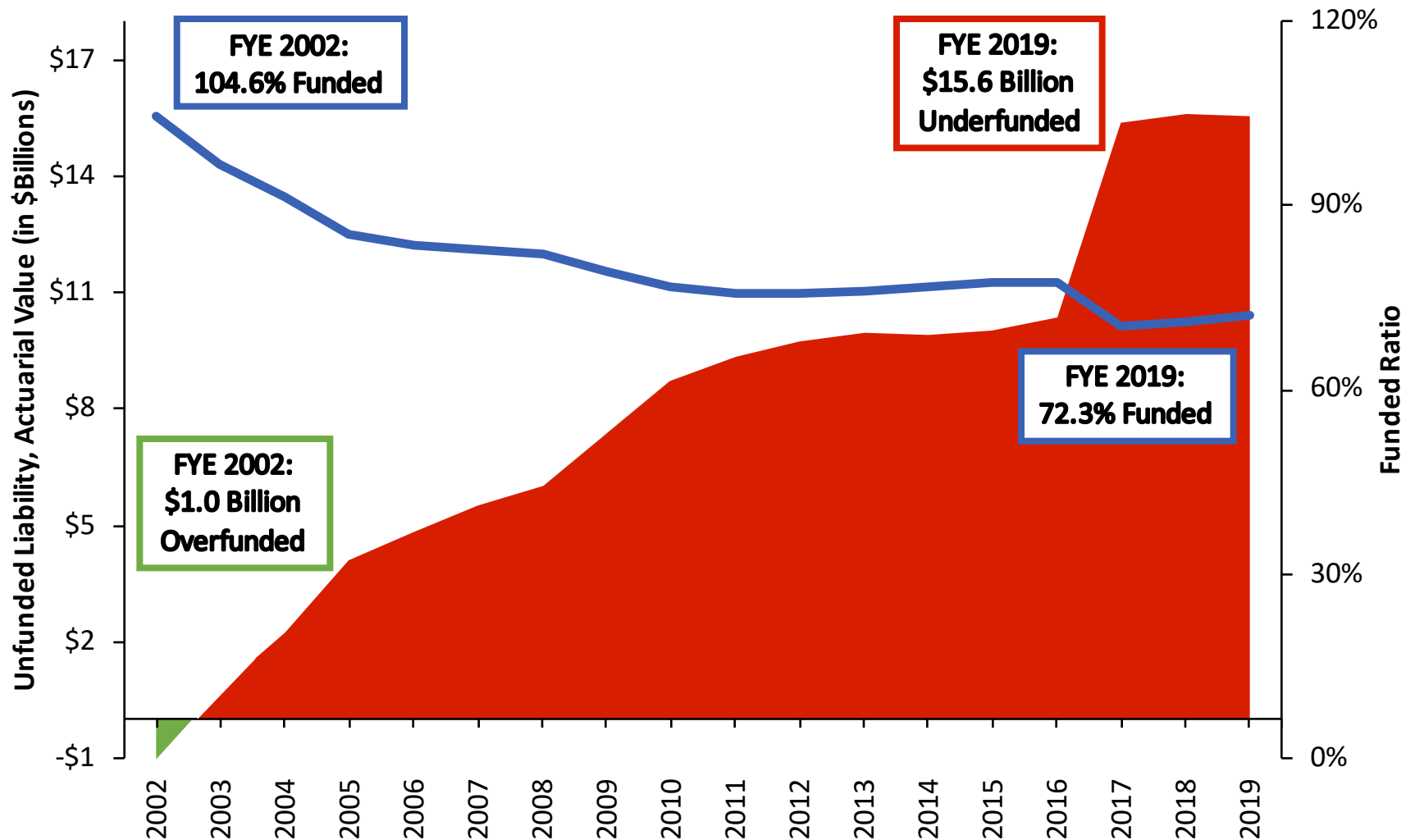
- *Customized analysis* of pension system design, trends
- *Independent actuarial modeling* of reform scenarios
- Consultation and modeling around *custom policy designs*
- Latest pension reform *research and case studies*
- *Peer-to-peer mentoring* from state and local officials who have successfully enacted pension reforms
- Assistance with *stakeholder outreach*, engagement and relationship management
- Design and execution of *public education programs* and media campaigns

# ASRS Liabilities are Growing Faster than Assets



Source: Pension Integrity Project analysis of ASRS actuarial valuation reports through FY2019.

# ASRS' Steadily Deteriorating Funding (2002-19)

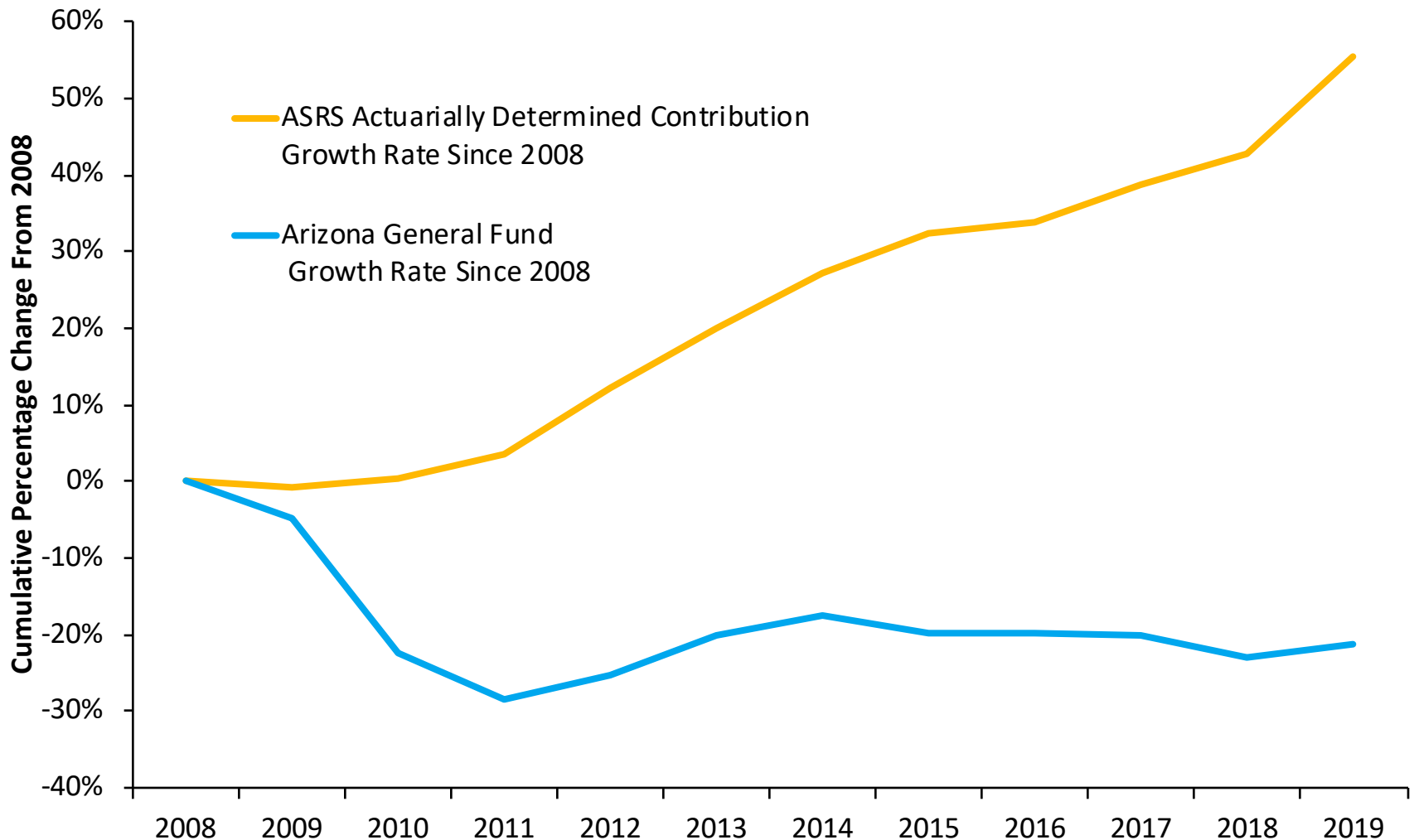


Source: Pension Integrity Project analysis of ASRS actuarial valuation reports and CAFRs.

The significant increase for FYE 2017 was due to changes in assumptions, most notably the decrease of the assumed rate of return to 7.5%.

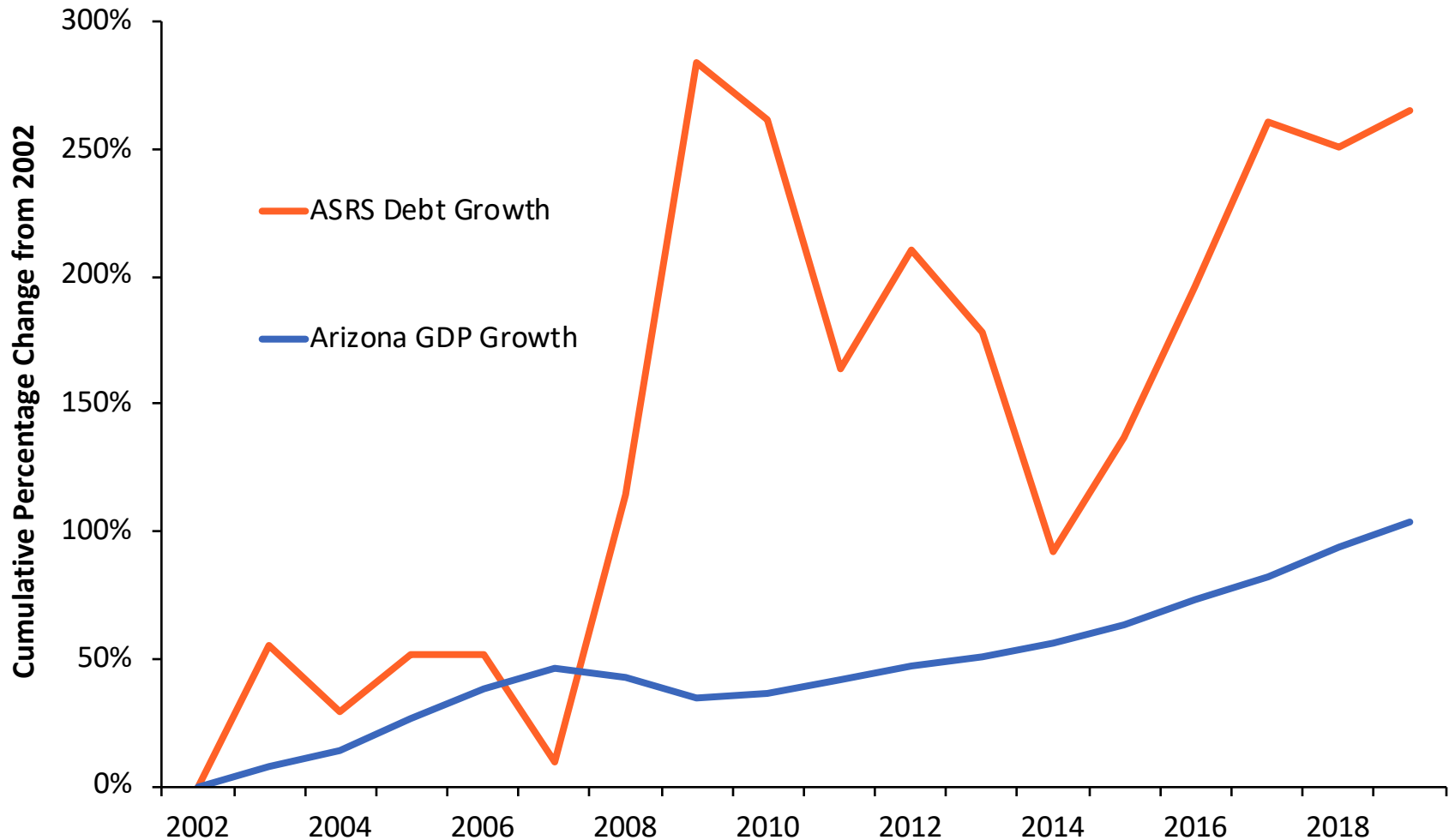


# ASRS Costs are Growing Faster than the State Budget



Source: Pension Integrity Project analysis of ASRS actuarial valuation reports and CAFRs, and data from NASBO Fiscal Survey of States.

# ASRS Unfunded Liabilities are Growing Faster than the Arizona Economy



Source: Pension Integrity Project analysis of ASRS actuarial valuation reports and CAFRs, and NASBO Fiscal Survey of States.

