

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

Prepared by:

Pension Integrity Project at Reason Foundation

October 27, 2020





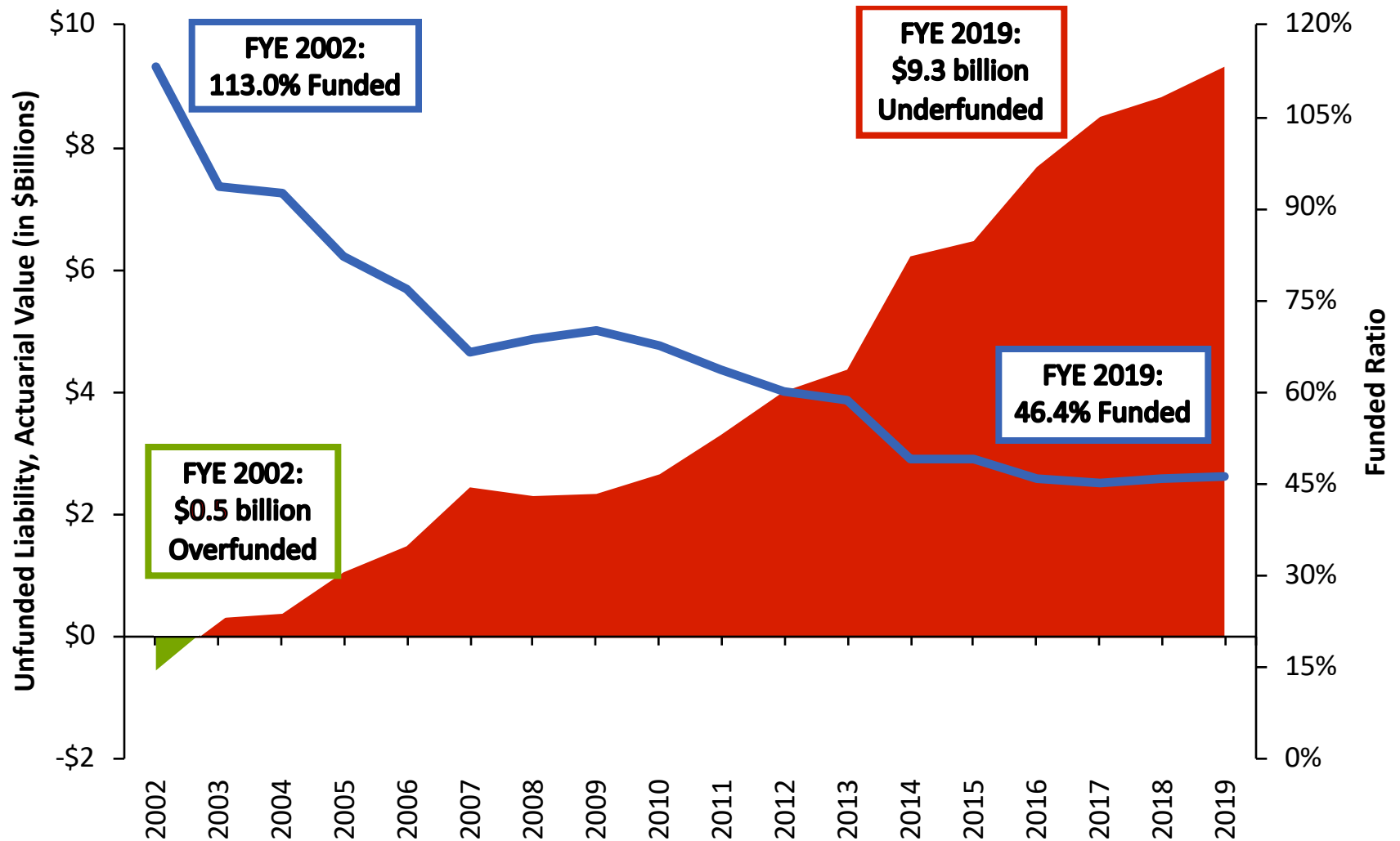
About the Pension Integrity Project

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



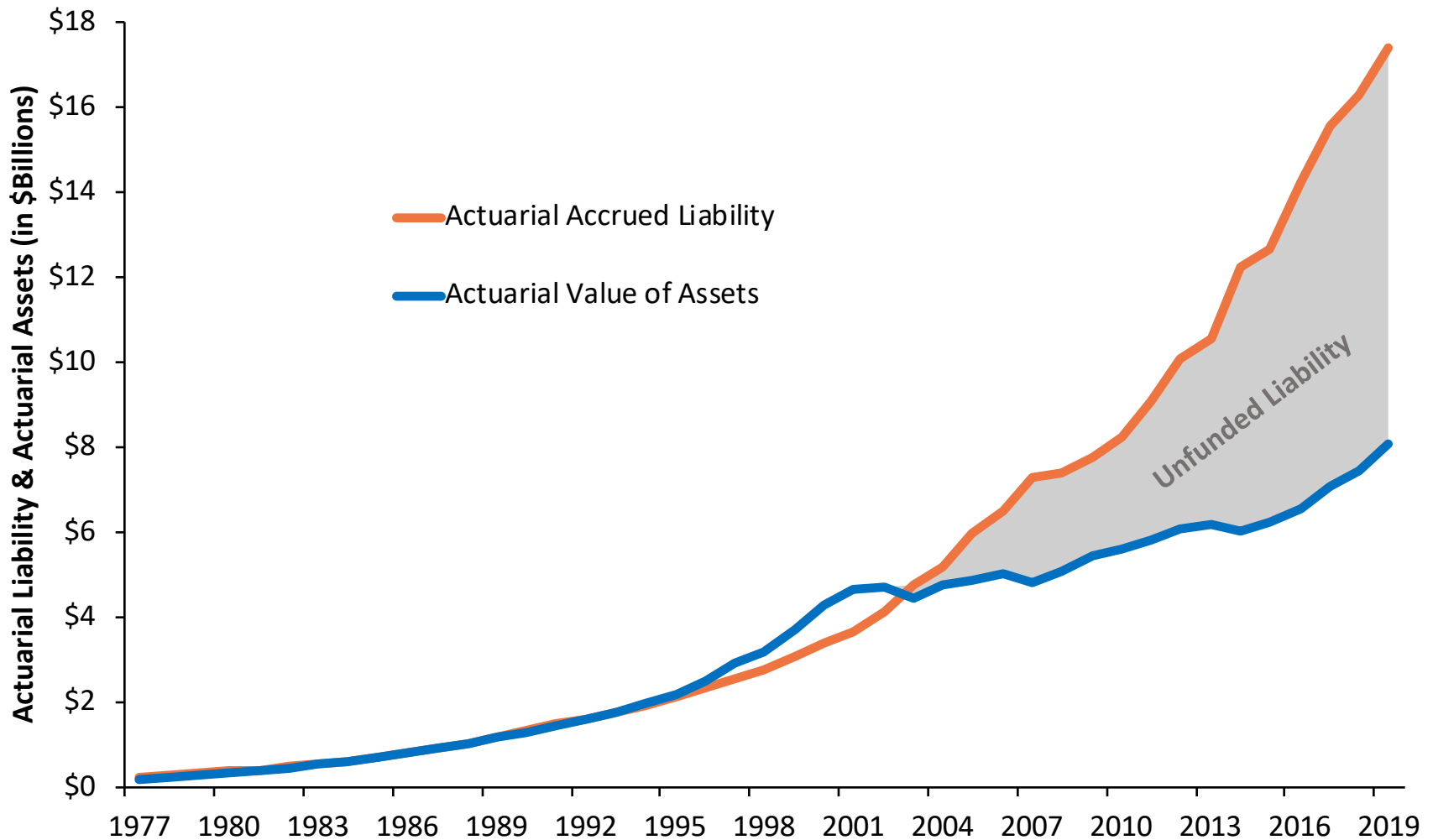
A History of Weakening Solvency (2002-2019)



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



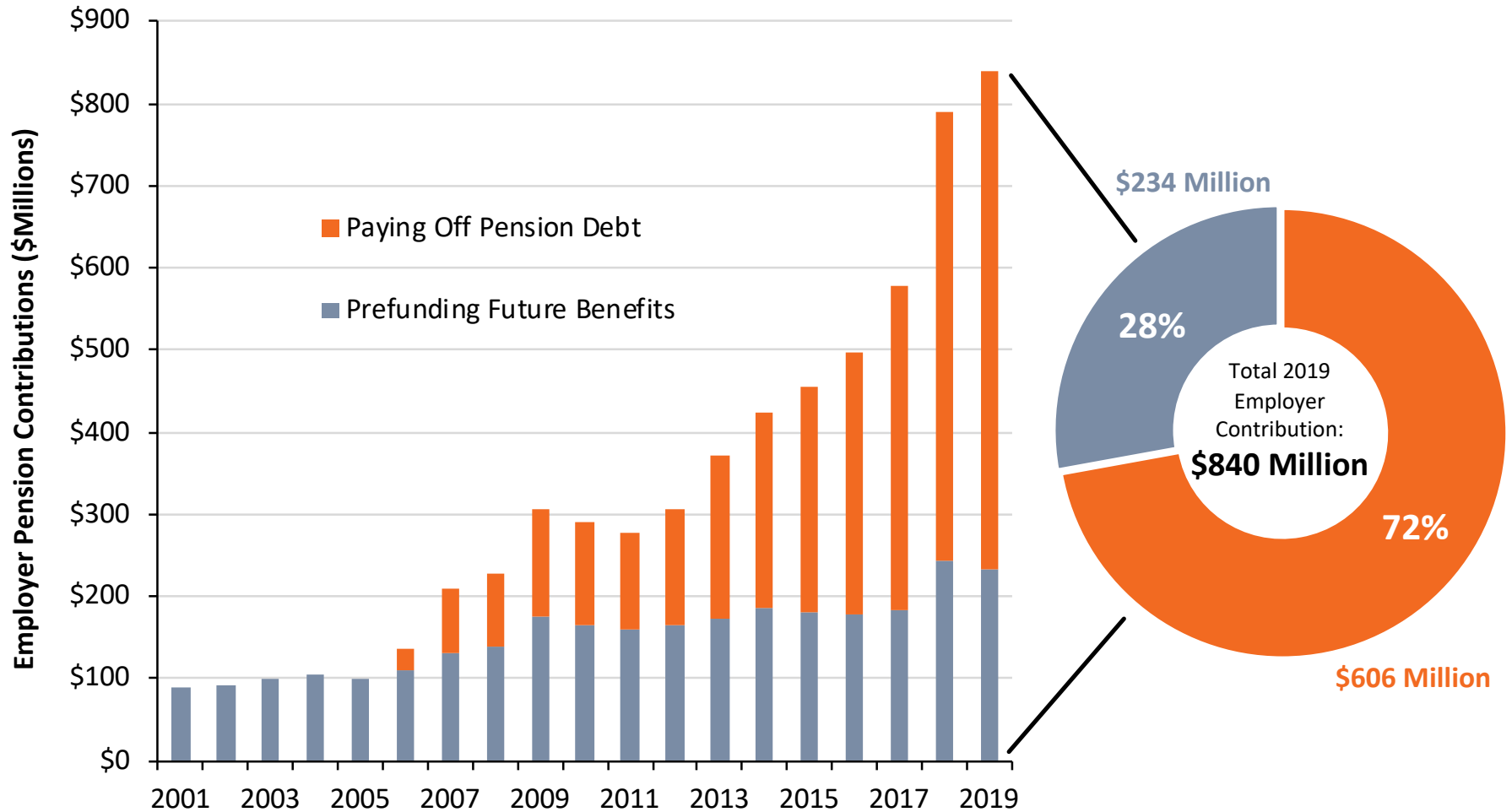
PSPRS Liabilities are Growing Faster than Assets



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



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

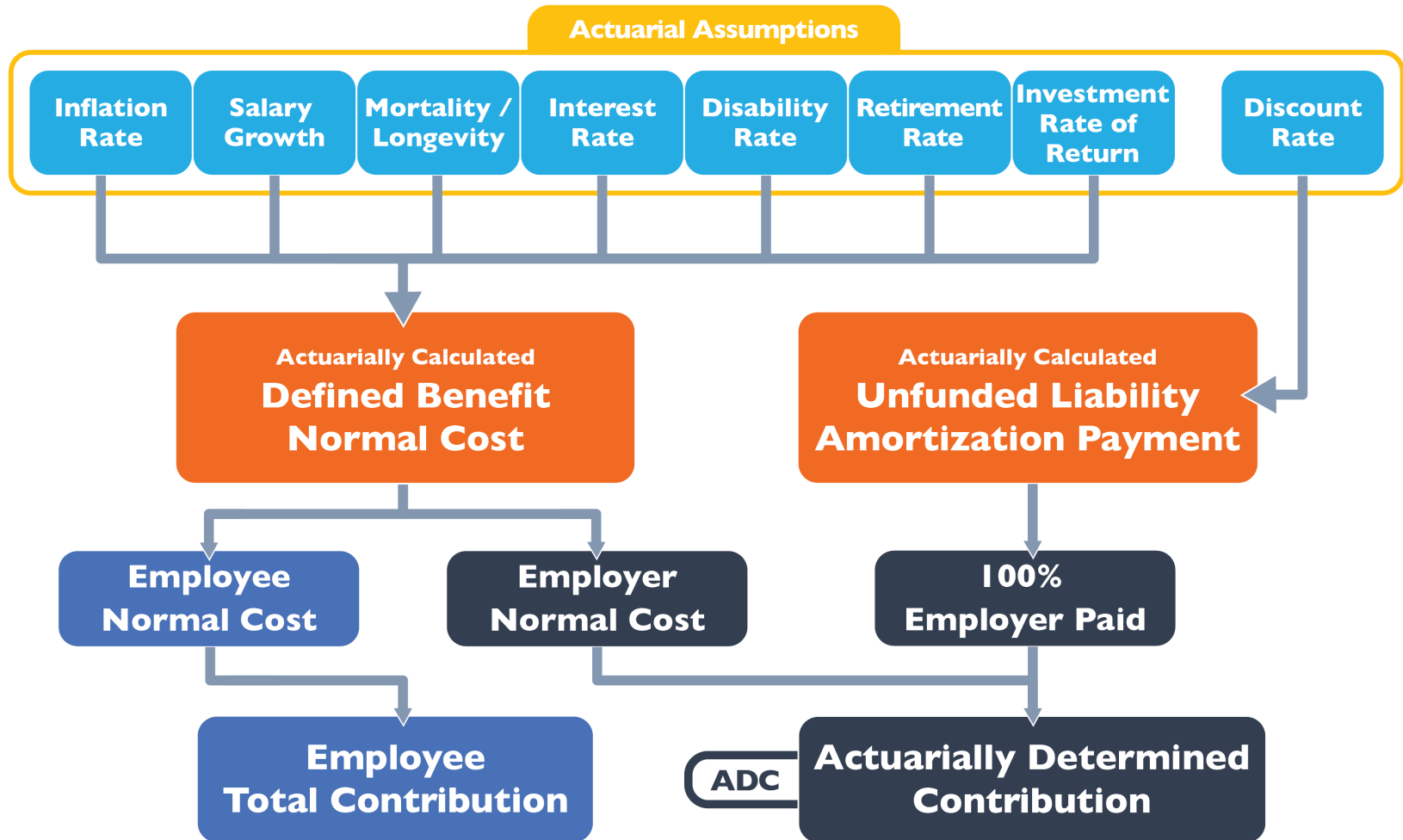
- PSPRS trustees voted to reduce the assumed rate of return to 7.30%.