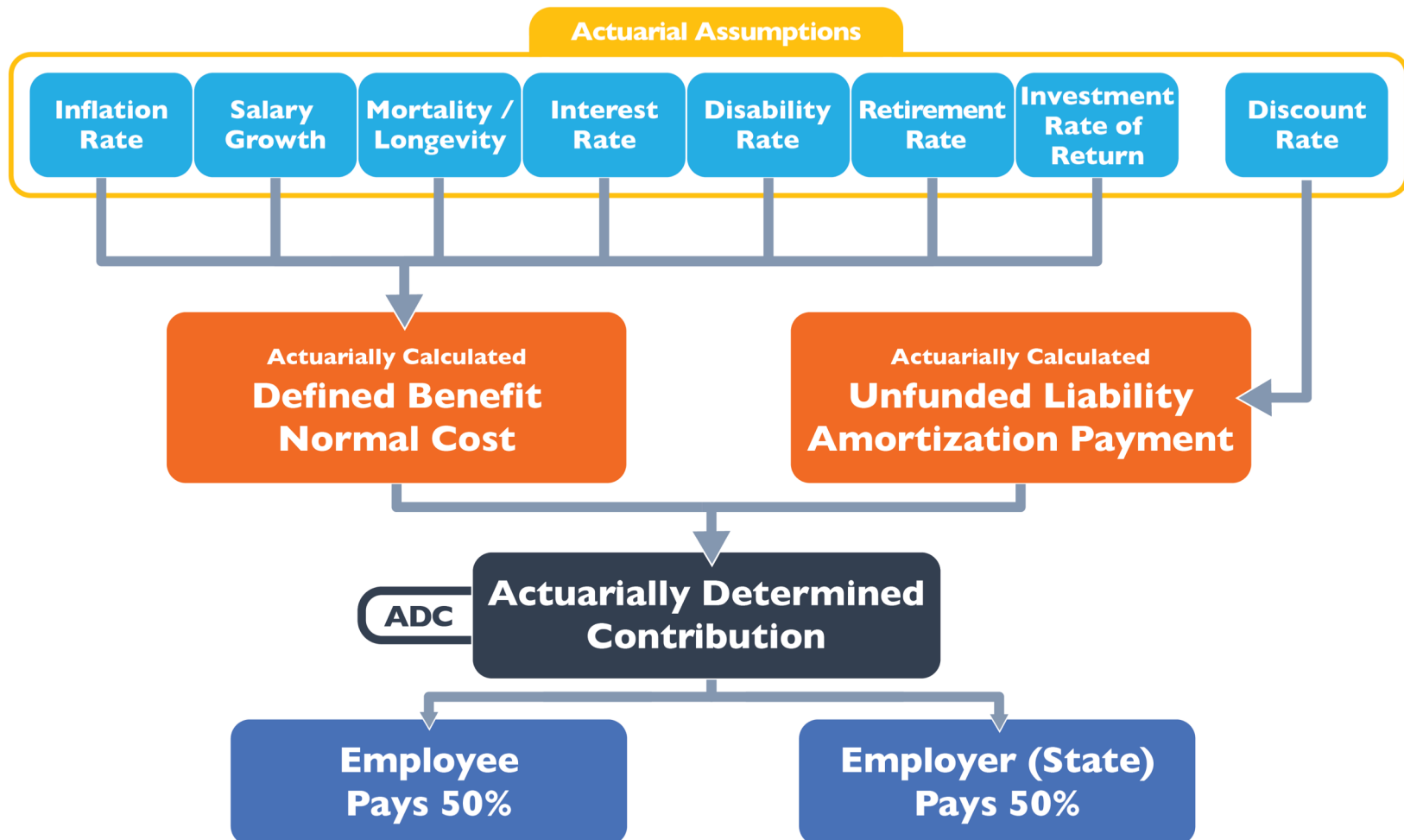


# CHALLENGES CURRENTLY FACING ASRS

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# How ASRS is Funded





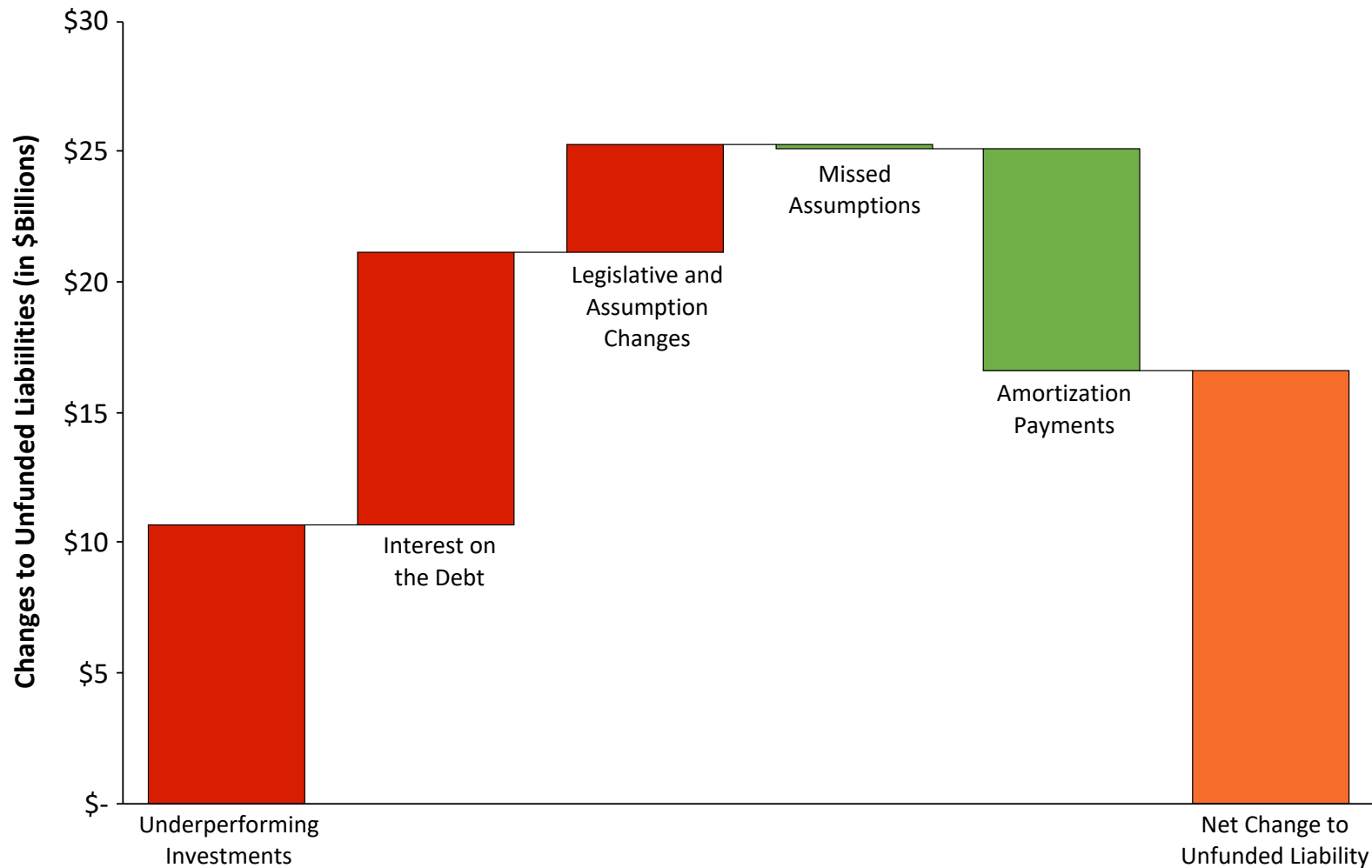
# Makeup of ASRS Contributions

|                          | FY2021 Contributions |                |
|--------------------------|----------------------|----------------|
|                          | % of Payroll         | \$ Value       |
| <b>Employee</b>          | 12.39%               | \$1.32 billion |
| <b>Employer</b>          | 12.00%               | \$1.27 billion |
| <b>Total</b>             | 24.39%               | \$2.59 billion |
|                          |                      |                |
| <b>Normal Cost</b>       | 14.25%               | \$1.51 billion |
| <b>Debt Amortization</b> | 10.14%               | \$1.08 billion |
| <b>Total</b>             | 24.39%               | \$2.59 billion |

Over the past 20 years, annually required employer contributions into ASRS have grown six fold, going from under 2% in 2002 to 12% by 2021. Contributions could rise even more if the system continues to experience the same challenges and leaves them unaddressed.

# The Causes of the Pension Debt

Actuarial Experience of ASRS, 2002-2019



Source: Pension Integrity Project analysis of ASRS actuarial valuations. Data represents cumulative unfunded liability by gain/loss category.



# Driving Factors Behind ASRS Challenges

1. **Deviations from Investment Return Assumptions** have been the largest contributor to the unfunded liability, adding \$10.7 billion to the unfunded liability since 2002.
  - ASRS assets have consistently returned less than assumed, leading to growth in unfunded liabilities.
2. **Interest on Pension Debt** has added \$10.5 billion to the unfunded liability since 2002.
  - Accumulated interest on unfunded pension liabilities makes a pension more expensive.
  - Interest accrual on unfunded pension liabilities has frequently exceeded amortization payments, resulting in \$1.2 billion in negative amortization (interest on the unfunded liability exceeding amortization payments).
3. **Changes in methods and assumptions** have revealed roughly \$4.1 billion to the unfunded liability since 2002.
4. **Undervaluing debt** through discounting methods has likely led to the tacit undercalculation of required contributions.



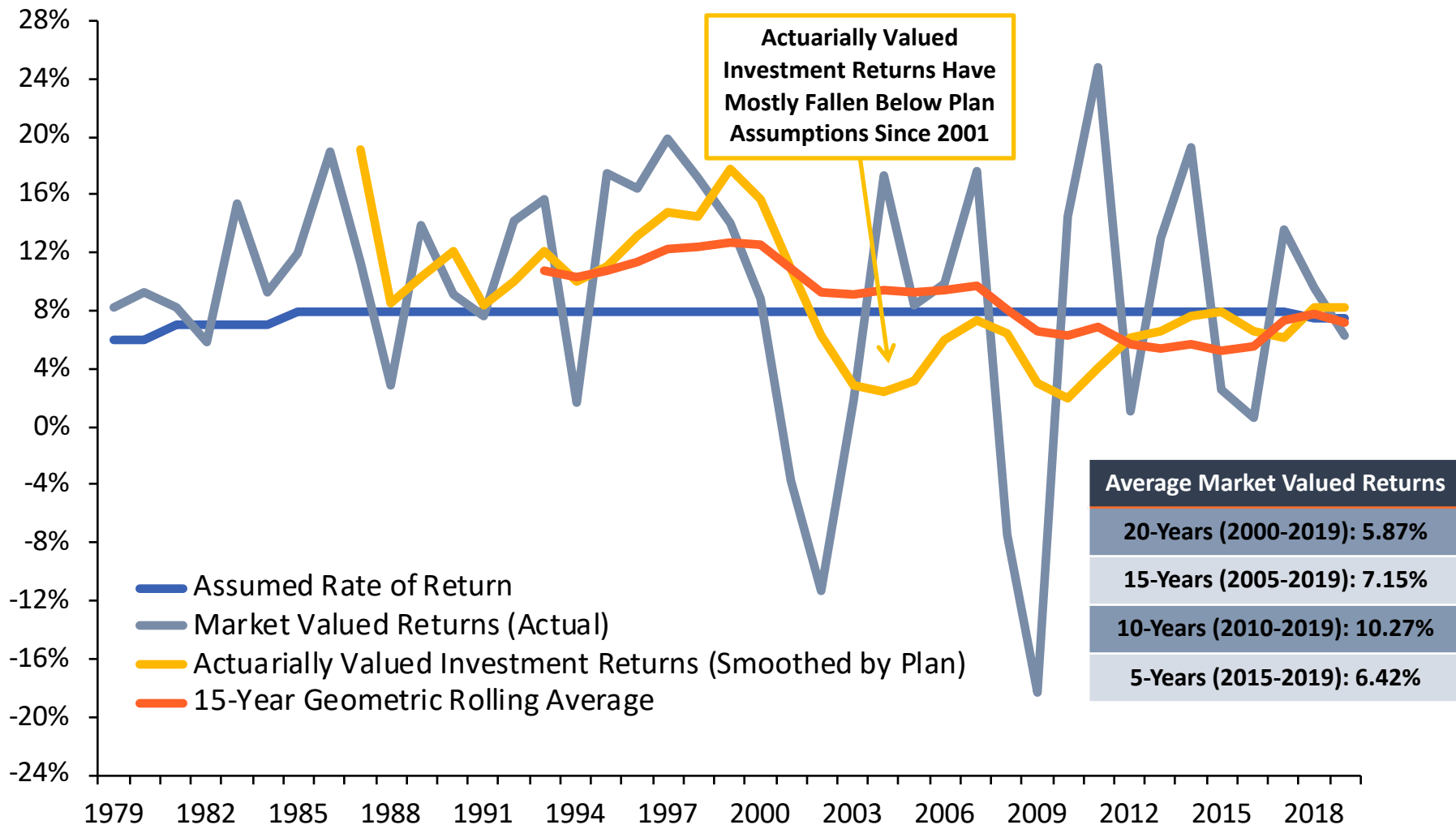
# CHALLENGE I: ASSUMED RATE OF RETURN

- **Unrealistic Expectations:** The return assumption used by ASRS is exposing taxpayers to significant investment underperformance risk.
- **Underpricing Contributions:** Using an overly optimistic investment return assumption leads to underpricing benefits and an undercalculated actuarially determined contribution rate.



## ASRS Problem: Underperforming Assets

## Investment Return History, 1979-2019



## ASRS Problem: Underperforming Assets

# Investment Returns Have Underperformed



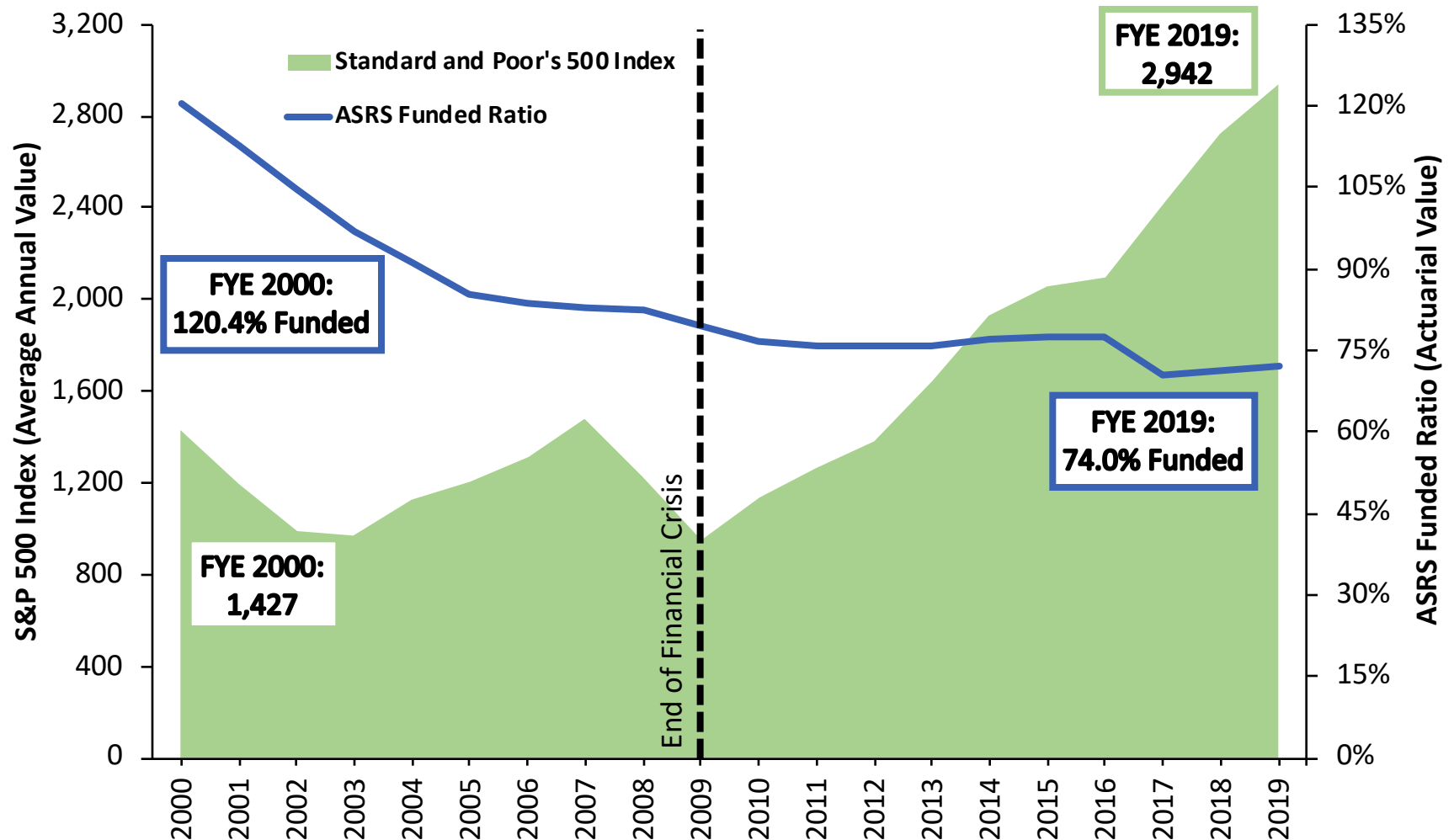
- ASRS actuaries have historically used an 8% assumed rate of return to calculate benefit cost to members and employers despite significant market changes, only lowering the rate to 7.5% in 2018.
- Average long-term portfolio returns have not matched long-term assumptions over different periods of time:

| Average Market Valued Returns | Average Actuarially Valued Returns |
|-------------------------------|------------------------------------|
| 20-Years (2000-2019): 5.87%   | 20-Years (2000-2019): 6.35%        |
| 15-Years (2005-2019): 7.15%   | 15-Years (2005-2019): 5.95%        |
| 10-Years (2010-2019): 10.27%  | 10-Years (2010-2019): 6.33%        |
| 5-Years (2015-2019): 6.42%    | 5-Years (2015-2019): 7.39%         |

Note: past performance is not the best measure of future performance, but it does help provide some context to the problem created by having an excessively high assumed rate of return.



# New Normal: Markets Have Recovered Since the Crisis—ASRS Funded Ratio Has Not



Source: Pension Integrity Project analysis of ASRS actuarial valuation reports and Yahoo Finance data.