CHALLENGES CURRENTLY FACING PSPRS

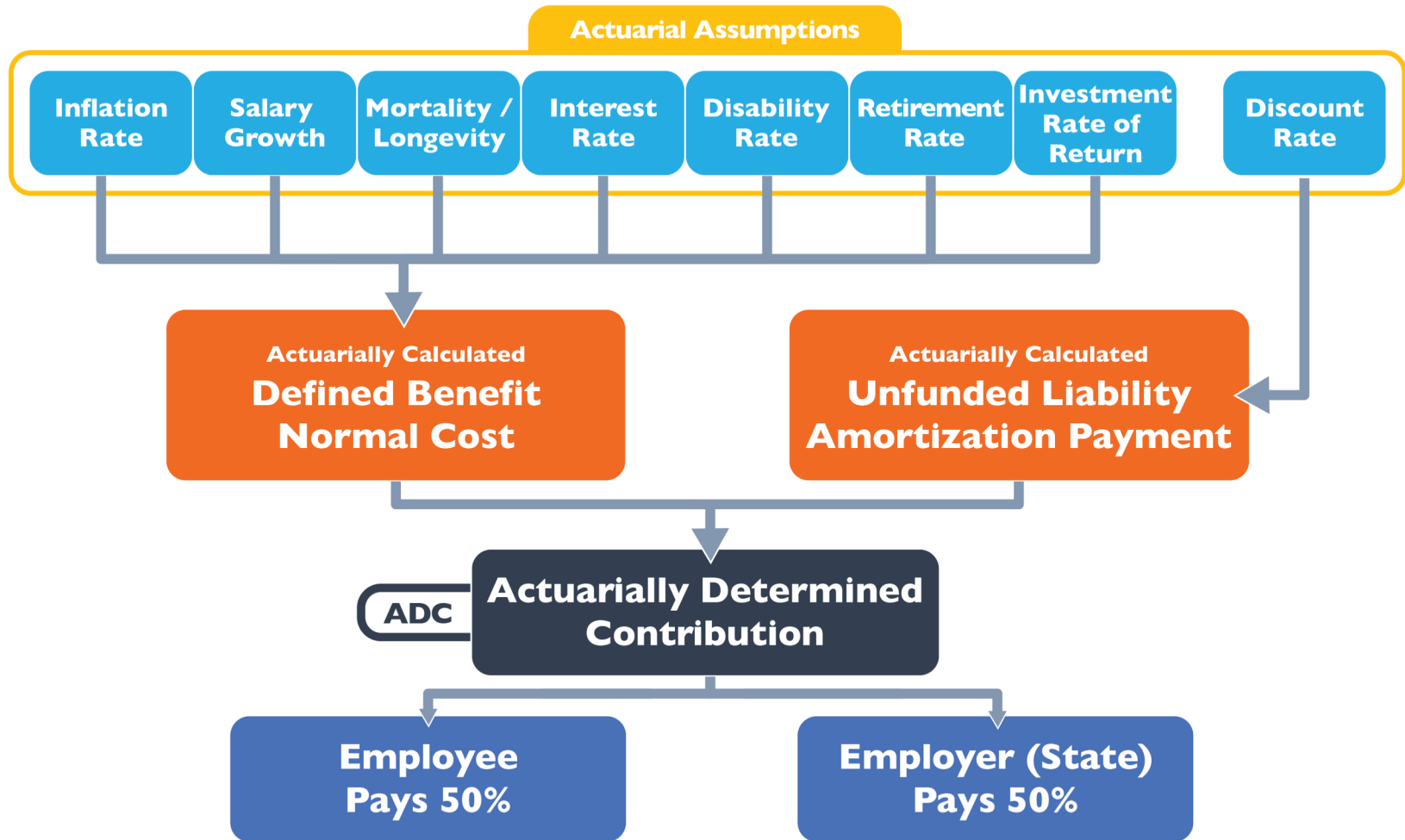


How PSPRS is Funded: Tiers 1 & 2





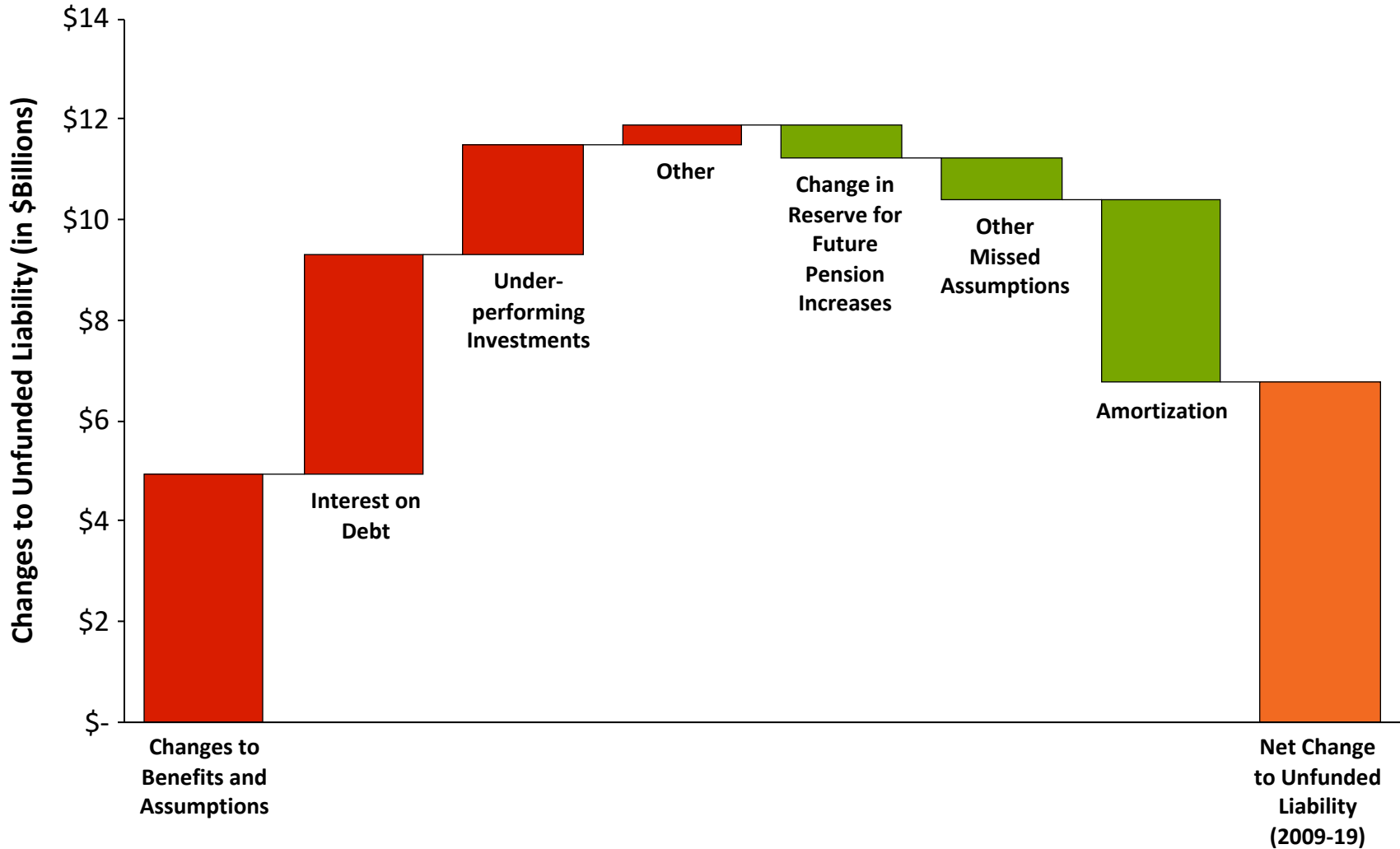
How PSPRS is Funded: Tier 3





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

- **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 elected to extend their amortization schedule to 30 years with 26 years remaining
- Phoenix elected to adopt a 25-year schedule with 21 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 Years Remaining	Number of Plans	Unfunded 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.

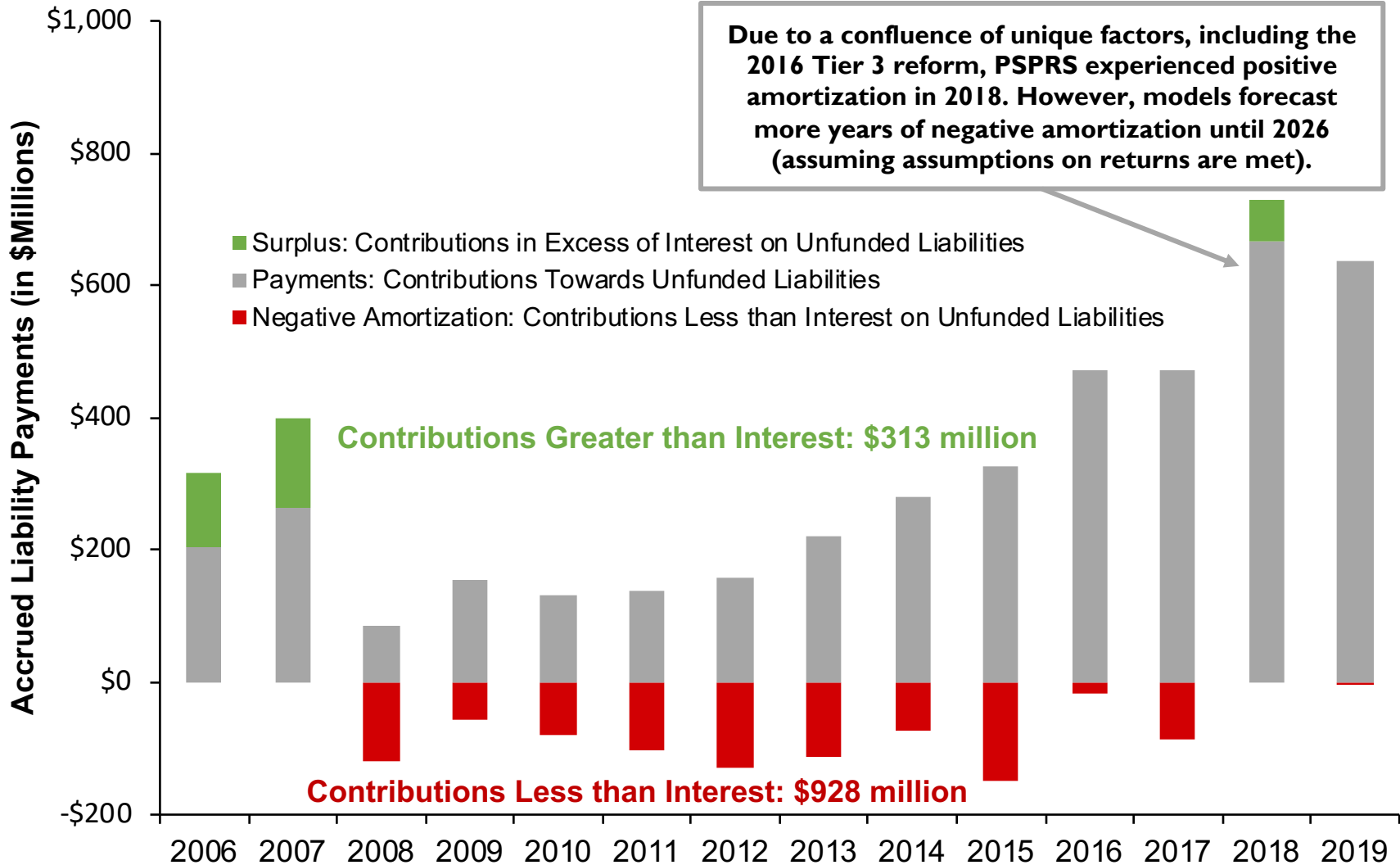
- What is level percent of payroll amortization?
 - Sets the amortization payment as a fixed share of total member payroll
 - Very sensitive to missed assumptions
 - Often results in back-loaded pension debt payments, especially if payroll growth slows
- What is level dollar amortization?
 - Sets the 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)

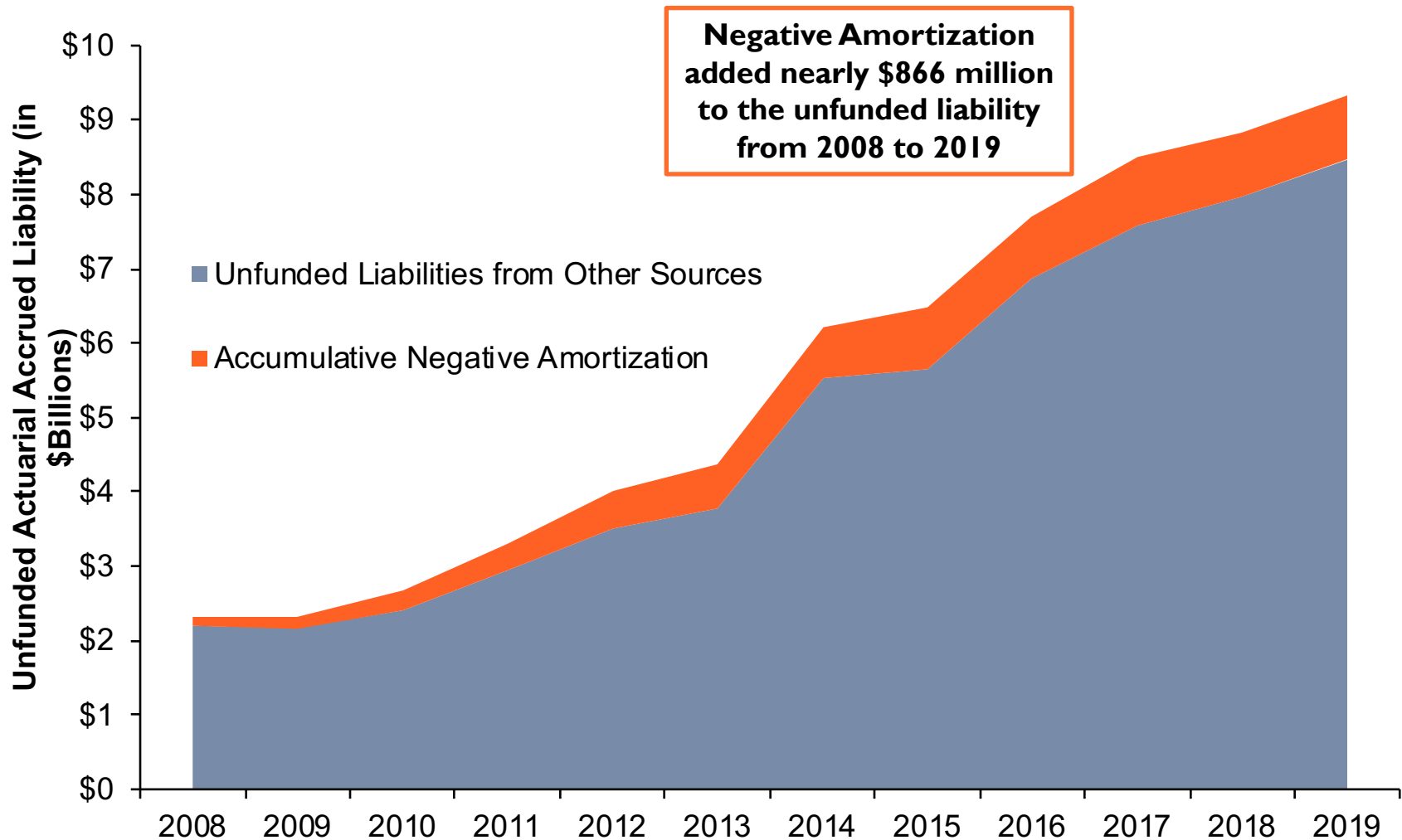
Interest on the Debt v. Accrued Liability Payments



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.