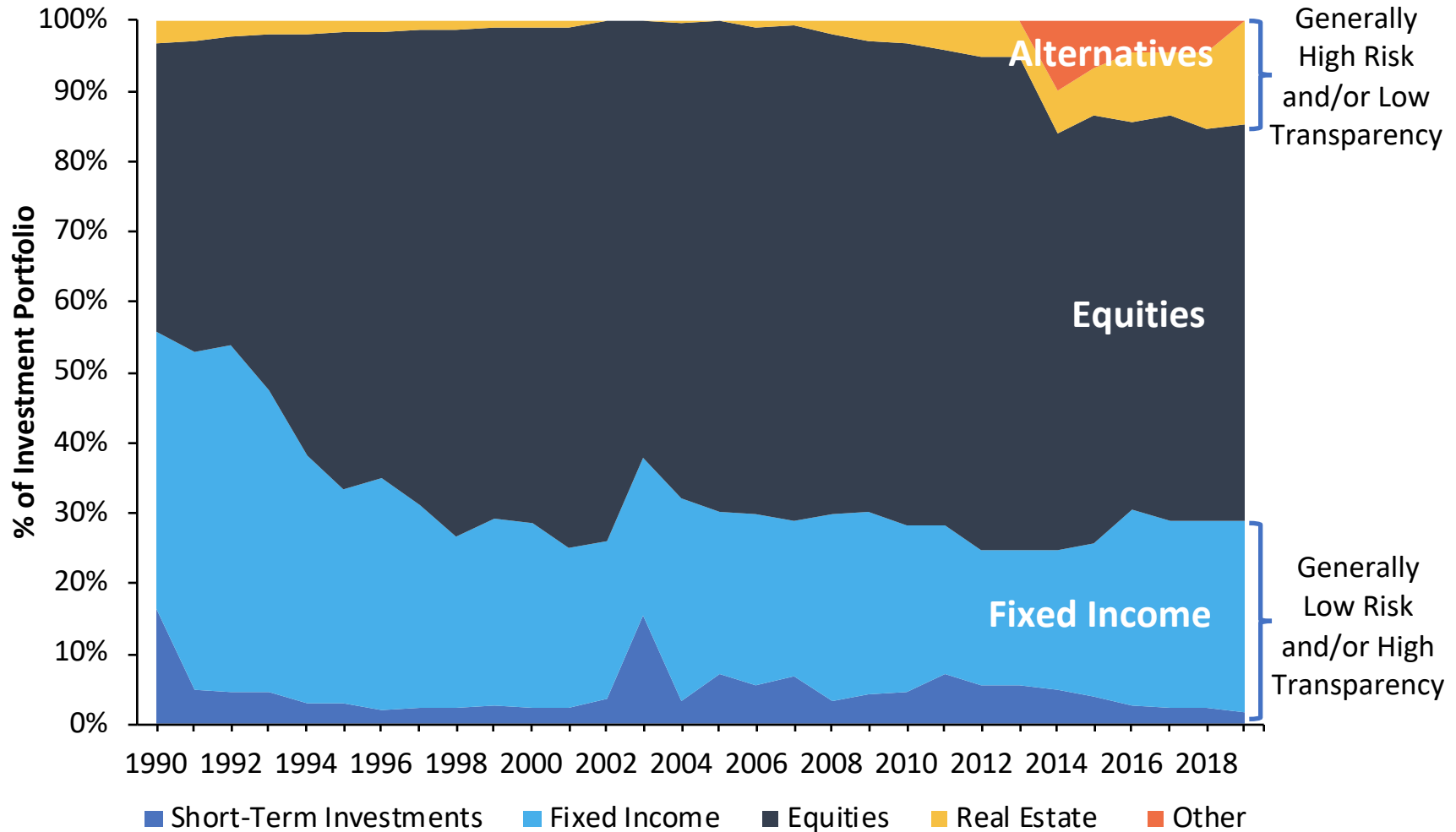
# New Normal: The Market Has Changed

The “new normal” for institutional investing suggests that achieving even a 6% average rate of return is optimistic.

1. Over the past two decades there has been a steady change in the nature of institutional investment returns.
  - 30-year Treasury yields have fallen from around 8% in the 1990s to consistently less than 4% today.
  - New phenomenon: negative interest rates, designates a collapse in global bond yields.
  - The U.S. experiences the longest economic recovery in history, yet average growth rates in GDP and inflation are below expectations.
  - Per empirical analysis (e.g. using Gordon Growth Model), subdued economic, inflation and dividend yield growth rates portend equity returns in the ballpark of 6 percent over the long-term.
2. McKinsey & Co. forecast the returns on equities will be 20% to 50% lower over the next 20 years compared to the previous 30.
  - Using their forecasts, the best-case scenario for a 70/30 portfolio of equities and bonds is likely to earn around 5% return.
3. ASRS had yet to recover from the Great Recession, and now it will be dealing with high economic uncertainty and volatility in the wake of COVID-19.

## ASRS Asset Allocation (1990-2019)

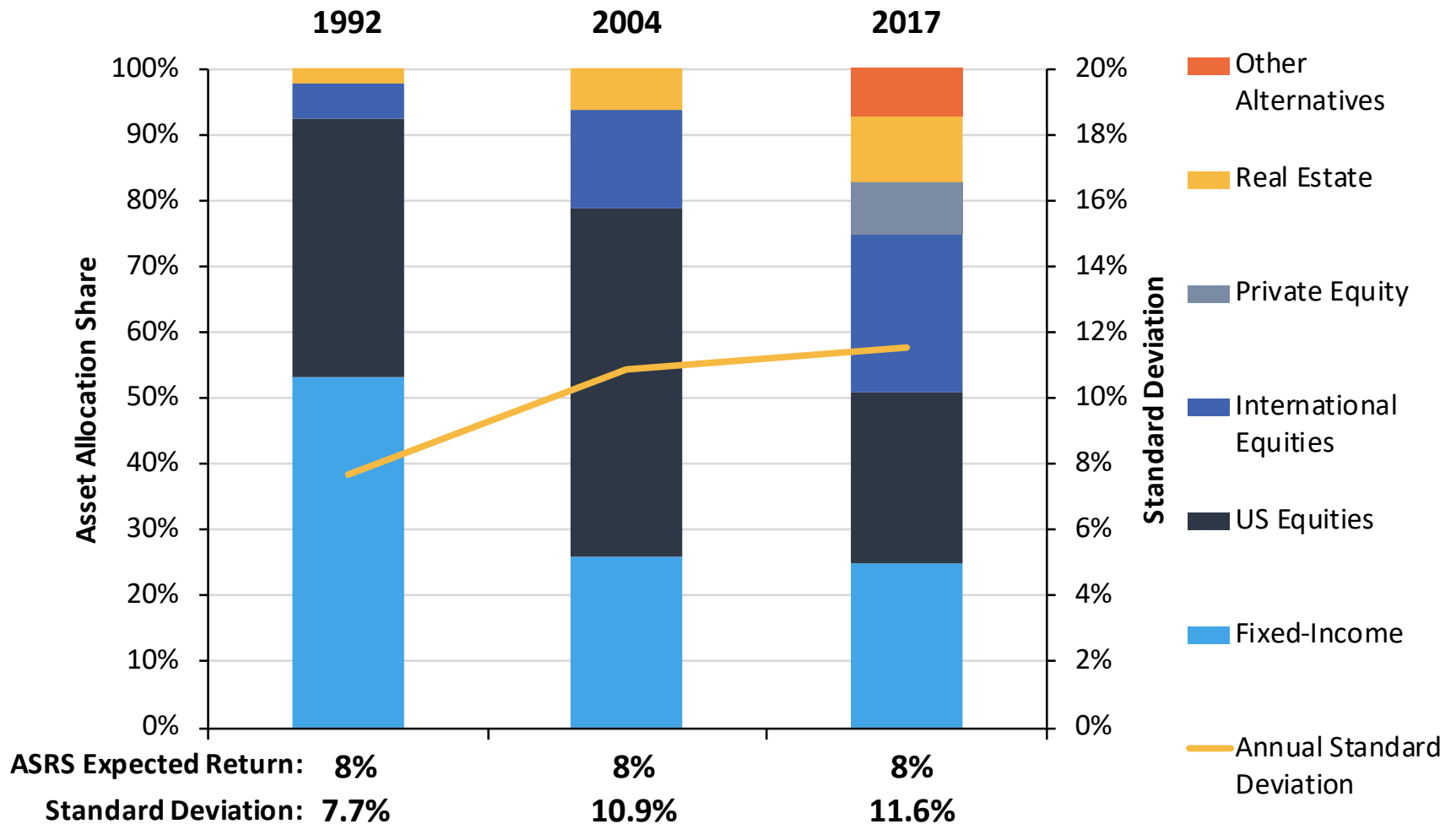
## Expanding Risk in Search for Yield



Source: Pension Integrity Project analysis of ASRS actuarial valuation reports and CAFRS.

# New Normal: Market Trend Towards Risk

ASRS Has Changed its Asset Allocation Towards More Risky Investments  
Resulting in a Higher Annual Standard Deviation of Returns



Source: Pension Integrity Project Monte Carlo model based on ASRS asset allocation and reported expected of returns by asset class.

# Probability Analysis: Measuring the Likelihood of ASRS Achieving Various Rates of Return



| Possible Rates of Return | Probability of ASRS Achieving A Given Return Based On: |                         |                             |                               |                                      |                                 |                            |                                 |
|--------------------------|--|-------------------------|-----------------------------|-------------------------------|--------------------------------------|---------------------------------|----------------------------|---------------------------------|
|                          | ASRS Assumptions & Experience                          |                         | Short-Term Market Forecast  |                               |                                      |                                 | Long-Term Market Forecast  |                                 |
|                          | Based on ASRS Assumptions                              | ASRS Historical Returns | BNY Mellon 10-Year Forecast | JP Morgan 10-15 Year Forecast | Research Affiliates 10-Year Forecast | Horizon 10-Year Market Forecast | BlackRock 20-Year Forecast | Horizon 20-Year Market Forecast |
| 8.0%                     | 47.4%  | 20.7%                   | 20.1%                       | 22.7%                         | 8.6%                                 | 30.7%                           | 39.1%                      | 44.2%                           |
| 7.5%                     | 54.5%  | 26.9%                   | 27.0%                       | 29.2%                         | 12.3%                                | 37.5%                           | 46.4%                      | 51.7%                           |
| 7.0%                     | 61.7%  | 34.1%                   | 35.0%                       | 36.5%                         | 17.2%                                | 44.7%                           | 53.6%                      | 58.8%                           |
| 6.5%                     | 68.3%  | 42.5%                   | 44.1%                       | 45.1%                         | 23.3%                                | 51.9%                           | 60.5%                      | 66.1%                           |
| 6.0%                     | 74.6%  | 50.7%                   | 53.0%                       | 53.7%                         | 30.2%                                | 58.9%                           | 67.3%                      | 72.2%                           |
| 5.5%                     | 80.2%  | 58.4%                   | 61.8%                       | 61.8%                         | 37.3%                                | 65.5%                           | 74.0%                      | 77.4%                           |
| 5.0%                     | 85.3%  | 66.5%                   | 70.2%                       | 69.8%                         | 45.3%                                | 72.0%                           | 79.8%                      | 82.4%                           |
| 4.5%                     | 89.0%  | 73.5%                   | 77.3%                       | 76.6%                         | 53.5%                                | 77.3%                           | 84.7%                      | 86.9%                           |

Source: Pension Integrity Project Monte Carlo model based on ASRS asset allocation and reported expected returns by asset class. Forecasts of returns by asset class generally by BNYM, JPMC, BlackRock, Research Affiliates, and Horizon Actuarial Services were matched to the specific asset class of ASRS. Probability estimates are approximate as they are based on the aggregated return by asset class. For complete methodology contact Reason Foundation.

# Probability Analysis: Measuring the Likelihood of ASRS Achieving Various Rates of Return



## ASRS Assumptions & Experience

- A probability analysis of ASRS historical returns over the past 20 years (1999-2019) indicates only a modest chance (27%) of hitting the plan's 7.5% assumed return.
- ASRS actuaries calculate an approximately 50% (+/-) chance of achieving their investment return target each year.

## Short-Term Market Forecast

- Returns over the short to medium term can have significant negative effects on funding outcomes for mature pension plans like ASRS.
- Analysis of capital market assumptions publicly reported by the leading financial firms (BlackRock, BNY Mellon, JPMorgan, and Research Affiliates) suggests that over a 10-15 year period, ASRS returns are likely to fall short of assumptions.

## Long-Term Market Forecast

- Longer-term projections typically assume ASRS investment returns will revert back to historical averages.
  - ✓ The “reversion to mean” assumption **should be viewed with caution** given historical changes in interest rates and other market conditions that increase uncertainty over longer projection periods, relative to shorter ones.
- Forecasts showing long-term returns near 7.5% being likely also show a significant chance that the actual long-term average return will fall far shorter than expected.
  - ✓ For example, according to BlackRock's 20-year forecast the probability of achieving an average return of 7.5% or higher is about 46%, the probability of earning a rate of return below 5% is about 20%.





# RISK ASSESSMENT

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- How resilient is ASRS to volatile market factors?

# Important Funding Concepts



## All-in Employer Cost

- The true cost of a pension is not only in the annual contributions, but also in whatever unfunded liabilities remain. The "All-in Employer Cost" combines the total amount paid in employer contributions and adds what unfunded liabilities remain at the end of the forecasting window

## Baseline Rates

- The baseline describes ASRS current assumptions using the plan's existing contribution and funding policy and shows the status quo before the 2020 market shock

## Employee Rates

- The scenarios in this analysis assume that employee and employer contributions will take equal shares of the annual actuarially determined rate

### Quick Note:

With actuarial experiences of public pension plans varying from one year to the next, and potential rounding and methodological differences between actuaries, projected values shown onwards are not meant for budget planning purposes. **For trend and policy discussions only.**

# Stress Testing ASRS Using Crisis Simulations



## Stress on the Economy:

- Market watchers expect dwindling consumption and incomes to severely impact near-term tax collections – applying more pressure on state and local budgets.
- Revenue declines are likely to undermine employers' ability to make full pension contributions, especially for those relying on more volatile tax sources (e.g., sales taxes) and those with low rainy-day fund balances.
- Many financial advisors project double-digit drops in U.S. GDP for Q2 2020. In Q1 2020 alone the S&P500 dropped by 20%, while the Federal Reserve lowered federal funds rate virtually to zero.

## Methodology:

- Adapting the Dodd-Frank stress testing methodology for banks and Moody's Investors Service recession preparedness analysis, the following scenarios assume one year of -26.4% returns in 2020, followed by three years of 11% average returns.
- Recognizing expert consensus regarding a diminishing capital market outlook, the scenarios assume a long-term investment return on 6% once markets rebound.
- Given the increased exposure to volatile global markets and rising frequency of Black Swan economic events, we include a scenario incorporating a second Black Swan crisis event in 2035.
- In the event plan sponsors and members are unable to appropriate their full actuarially determined employer contributions amid budget stress, additional scenarios show the impact of a five-year employer and employee contribution freeze.