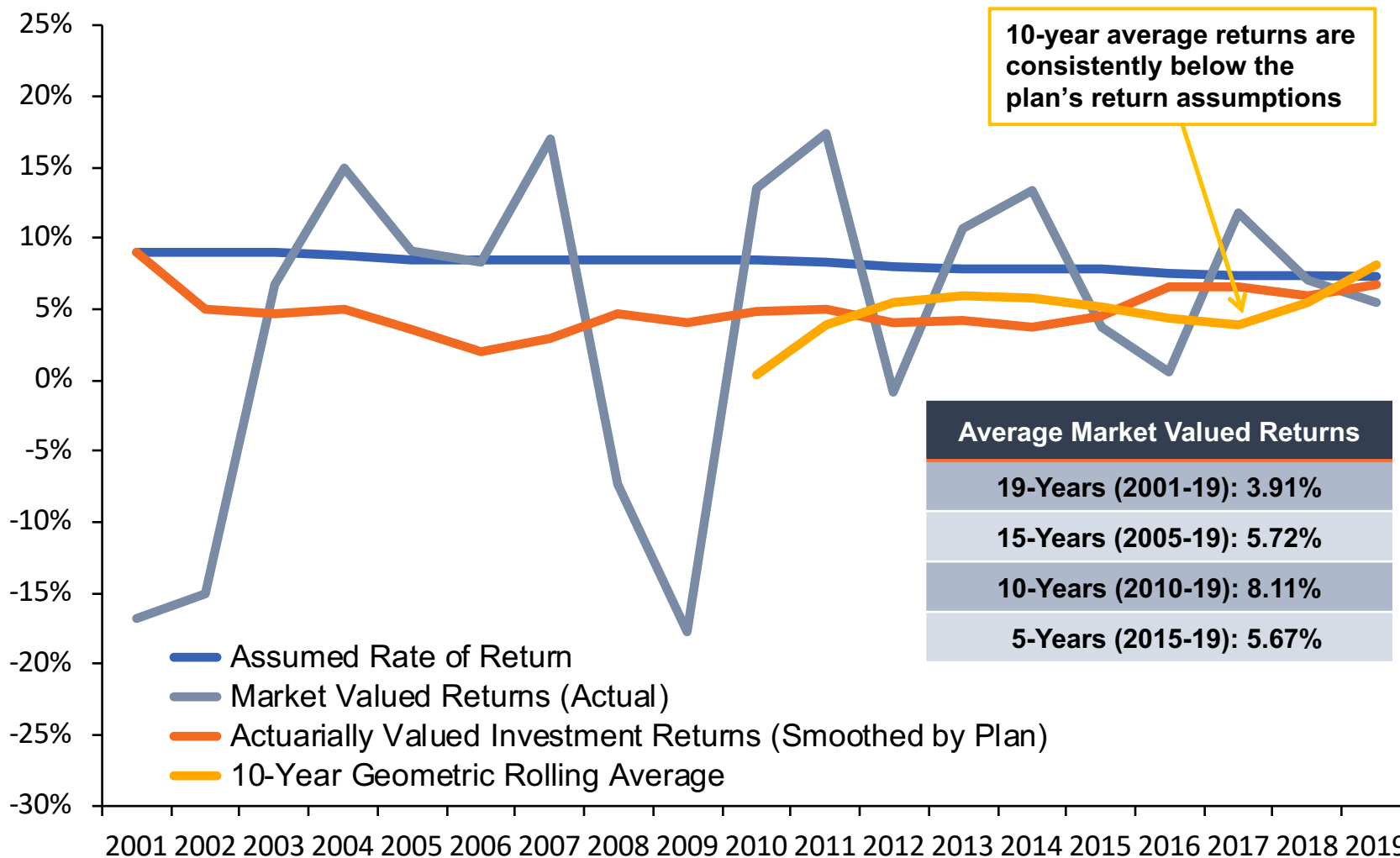
CHALLENGE 2: ASSUMED RATE OF RETURN

- **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



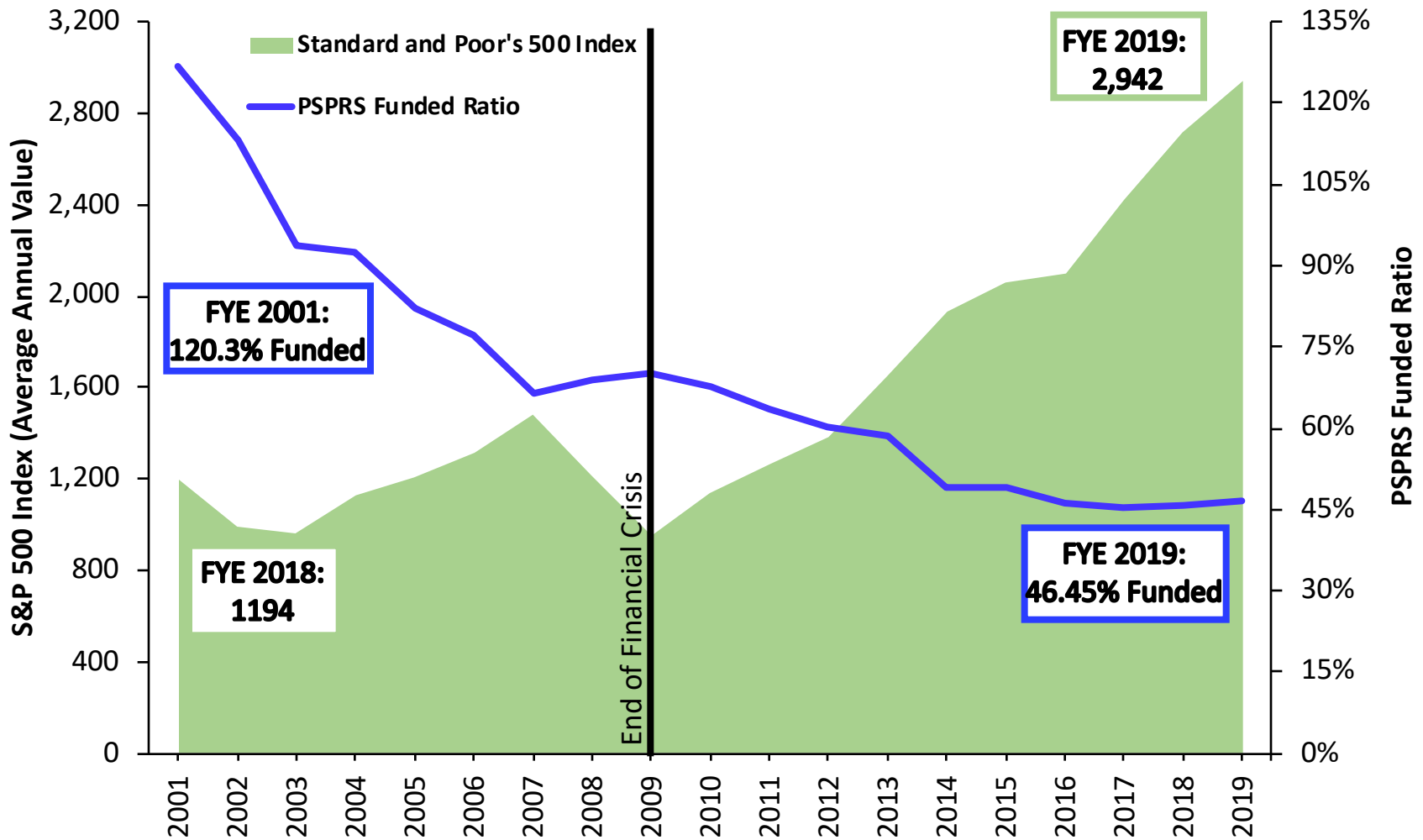
- Arizona PSPRS used above an 8% assumed rate of return on assets until 2013, despite significant market changes
- PSPRS has expanded its equity holdings in a search for greater investment returns (i.e. greater yields) over the past decade
- The investment portfolio's average returns have not matched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



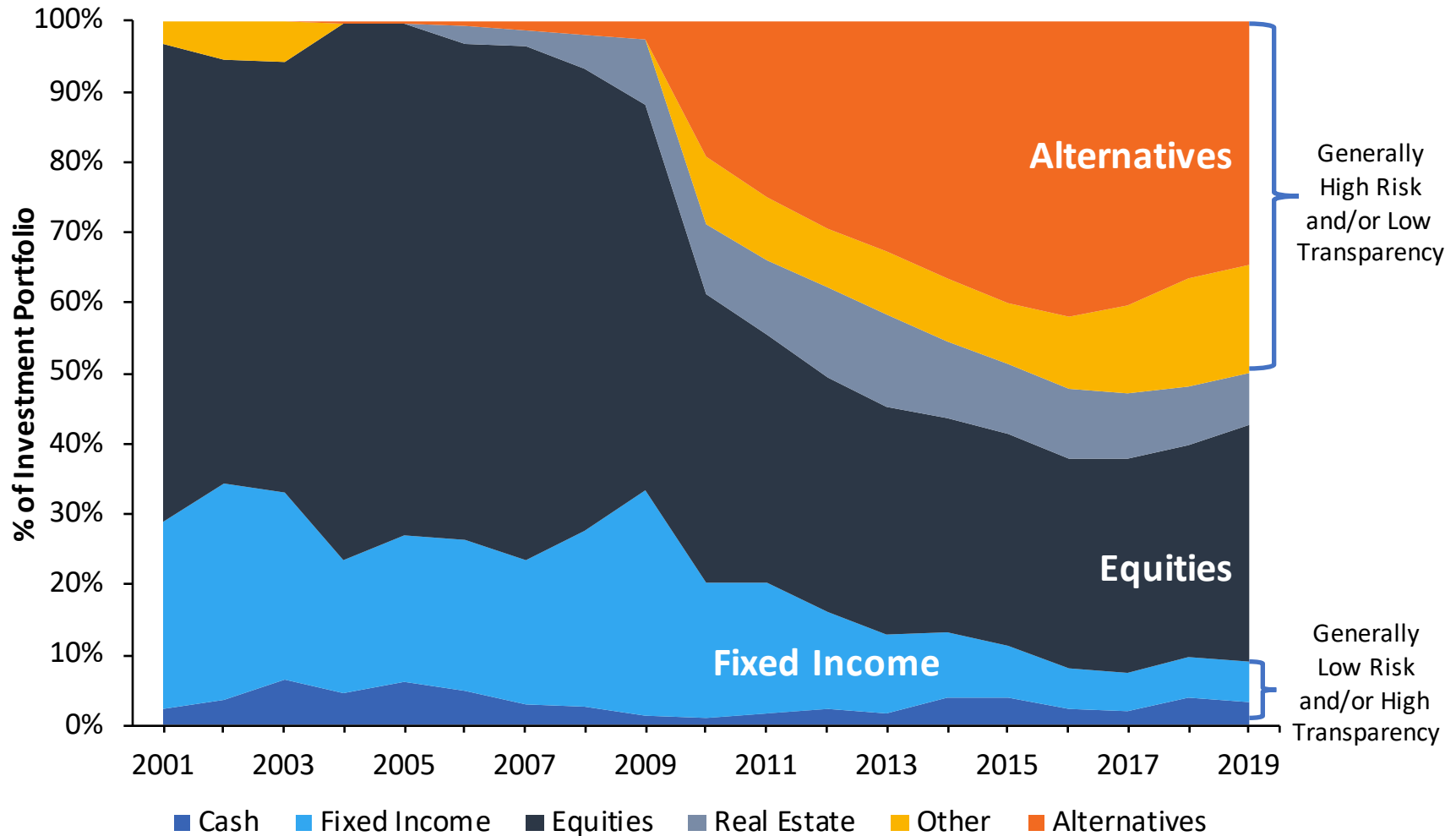
The “new normal” for institutional investing suggests that achieving even a 6% average rate of return is optimistic.

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

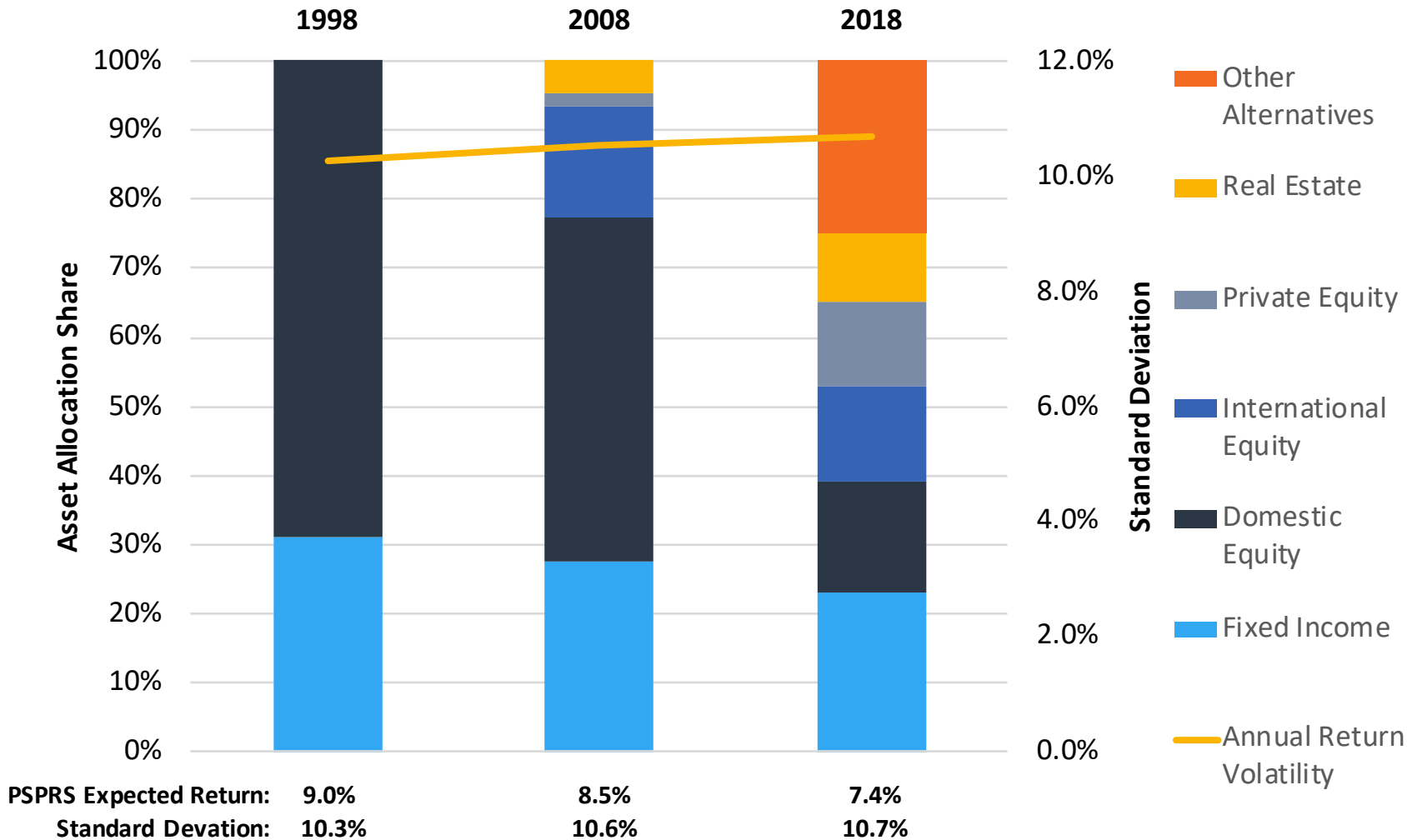


Source: Pension Integrity Project analysis of Arizona PSPRS actuarial valuation reports and CAFRS.



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

- 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:

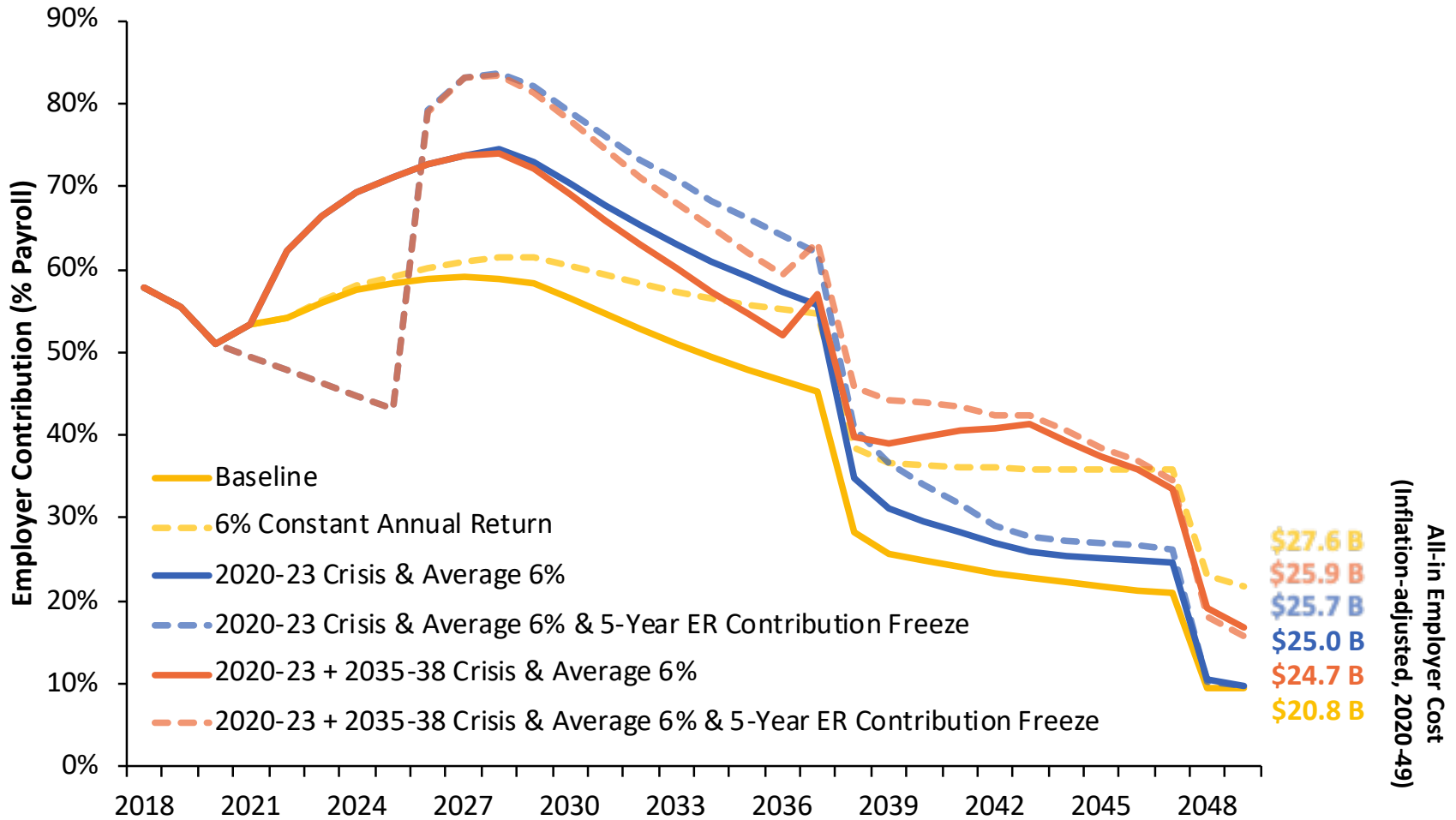
1. 6% Constant Annual Return
2. 2020-23 Crisis + Average 6.0% Long-Term
3. 2020-23 Crisis + 2035-38 Crisis + Average 6.0% Long-Term
4. Scenario 2 + 5-Year Employer Contribution Freeze
5. Scenario 3 + 5-Year Employer Contribution Freeze



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

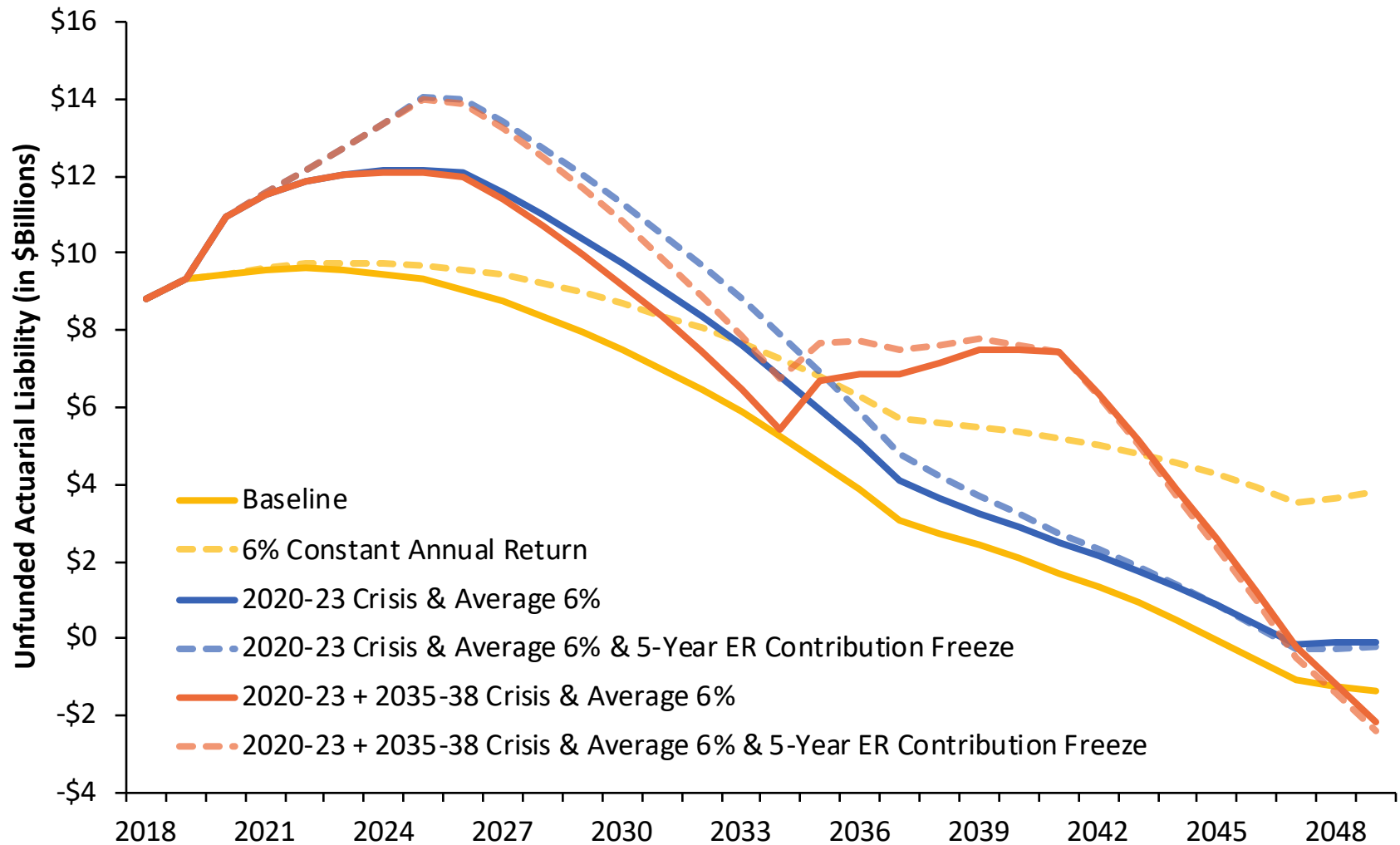
Scenarios	30-Year Employer Contributions	2049 Unfunded Market Liability	Total All-in Employer Costs
Pre-Crisis Baseline	\$21.3 B	\$(0.5) B	\$20.8 B
6% Constant Annual Return	\$25.4 B	\$2.2 B	\$27.6 B
2020-23 Crisis + Average 6%	\$25.5 B	\$(0.5) B	\$25.0 B
Two Crises + Average 6%	\$27.6 B	\$(0.3) B	\$25.3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