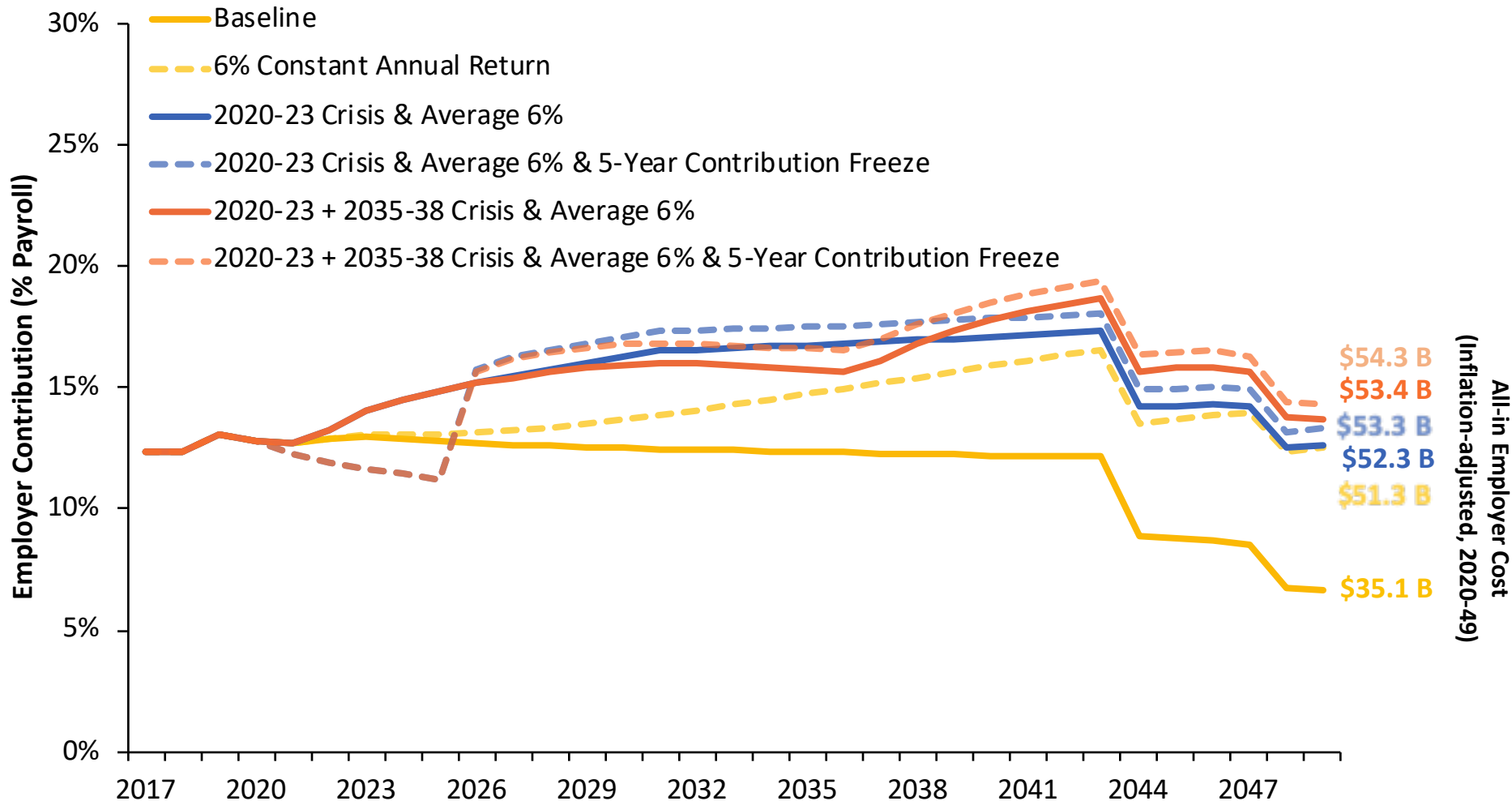
## Stress Testing Scenarios:

1. 6% Constant Annual Return
2. 2020-23 Crisis + Average 6.0% Long-Term
3. 2020-23 Crisis + 2035-38 Crisis + Average 6.0% Long-Term
4. Scenario 2 + 5-Year Employer & Employee Contribution Freeze
5. Scenario 3 + 5-Year Employer & Employee Contribution Freeze

## ASRS Stress Testing: All-in Employer Cost Projections

# How a Crisis Increases ASRS Costs

Discount Rate: 7.5%, Assumed Return: 7.5%, Actual Return: Varying, Amo. Period: 30-Year, Closed



Source: Pension Integrity Project actuarial forecast of ASRS. Values are rounded and adjusted for inflation. State is assumed to make actuarial contributions. The "All-in Cost" includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by the end of the forecast period.

# Scenario Comparison of Employer Costs



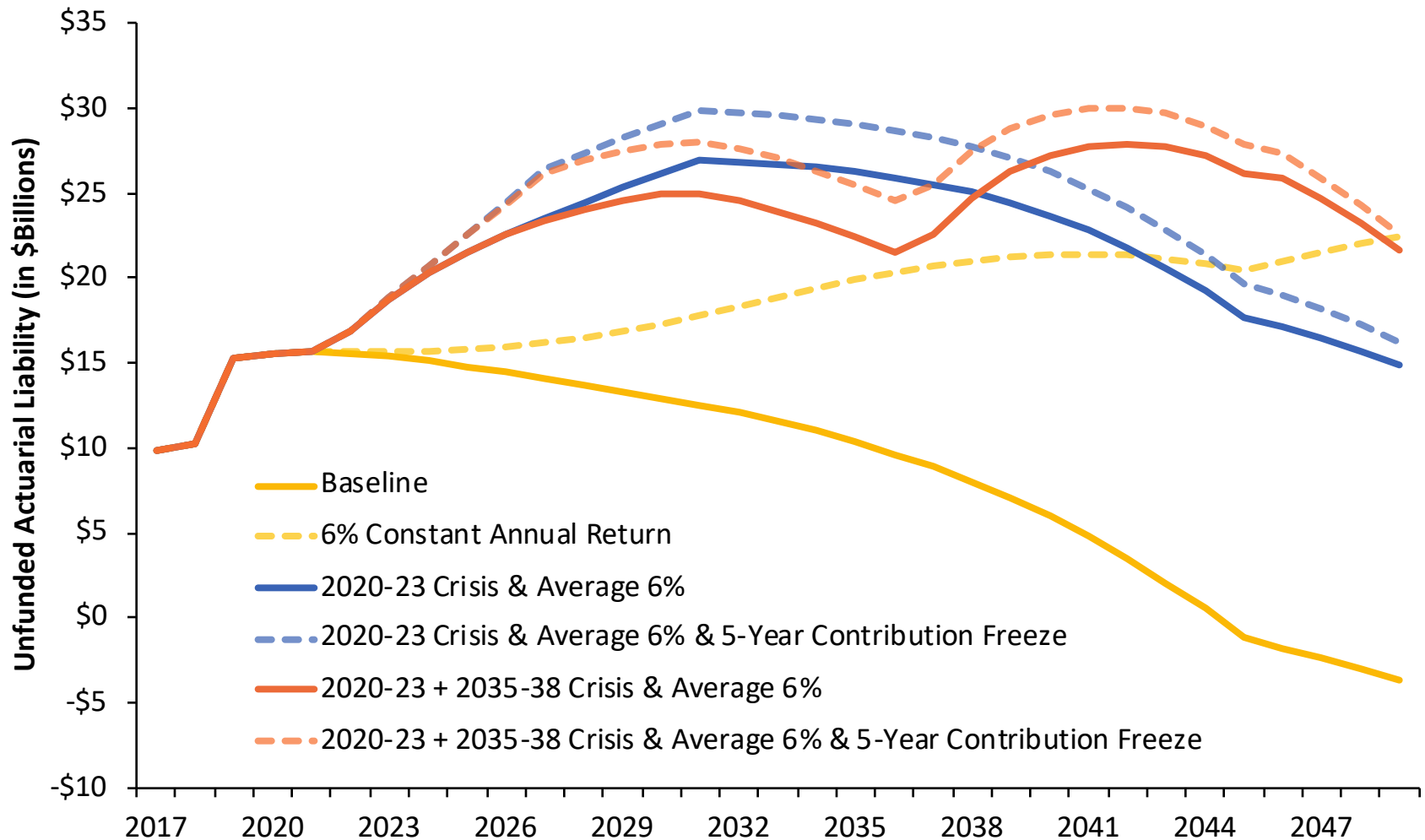
| Scenarios   | 30-Year Employer Contributions | 2049 Unfunded Liability (Market Value) | Total All-in Employer Costs |
|---|--------------------------------|--|-----------------------------|
| Pre-Crisis Baseline                               | \$36.0 B                       | \$(0.9) B                              | \$35.1 B                    |
| 6% Constant Annual Return                         | \$43.8 B                       | \$7.5 B                                | \$51.3 B                    |
| 2020-23 Crisis + Average 6%                       | \$48.0 B                       | \$4.3 B                                | \$52.3 B                    |
| Two Crises + Average 6%                           | \$48.7 B                       | \$4.8 B                                | \$53.4 B                    |
| 2020-23 Crisis + Average 6% + 5-Year Cont. Freeze | \$48.8 B                       | \$4.5 B                                | \$53.3 B                    |
| Two Crises + Average 6% + 5-Year Cont. Freeze     | \$49.4 B                       | \$4.9 B                                | \$54.3 B                    |

Source: Pension Integrity Project actuarial forecast of ASRS funding. Values are rounded and adjusted for inflation. The "All-in Cost" includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by the end of the forecast period.

## ASRS Stress Testing: Unfunded Liability Projections

## Crisis Scenarios Drive Unfunded Liabilities Higher

Discount Rate: 7.5%, Assumed Return: 7.5%, Actual Return: Varying, Amo. Period: 30-Year, Closed

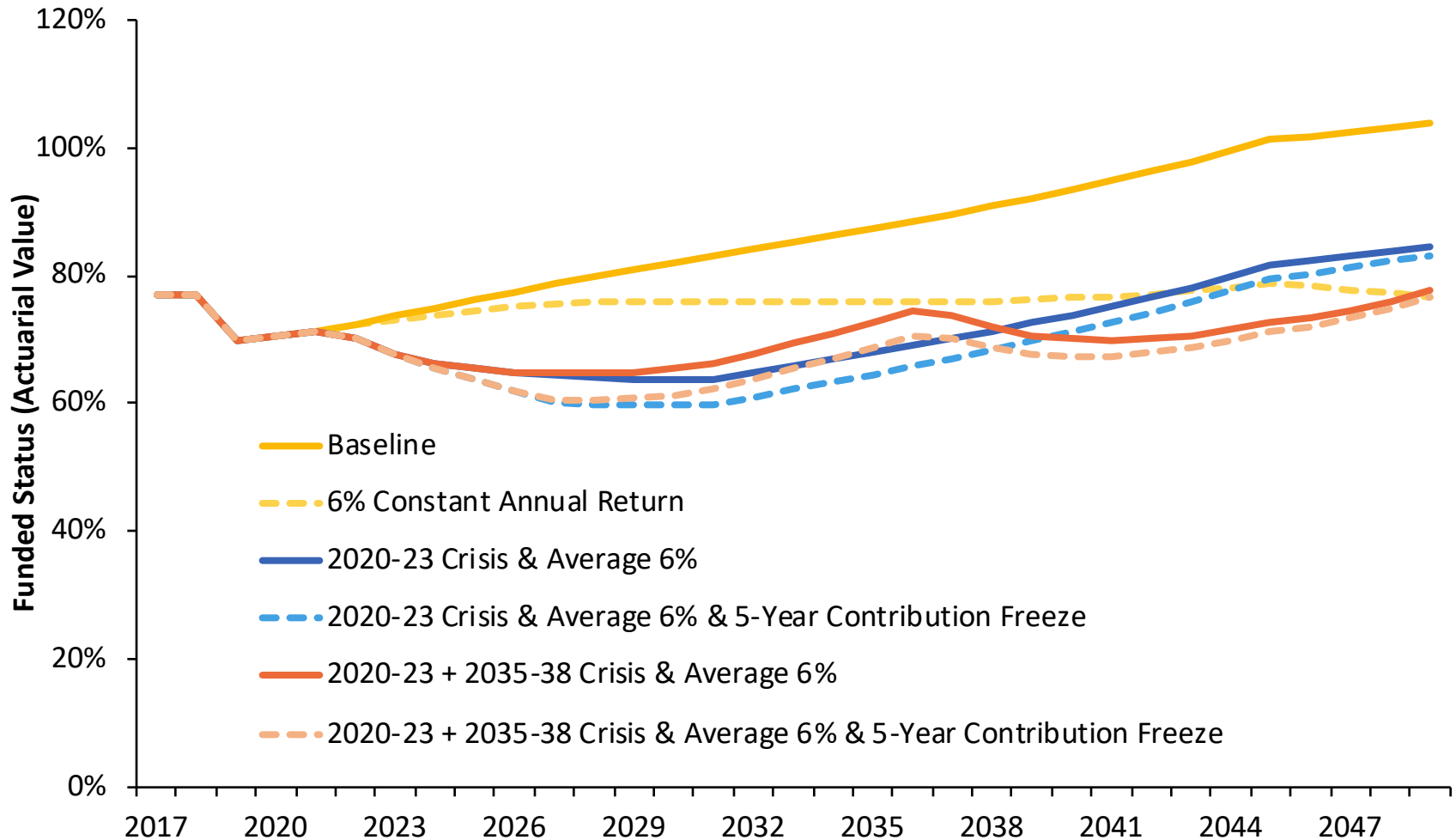


Source: Pension Integrity Project actuarial forecast of ASRS funding. Values are rounded and adjusted for inflation. State is assumed to make statutory contributions. The "All-in Cost" includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by the end of the forecast period.

## ASRS Stress Testing: Funded Status Projections

# Crisis Scenarios Impede Progress to Full Funding

Discount Rate: 7.5%, Assumed Return: 7.5%, Actual Return: Varying, Amo. Period: 30-Year, Closed



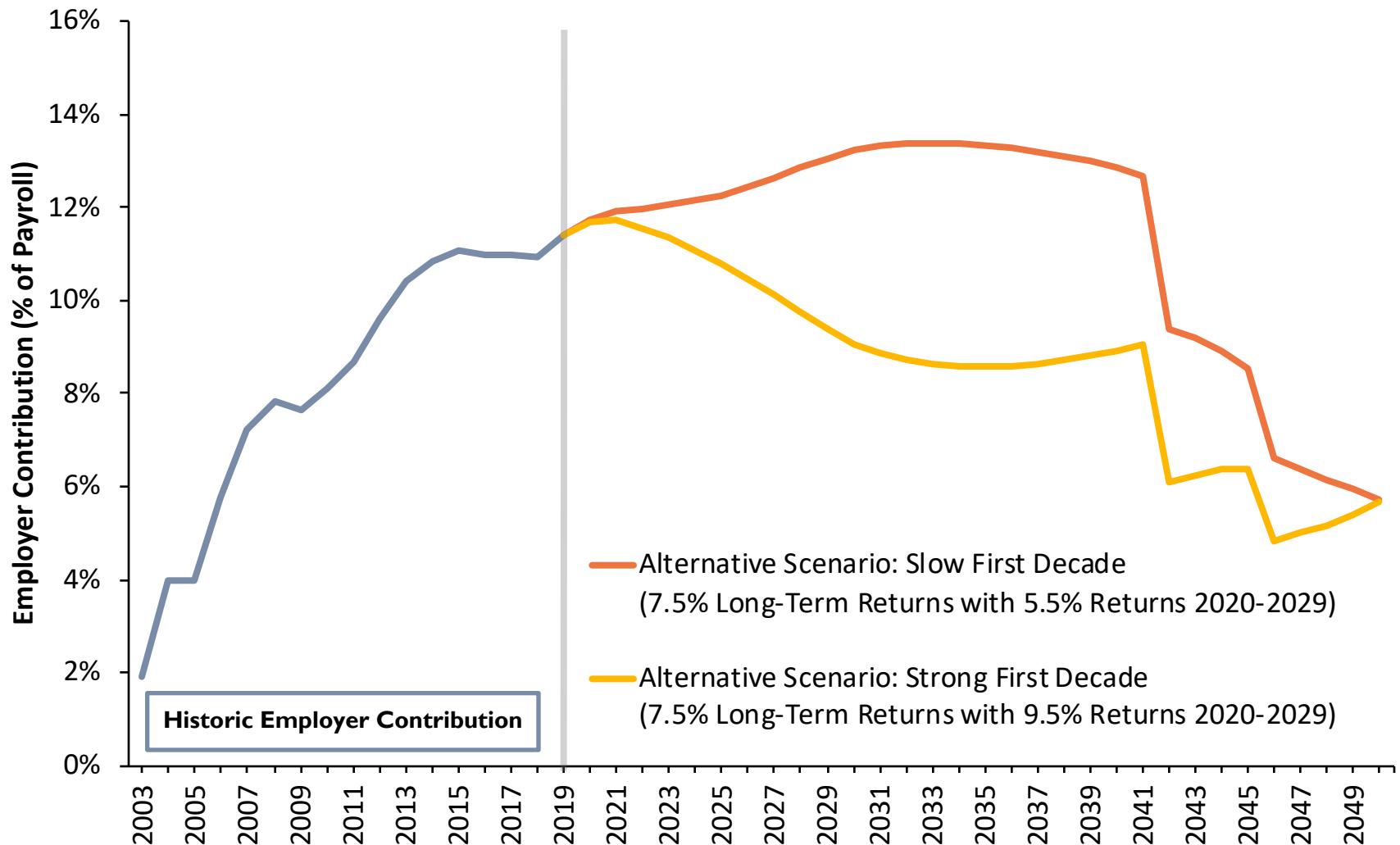
Source: Pension Integrity Project actuarial forecast of ASRS funding. State is assumed to make actuarial contributions.

The "All-in Cost" includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by the end of the forecast period.

## 30-year Employer Contribution Forecast

## Timing of Returns Affects What Arizona Pays

Long-Term Average Returns of 7.5%



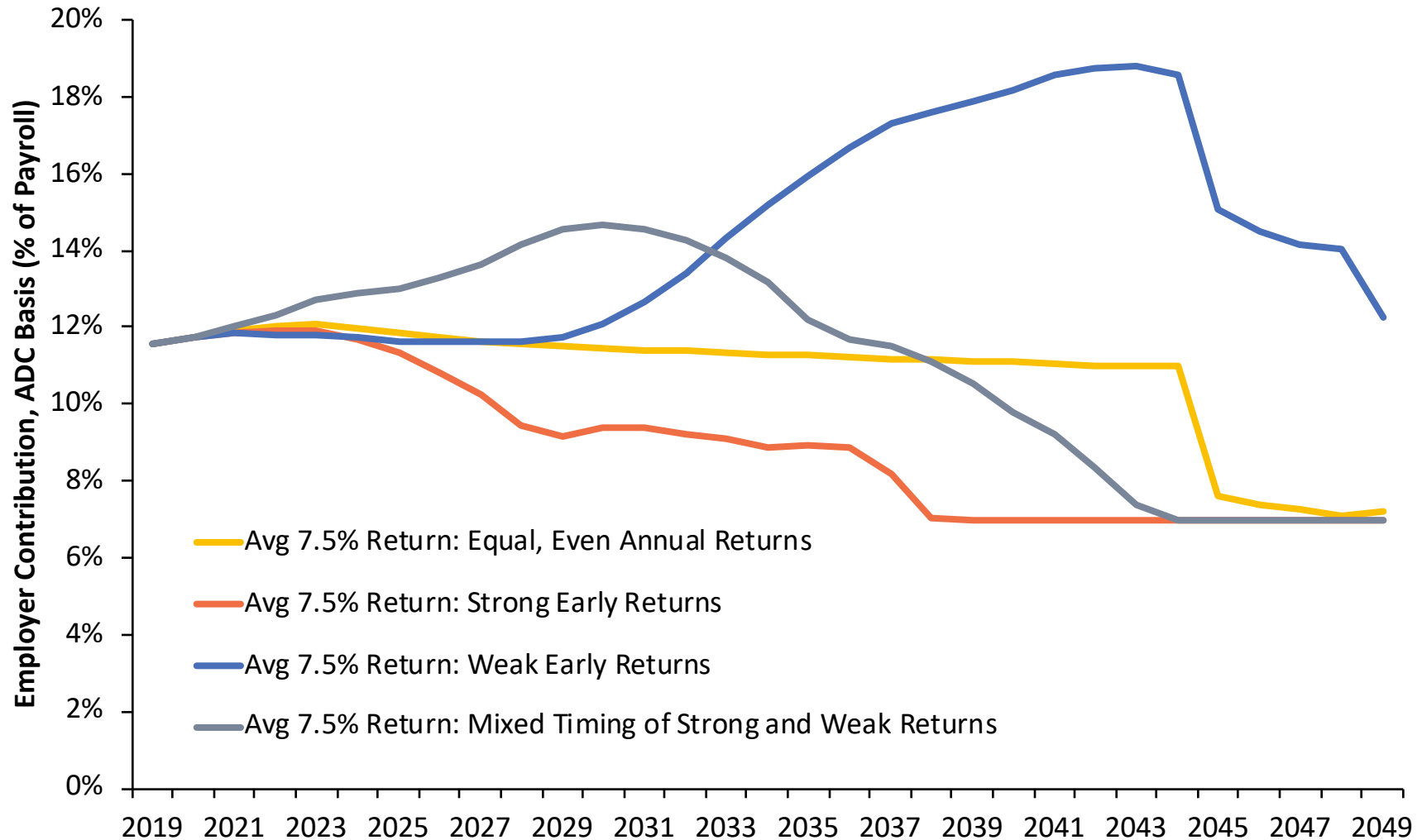
Source: Pension Integrity Project actuarial forecast of ASRS.



## 30-year Employer contribution Forecast

# All Paths to a 7.5% Average Return Are Not Equal

Long-Term Average Returns of 7.5%



Source: Pension Integrity Project actuarial forecast of ASRS plan. Strong early returns (TWRR = 7.5%, MWRR = 8.6%), Even, equal annual returns (Constant Return = 7.5%), Mixed timing of strong and weak returns (TWRR = 7.5%, MWRR = 7.5%), Weak early returns (TWRR = 7.5%, MWRR = 6.6%)  
 Scenario assumes that ASRS pays the actuarially required rate each year. Years are plan's fiscal years.



# Forecasting the Impact of Market Volatility

## Random Investment Return Analysis

### What is it?

- Model generates 10,000 different random investment return scenarios, creating ranges in required contributions and funding outcomes
- The analysis displays 50 percent of all outcomes that are closest to the median outcome

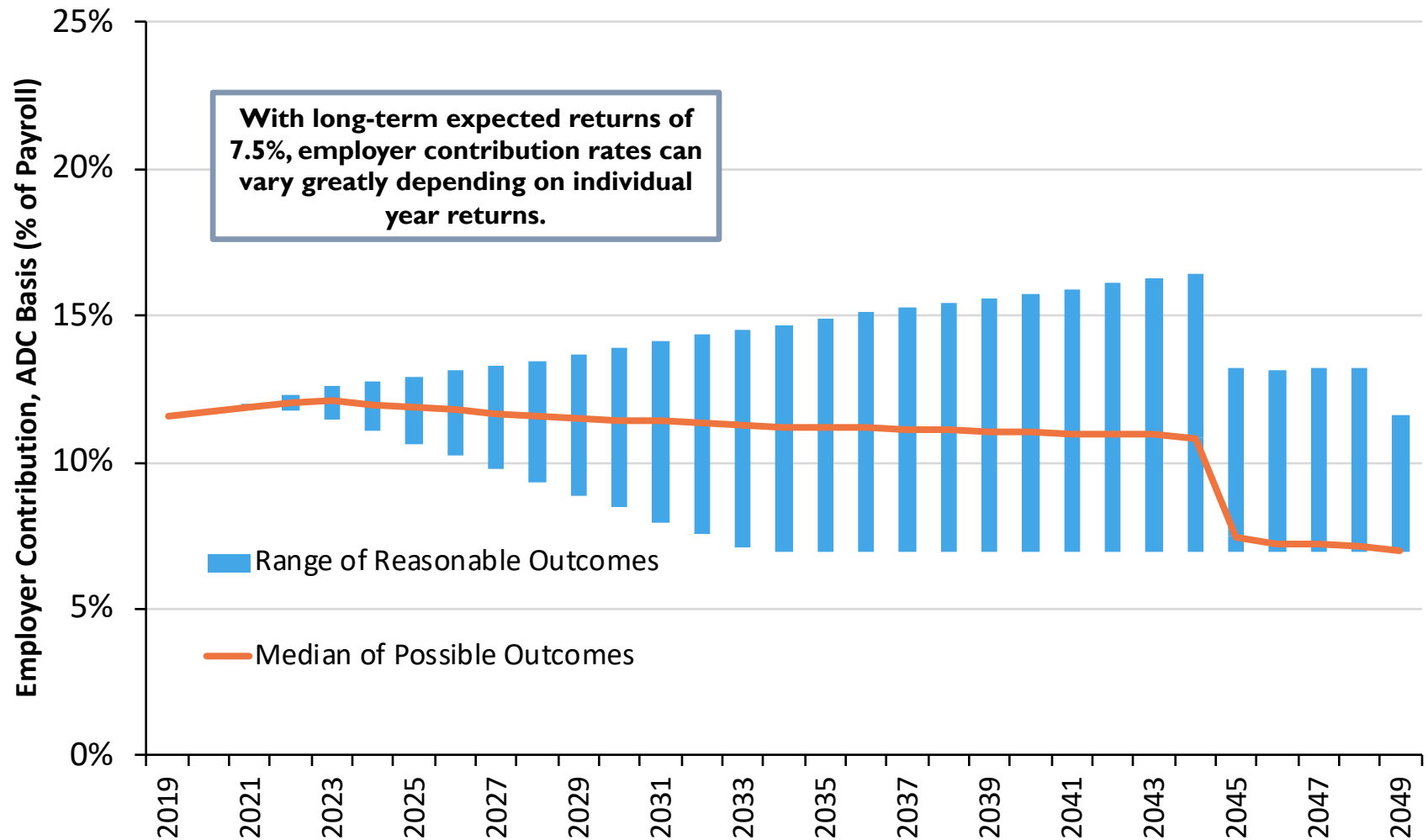
### Why use it?

- Using a large sample of potential 30-year return scenarios can show the differences in how plan's funding will react to high or low investment fluctuations.
- The cone of displayed outcomes and the median illustrates the level of risk placed on the plan
- A narrow cone suggests a plan is more resilient—and has less investment risk—than that of a wider cone

## 30-year Employer Contribution Forecast

## If ASRS Performs as Expected, Rates Can Still Vary

Long-term Average Expected Returns of 7.5%

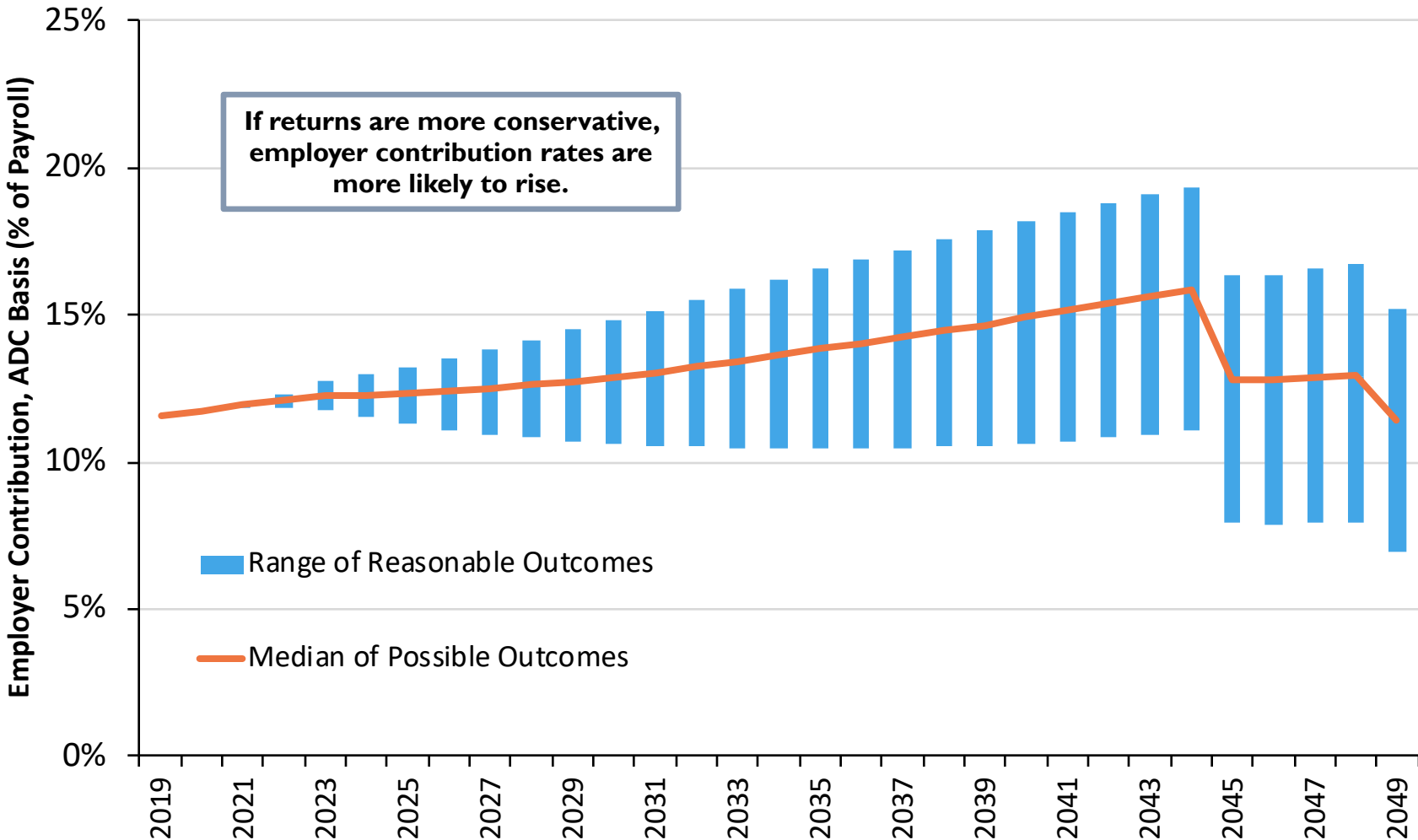


Source: Pension Integrity Project actuarial forecast of ASRS. Scenario assumes that the state continues to pay 100% of the statutory contribution each year. Range of Reasonable Outcomes represents the 50% of possible outcomes closest to the median. Figures are rounded and adjusted for inflation.