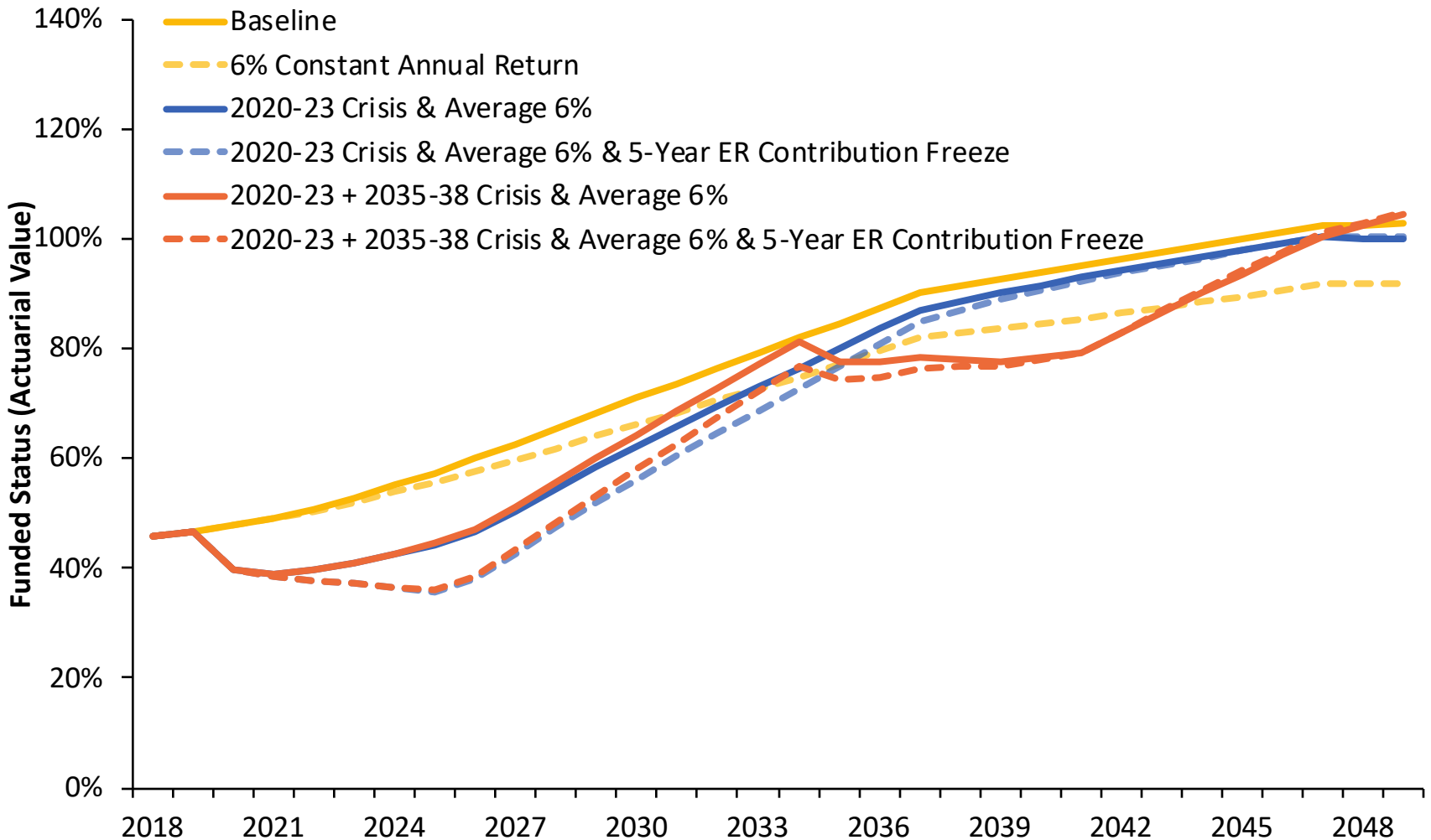


Source: Pension Integrity Project actuarial forecast of PSPRS. State is assumed to make 100% actuarially required contributions. The “All-in Cost” includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by the end of the forecast period.

PSPRS Stress Testing: Funded Ratio Projections

Crisis Scenarios Slow Progress to Full Funding

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



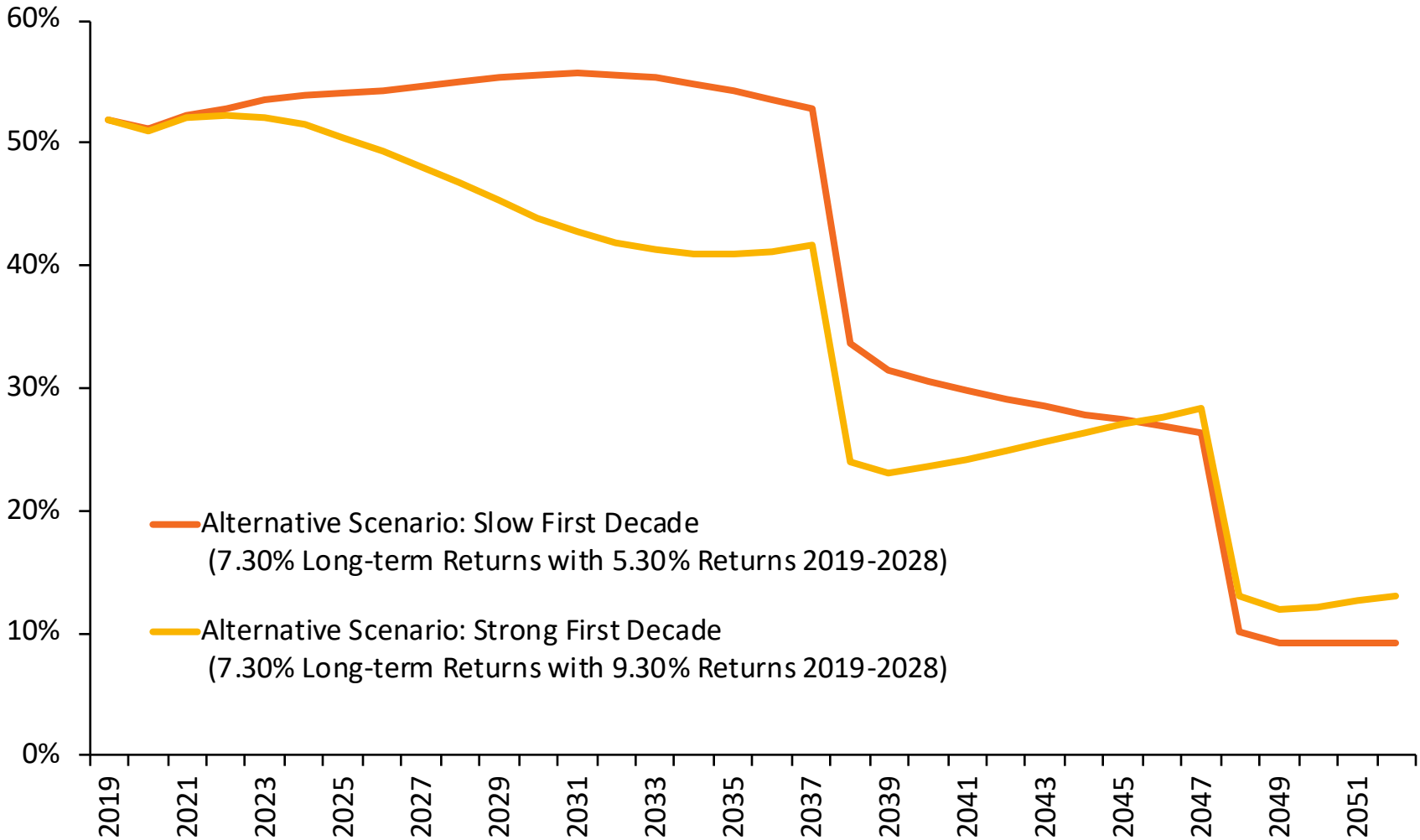
Source: Pension Integrity Project actuarial forecast of PSPRS. State is assumed to make 100% actuarially required contributions. The “All-in Cost” includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by the end of the forecast period.