30-year Employer Contribution Forecast

If ASRS Underperforms, Expect Higher Contribution Rates

More Conservative Long-term Average Expected Returns

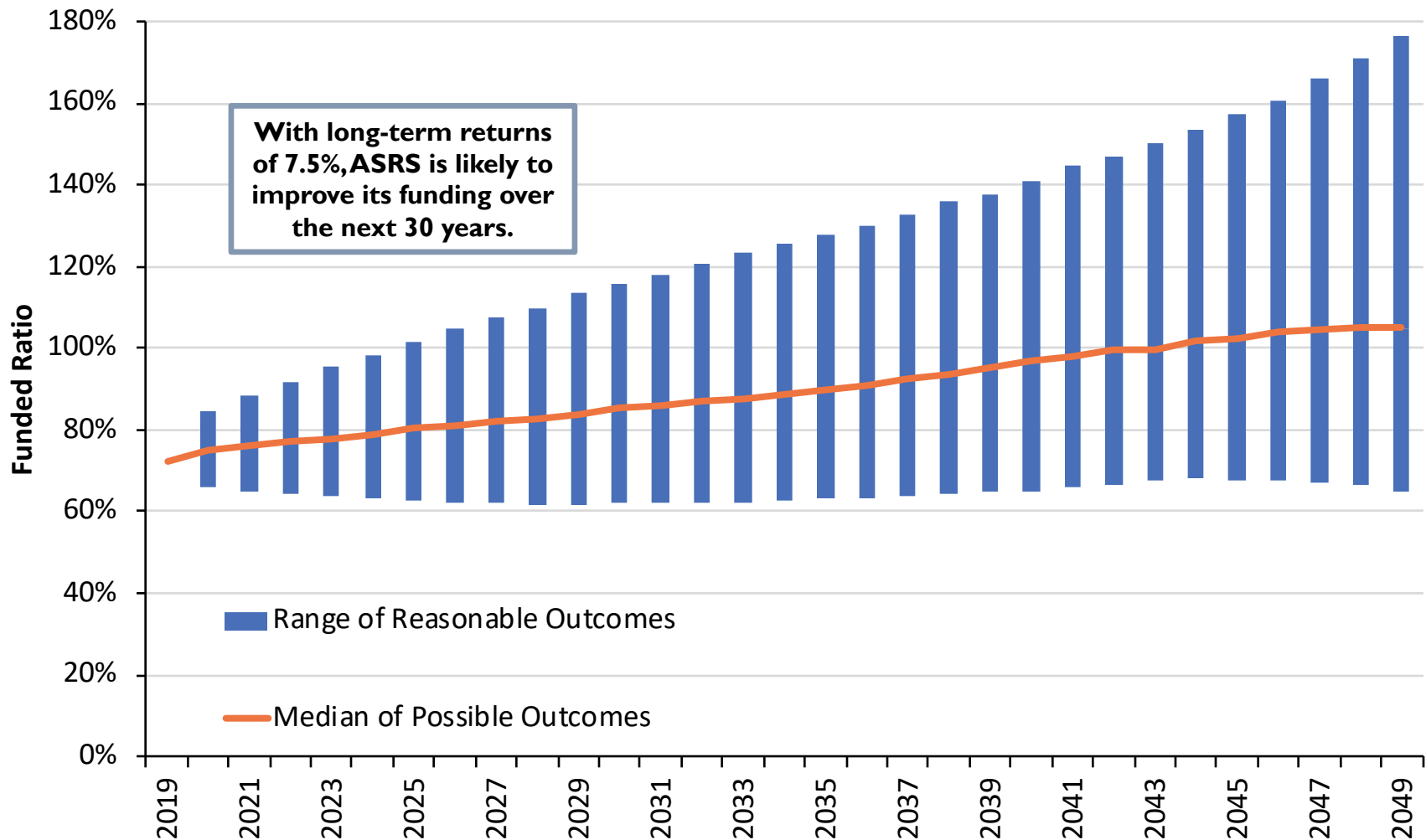


Source: Pension Integrity Project actuarial forecast of ASRS plan using the return and risk assumptions of the Monte Carlo analysis. Conservative returns are 5.72%, which are the result of combining the long-term capital market assumptions from four prominent financial firms (see slide 18)

## 30-year Funded Ratio Forecast

## Funded Ratio Outcomes Can Vary Significantly

Long-term Average Returns of 7.5%

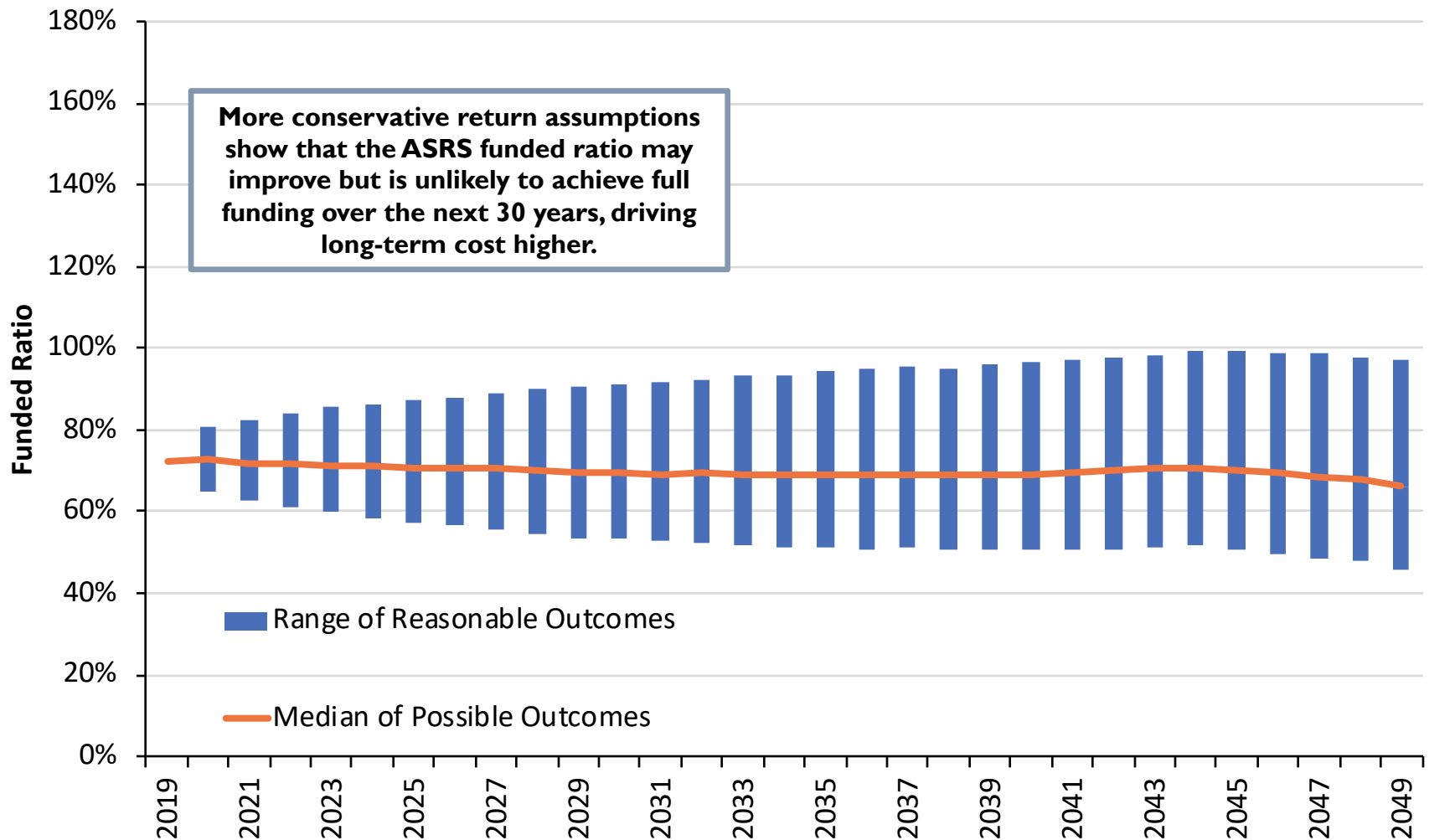


Source: Pension Integrity Project actuarial forecast of ASRS plan based on plan return and risk assumptions.  
Range of Reasonable Outcomes represents the 50% of possible outcomes closest to the median.

## 30-year Funded Ratio Forecast

## ASRS Funding in a “New Normal” Future

More Conservative Long-term Average Returns



Source: Pension Integrity Project actuarial forecast of ASRS plan using the return and risk assumptions of the Monte Carlo analysis. Conservative returns are 5.72%, which are the result of combining the long-term capital market assumptions from four prominent financial firms (see slide 18)

# Sensitivity Analysis: Normal Cost Comparison Under Alternative Assumed Rates of Return



(Amounts to be Paid in 2021-22 Contribution Fiscal Year, % of projected payroll)

|  | Gross Normal Cost | Employer Normal Cost | Employee Normal Cost (Average) |
|--|-------------------|----------------------|--------------------------------|
| <b>7.5%</b><br>Assumed Return<br>(FYE 2019 Baseline) | 13.46%            | 6.73%                | 6.73%                          |
| <b>7.0%</b><br>Assumed Return                        | 14.58%            | 7.29%                | 7.29%                          |
| <b>6.5%</b><br>Assumed Return                        | 15.80%            | 7.90%                | 7.90%                          |
| <b>6.0%</b><br>Assumed Return                        | 17.18%            | 8.59%                | 8.59%                          |

Note: These alternative gross normal cost figures should be considered approximate guides to how much more normal cost should be under different discount rates. Any policy changes should be based on more precise normal cost forecasts using detailed plan data. Alternative normal cost rates based on reported liability sensitivity from the FYE 2019 ASRS CAFR.

Source: Pension Integrity Project analysis based on ASRS actuarial valuation reports and CAFRs.



## CHALLENGE 2: AMORTIZATION METHODS

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- Long amortization schedules for unfunded liabilities are creating negative amortization and higher long-term costs



## Debt Management Policies

# Back-Loaded Pension Debt Payments



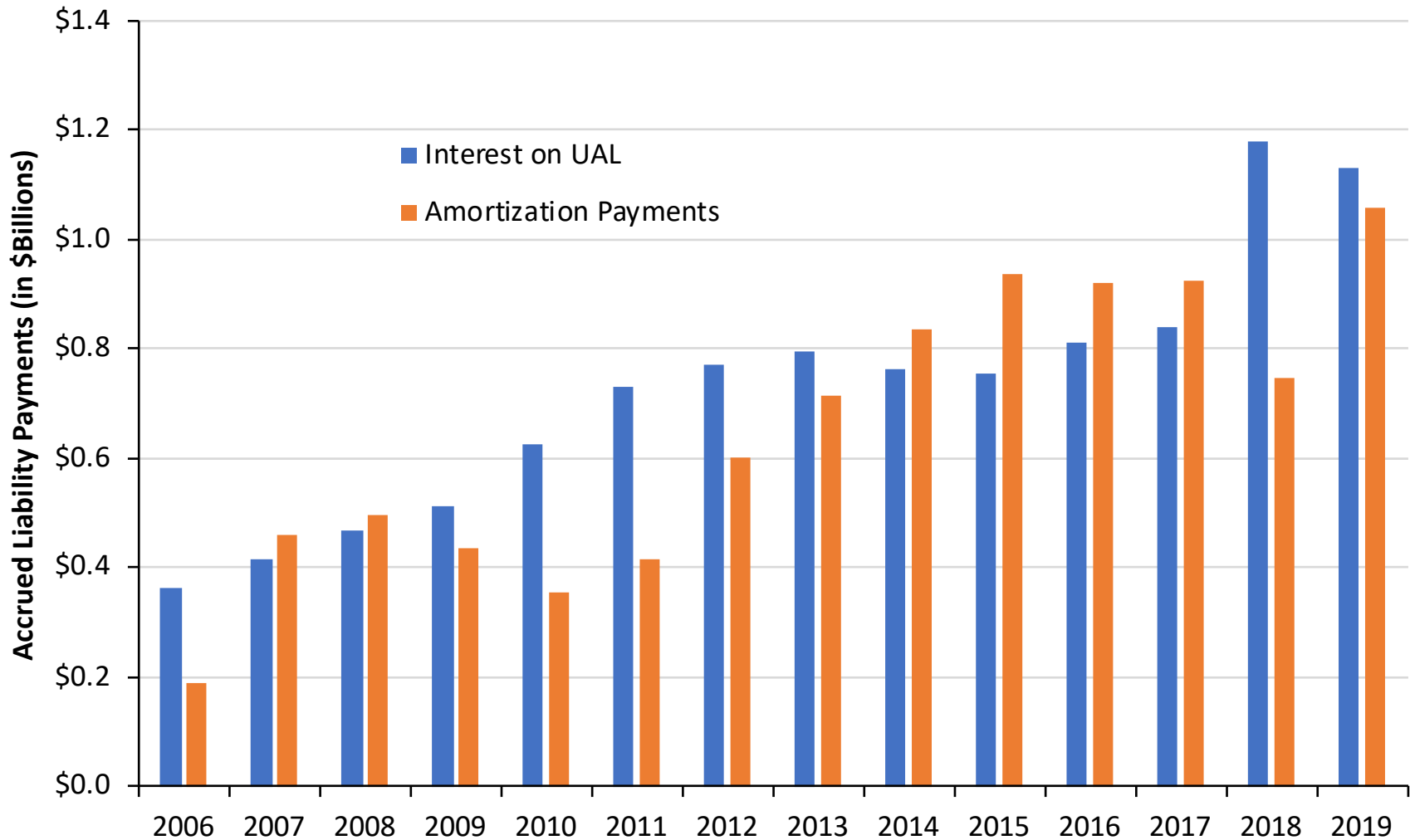
ASRS uses a 30-year, level-percentage amortization on a layered basis method to amortize accrued unfunded liability.

- **What is level percent of payroll amortization?**
  - Sets the amortization payment as a fixed share of total member payroll
  - Often results in back-loaded pension debt payments, especially if payroll growth slows
- **What does amortizing unfunded liabilities using a layered-base approach mean?**
  - Any new ASRS unfunded liabilities in a given year are amortized over a 30-year period, meaning that there is no fixed-end date for the complete elimination of unfunded liabilities
- **What does a long amortization period mean?**
  - Professional actuaries generally recommend layering in periods 20 years or less in order to pay down unfunded liabilities faster, ensure sufficient contributions, and minimize the risk that pension debt is exposed to ongoing market risk
  - Makes it more likely unfunded liabilities will never be paid off
  - Often leaves debt payments each year short of the interest accrued on the debt (e.g. negative amortization)

## Debt Management Policies

# Interest on Debt vs. Amortization Payments

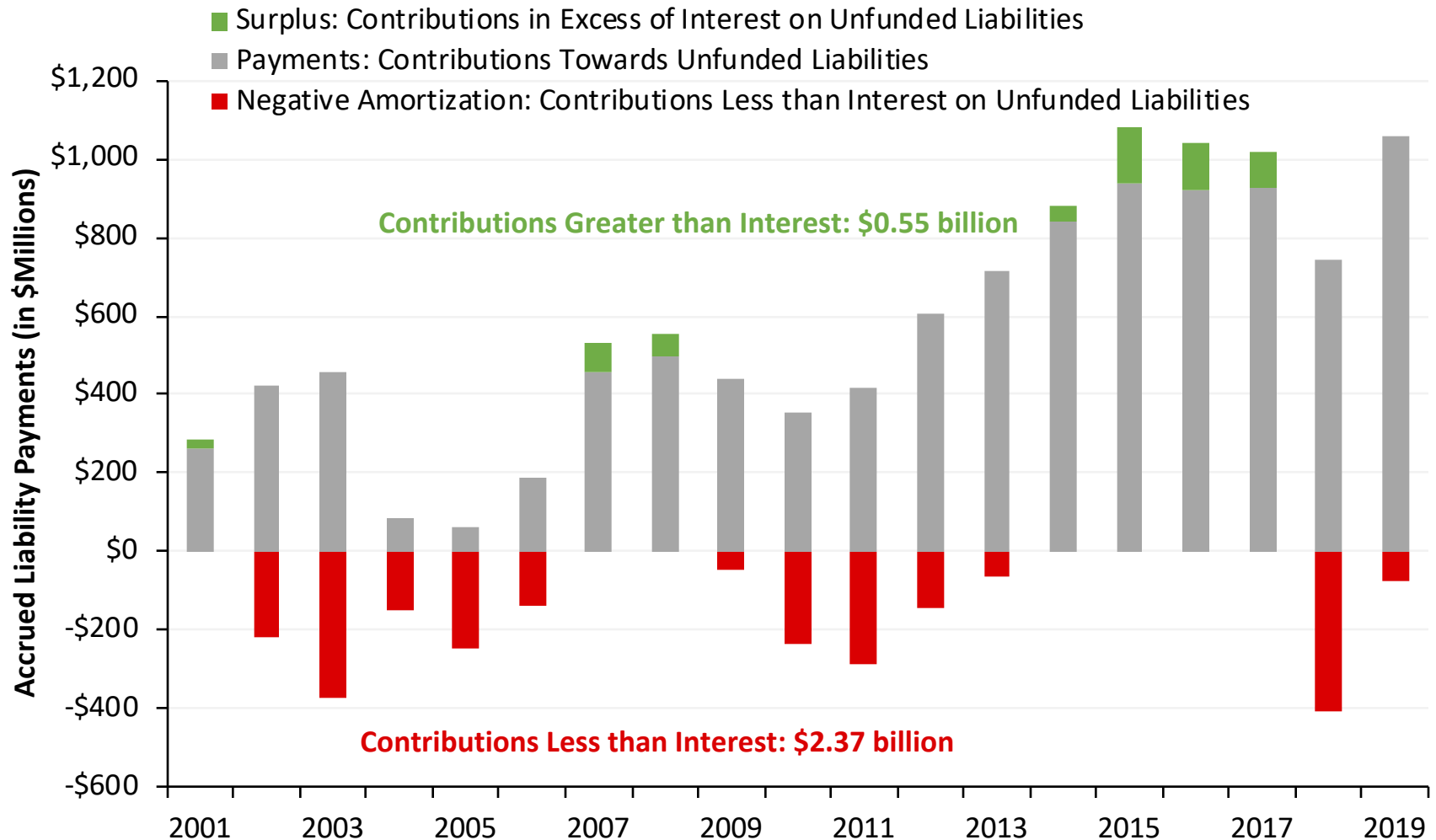
ASRS Negative Amortization Growth, 2006-2019



Source: Pension Integrity Project analysis of ASRS actuarial reports and CAFRs.

## Negative Amortization Growth (2001-2019)

## Interest on the Debt v. Accrued Liability Payments



Source: Pension Integrity Project analysis and forecast of ASRS Actuarial Valuation Reports and CAFRs. Figures are rounded.



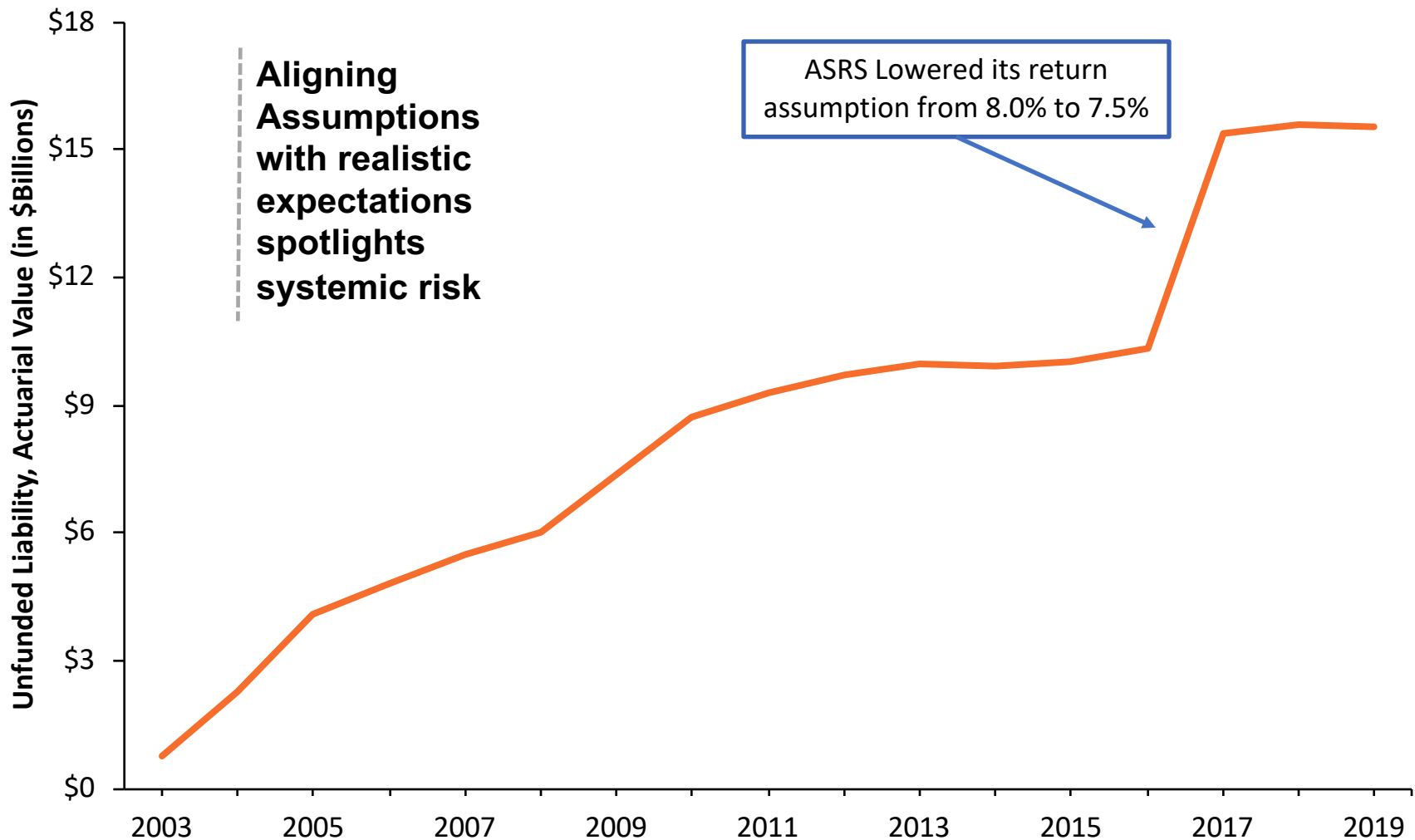
# CHALLENGE 3: UNCOVERING HIDDEN COSTS

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- Adjusting actuarial assumptions to reflect the changing demographics and new normal in investment markets exposes hidden pension cost by uncovering existing but unreported unfunded liabilities.

## Challenges in Making Prudent Assumptions

## Recognition of More Accurate Debt Levels



Source: Pension Integrity Project analysis of ASRS actuarial reports and CAFRs.



## Challenges from Aggressive Actuarial Assumptions

### Actual Experience Different from Actuarial Assumptions

#### **(-) New Member Rate Assumptions**

- ASRS new hire and rehire rates have *differed from expectations* resulting in a \$543 million growth in unfunded liabilities from 2009-2014.

#### **(-) Withdrawal Rate Assumptions**

- ASRS assumptions on the rates of employer withdrawal have *differed from expectations* resulting in a \$21 million growth in unfunded liabilities from 2009-2014.

#### **(-) Disability Rate Benefits**

- ASRS disability claims have been more than expected, resulting in a \$14 million growth in unfunded liabilities from 2009-2014.

#### **(-) Active Mortality Rate Benefits**

- ASRS survivor claims for active members have been more than expected, resulting in a \$13 million growth in unfunded liabilities from 2009-2014.



## Challenges from Aggressive Actuarial Assumptions

# Actual Experience Different from Actuarial Assumptions

### **(-) Age and Service Retirement**

- ASRS members have been retiring at younger than expected ages, resulting in a larger liability than expected and \$7 million in growth in unfunded liabilities from 2009 to 2014.

### **(-) Other Missed Assumptions**

- Other ASRS assumptions (not specified in financial documents) have *differed from expectations* resulting in a \$285 million growth in unfunded liabilities from 2009-2014.

### **(+) Inactive Mortality Rate Benefits**

- ASRS survivor claims for inactive members have been less than expected, resulting in a \$154 million reduction in unfunded liabilities from 2009-2014



# Challenges from Aggressive Actuarial Assumptions

## Actual Experience Different from Actuarial Assumptions

### (+) Overestimated Payroll Growth

- ASRS employers have not raised salaries as fast as expected, resulting in lower payrolls and thus lower earned pension benefits. This has meant a \$2 billion reduction in unfunded liabilities from 2009-2014.

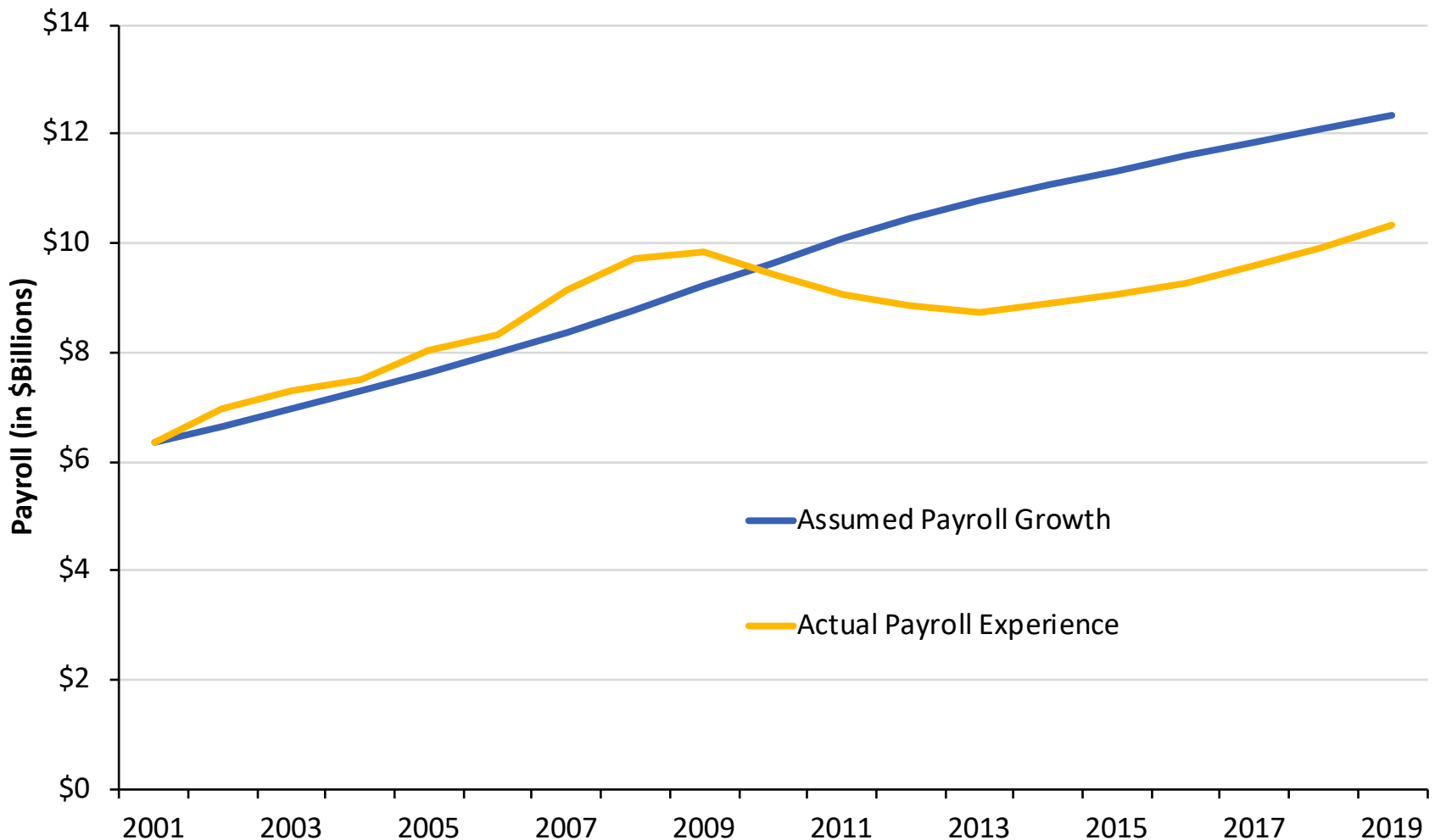
### (-) Overestimated Payroll Growth

- However, overestimating payroll growth is creating a long-term problem for ASRS because of its combination with the level-percentage of payroll amortization method used by the plan.
- This method *backloads pension debt payments* by assuming that future payrolls will be larger than today (a reasonable assumption). But when payroll does not grow as fast as expected, employer contributions must rise as a percentage of payroll. This means the amortization method combined with the inaccurate assumption is delaying debt payments.



# Challenges from Aggressive Actuarial Assumptions

## Actual Change in Payroll v. Assumption



Source: Pension Integrity Project analysis of ASRS actuarial valuation reports and CAFRS.



## Challenges from Aggressive Actuarial Assumptions

# Assumption & Method Changes

- **Inflation Assumption**

- Lowered from 4.25% to 3.75% in 2009
- Lowered from 3.75% to 3.25% in 2011
- Lowered from 3.25% to 3.00% in 2013
- Lowered from 3.00% to 2.30% in 2017

- **Payroll Growth Assumption**

- Lowered from 4.50% to 4.00% in 2011
- Lowered from 4.00% to 3.00% in 2013
- Lowered from 3.00% to 2.50% in 2017



# CHALLENGE 4: DISCOUNT RATE AND UNDERVALUING DEBT

- 
- The discount rate undervalues the measured amount of existing pension obligations

# ASRS Discount Rate

## Methodology is Undervaluing Liabilities



1. The “discount rate” for a public pension plan should reflect the risk inherent in the pension plan’s liabilities:
  - Most public sector pension plans — including ASRS — use the assumed rate of return and discount rate interchangeably, even though each serve a different purpose.
  - The **Assumed Rate of Return** (ARR) adopted by ASRS estimates what the plan will return on average in the long run and is used to calculate contributions needed each year to fund the plans.
  - The **Discount Rate** (DR), on the other hand, is used to determine the net present value of all of the already promised pension benefits and supposed to reflect the risk of the plan sponsor not being able to pay the promised pensions.

# ASRS Discount Rate

## Methodology is Undervaluing Liabilities



- 2. Setting a discount rate too high will lead to undervaluing the amount of pension benefits actually promised:**
  - If a pension plan is choosing to target a high rate of return with its portfolio of assets, and that high assumed return is then used to calculate/discount the value of existing promised benefits, the result will likely be that the actuarially recognized amount of accrued liabilities is undervalued.
- 3. It is reasonable to conclude that there is almost no risk that Arizona would pay out less than 100% of promised retirement income benefits to members and retirees.**
  - Arizona Constitution—Article 29
- 4. The discount rate used to account for this minimal risk should be appropriately low.**
  - The higher the discount rate used by a pension plan, the higher the implied assumption of risk for the pension obligations.

# ASRS Pension Debt Sensitivity

## FYE 2019 Unfunded Liability Under Varying Discount Rates

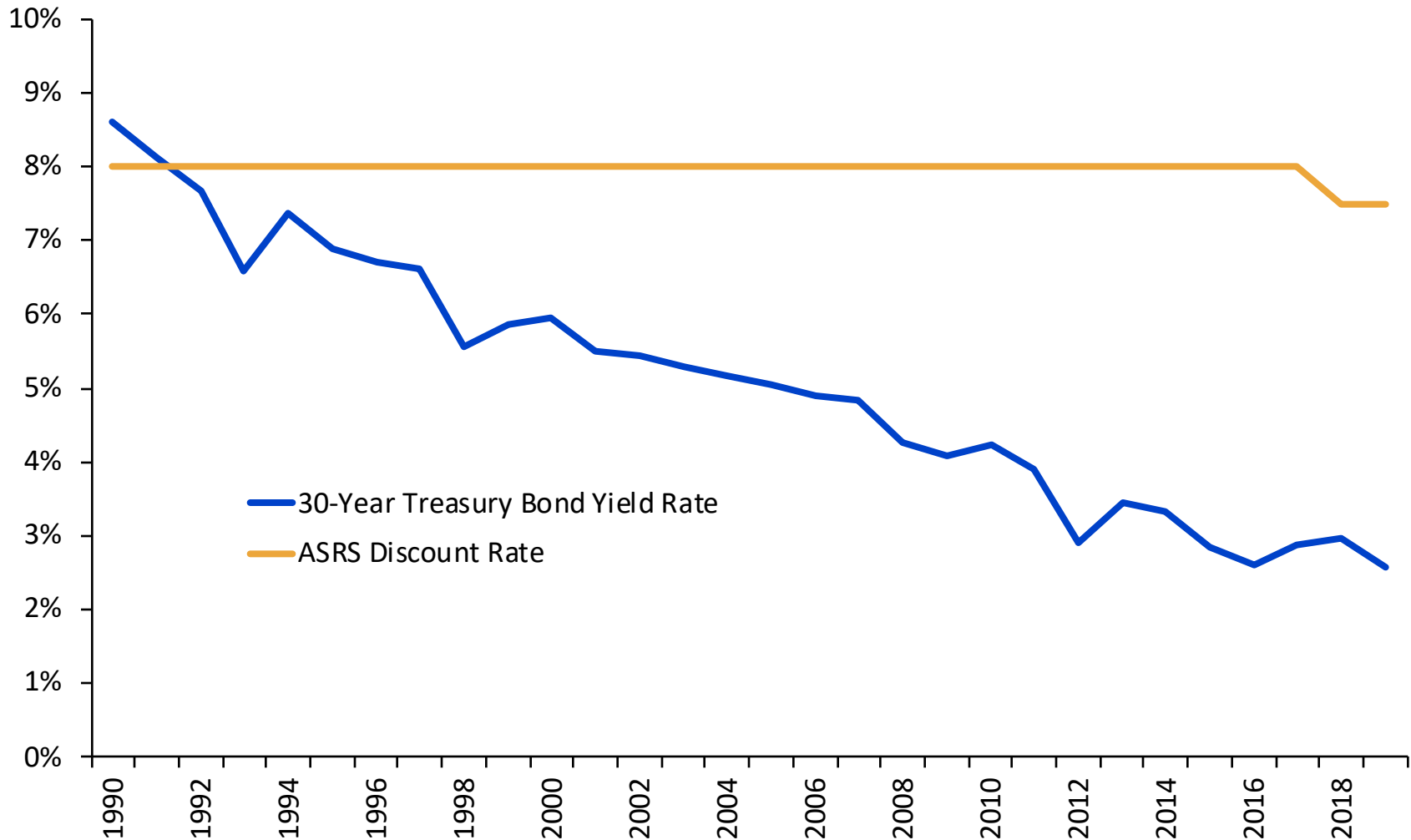


|                     | Funded Ratio | Unfunded Liability | Actuarial Accrued Liability |
|---------------------|--------------|--------------------|-----------------------------|
| 7.50% Discount Rate | 71.3%        | \$15.7 billion     | \$54.6 billion              |
| 6.50% Discount Rate | 65.8%        | \$20.7 billion     | \$60.5 billion              |
| 5.50% Discount Rate | 58.8%        | \$27.9 billion     | \$67.7 billion              |
| 4.50% Discount Rate | 52.5%        | \$36.1 billion     | \$75.9 billion              |

Source: Pension Integrity Project analysis of ASRS GASB Statements. Current ASRS discount rate is set at 7.5%.

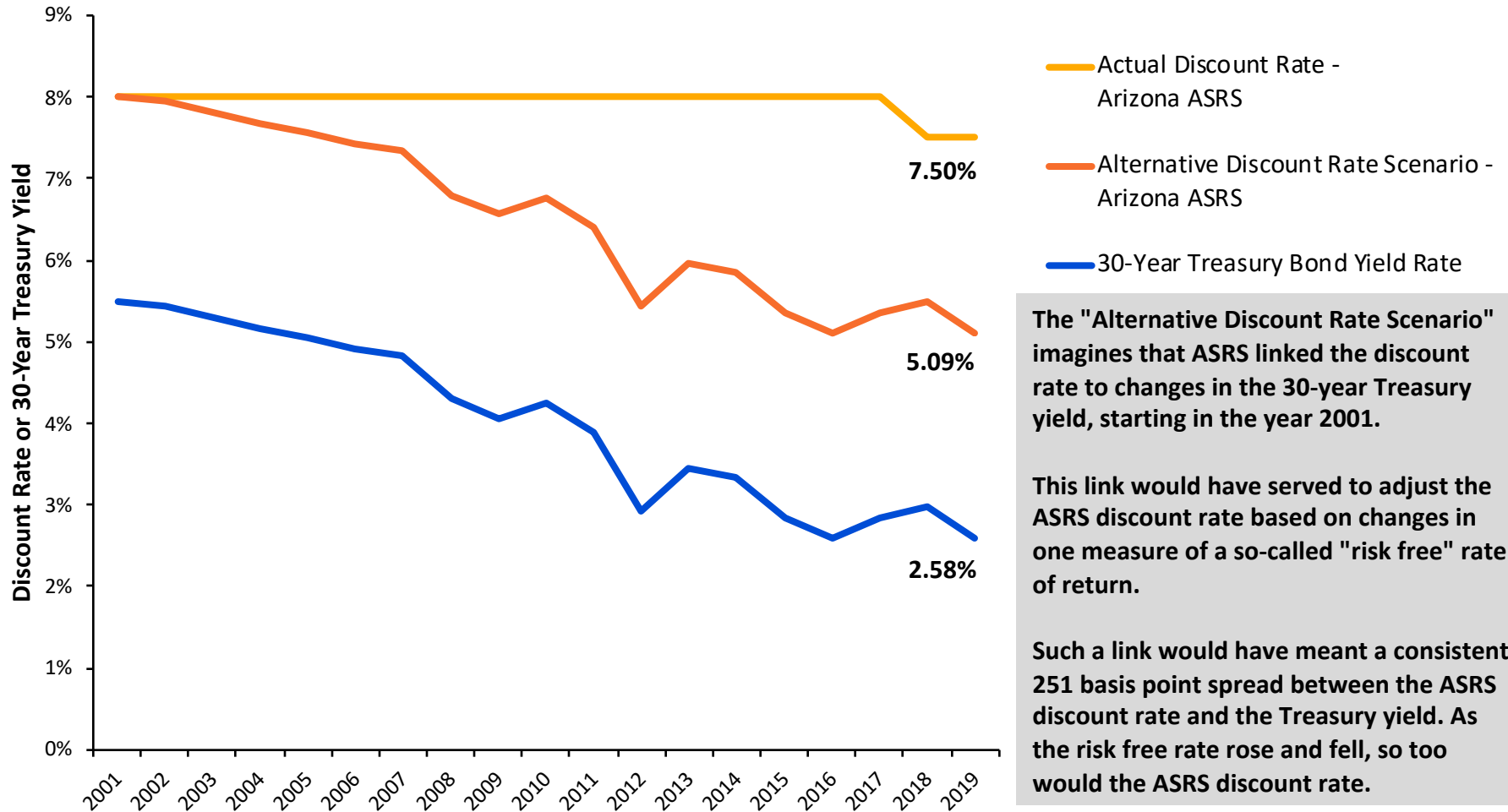
All dollar figures are market values. Market values used are fiduciary net position and actuarial accrued liability is total pension liability. Figures are rounded.

# Change in the Risk-Free Rate Compared to ASRS Discount Rate (1990-2019)



Source: Federal Reserve average annual 30-year treasury constant maturity rate

# Comparing Change in Discount Rate to the Change in the Risk-Free Rate, 2001-2019



Source: Federal Reserve average annual 30-year treasury constant maturity rate





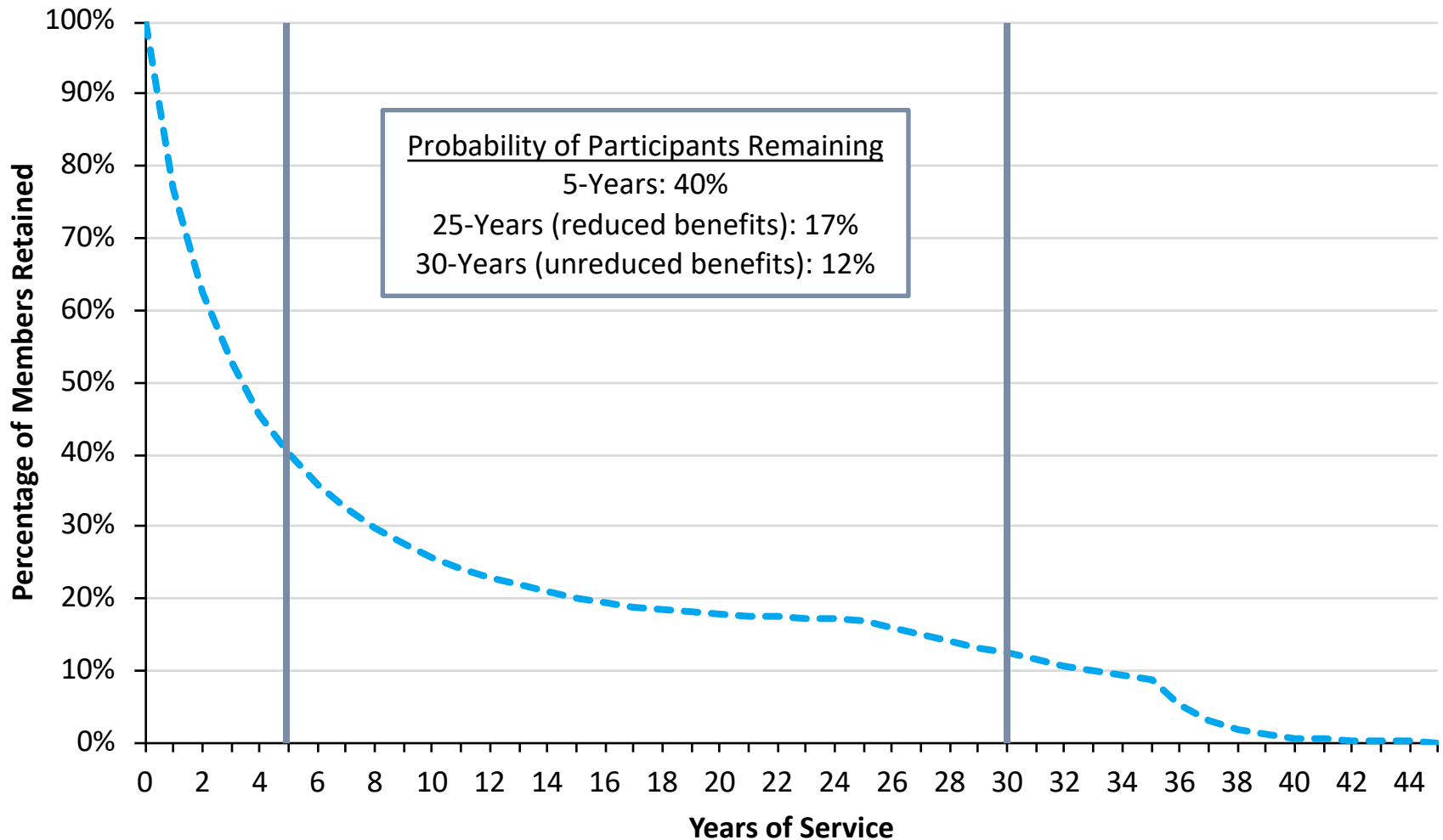
# CHALLENGE 5: THE EXISTING BENEFIT DESIGN DOES NOT WORK FOR EVERYONE

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- High pre-retirement withdrawal rates signal challenges in recruiting and retaining new public employees.



# Probability of Members Remaining in ASRS



Source: Pension Integrity Project analysis of ASRS actuarial reports and CAFRs. Analysis assumes worker is hired after 2011 at age 25.

# Does the ASRS Retirement Plan Work for Today's Employees?



- **60%** of new workers leave before 5 years of service
- **74%** of new workers leave before 10 years of service
- Just **17%** of ASRS workers remain in the system from start to finish to receive **partial** benefits at age 50
- Under **12%** of ASRS workers remain in the system from start to finish to receive **full** benefits at ages 55 to 65 (depending on their age at hiring)



# ASRS Benefit Overview

## DB Plan Design for New Hires

- **Multiplier:**
  - 2.10% for less than 20 years
  - 2.15% for 20-25 years
  - 2.20% for 25-30 years
  - 2.30% for more than 30 years
- **Final Average Salary:** Five highest years
- **Vesting:** immediate
- **Normal Retirement Eligibility:** Age 65 or age 55 with 30 years of service
- **2019 Employee Contribution:** 22.8%
- **Participation in Social Security:** Yes
- **Benefit Summary (*Retirees as of 2018*):**
  - Monthly Benefit for 45+ years: \$5,577
  - Number of Retirees and Beneficiaries: 151,878



# FRAMEWORK FOR SOLUTIONS & REFORM

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# Policy Objectives

- **Keeping Promises:** Ensure the ability to pay 100% of the benefits earned and accrued by active workers and retirees
- **Retirement Security:** Provide retirement security for all current and future employees
- **Predictability:** Stabilize contribution rates for the long-term
- **Risk Reduction:** Reduce pension system exposure to financial risk and market volatility
- **Affordability:** Reduce long-term costs for employers/taxpayers and employees
- **Attractive Benefits:** Ensure the ability to recruit 21st Century employees
- **Good Governance:** Adopt best practices for board organization, investment management, and financial reporting



# Pension Resiliency Strategies

1. Adopt better funding policy, risk assessment, and actuarial assumptions
  - Lower the assumed rate of return to align with independent actuarial recommendations.
  - These changes should aim at minimizing risk and contribution rate volatility for employers and employees.
2. Establish a plan to pay off the unfunded liability as quickly as possible.
  - The Society of Actuaries Blue Ribbon Panel recommends amortization schedules be no longer than 15 to 20 years.
  - Reducing the amortization schedule would save the state billions in interest payments.
3. Review current plan options to improve retirement security
  - Consider offering additional retirement options that create a pathway to lifetime income for employees that do not stay in public service.

# I. Adopt Better Funding Policy, Risk Assessment, and Actuarial Assumptions



## ■ Risk Assessment and Actuarial Assumptions

- Look to lower the assumed return such that it aligns with more realistic probability of success
- Work to reduce fees and costs of active management
- Consider adopting an even more conservative assumption for a new hire defined benefit plan
- Require stress testing for contribution rates, funded ratios, and cash flows with look-forward forecasts for a range of scenarios



## 2. Establish a Plan to Pay Off the Unfunded Liability as Quickly as Possible



- **Current amortization time horizons are too long**
  - ASRS' 30-year layered level percent of payroll amortization policy leaves unfunded liabilities significantly exposed to additional market risk and should be shortened similar to PSPRS' policies.
  - The Society of Actuaries Blue Ribbon Panel recommends amortization schedules be no longer than 15 to 20 years.
  
- **The legislature could put maximum amortization periods in place and/or require a gradual reduction in the funding period to target a lower number of years**
  - Other states have phased in changes by reducing the amortization schedules one year at a time
  - The legislature could require that ASRS be funded on a certain time period under specific scenarios, such as alternative assumptions and/or stress test scenarios



### 3. Create a Path to Retirement Security for All Participants of ASRS

- **ASRS is not providing a path for retirement income security to all Arizona public workers**
  - For example, only 12% of public employees make it to the 30 years necessary for a full pension. This means the majority of members would be better served by having the choice of an alternative plan design built for portability and an increasingly mobile workforce, such as a Cash Balance, Hybrid or DC plan.
- **Employees should have a choice to select a retirement plan design that fits their career and lifestyle goals**
  - Cash balance plans can be designed to provide a steady accrual rate, offer portability, and ensure a path to retirement security
  - Defined contribution plans can be designed to auto-enroll members into professionally managed accounts with low fees that target specified retirement income and access to annuities



# Questions?

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