30-year Employer Contribution Forecast

Timing of Returns Affects What PSPRS Employers Pay

Long-Term Average Returns of 7.30%

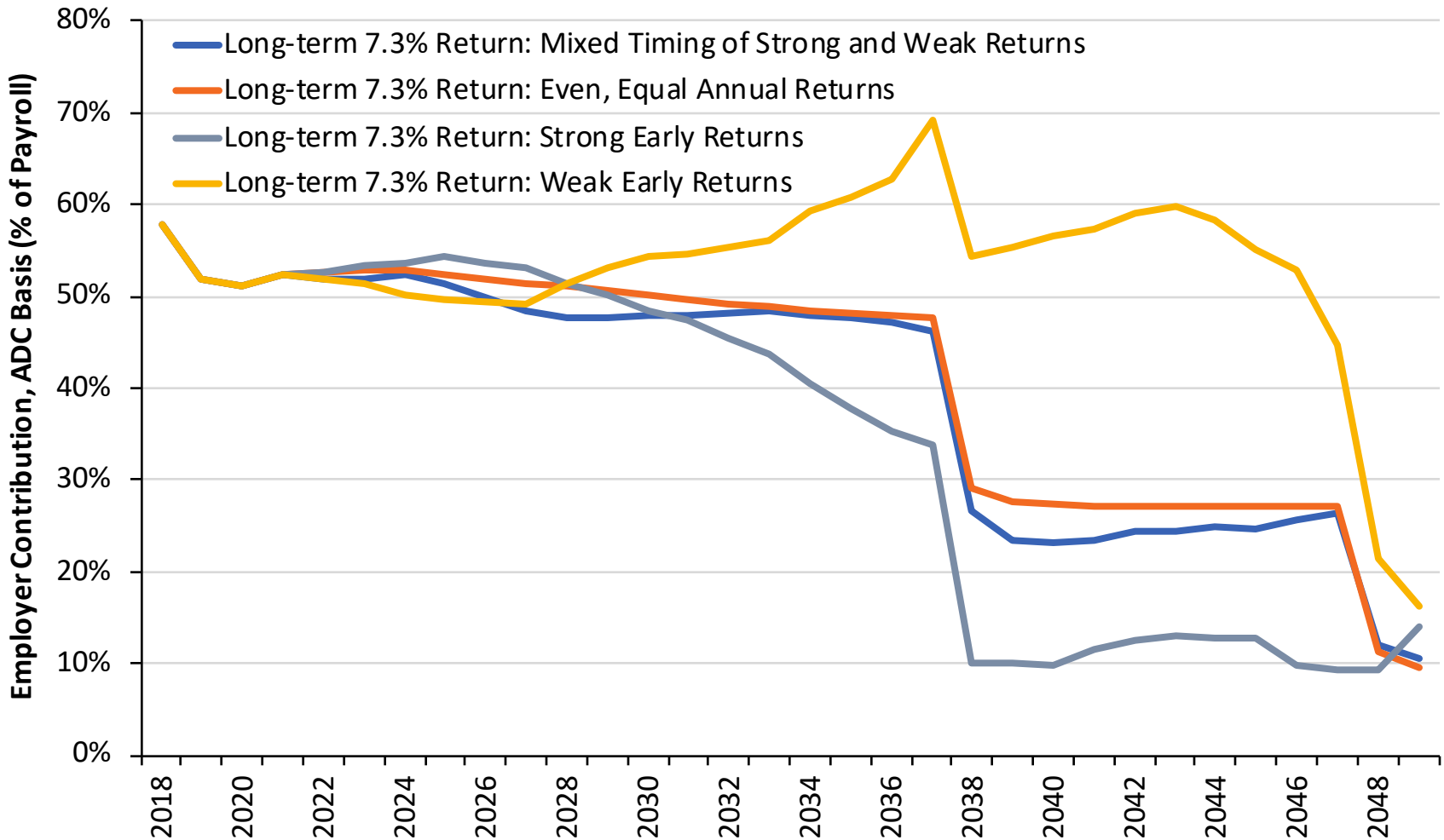


Source: Pension Integrity Project actuarial forecast of PSPRS.



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

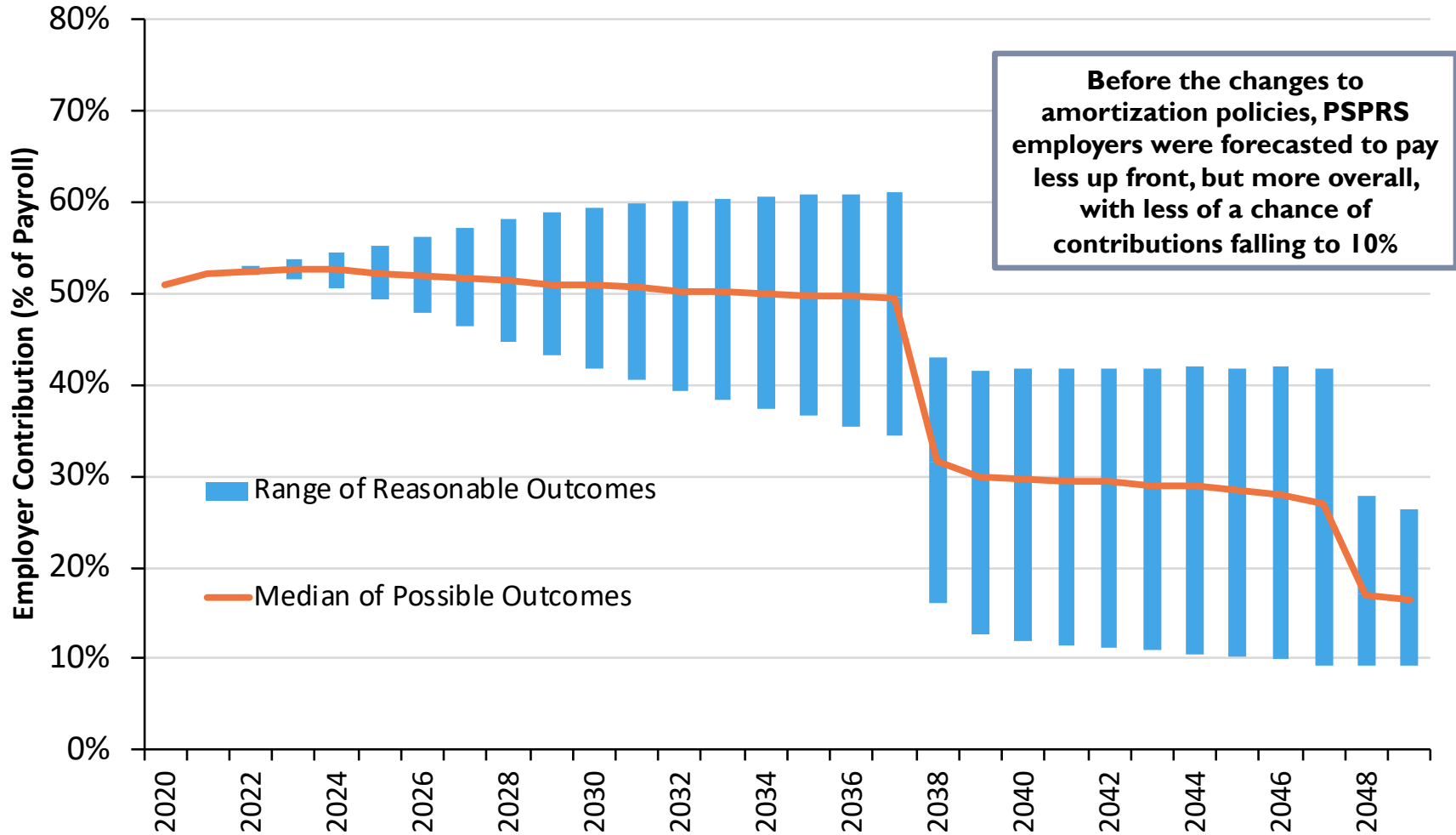
Why use it?

- 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%

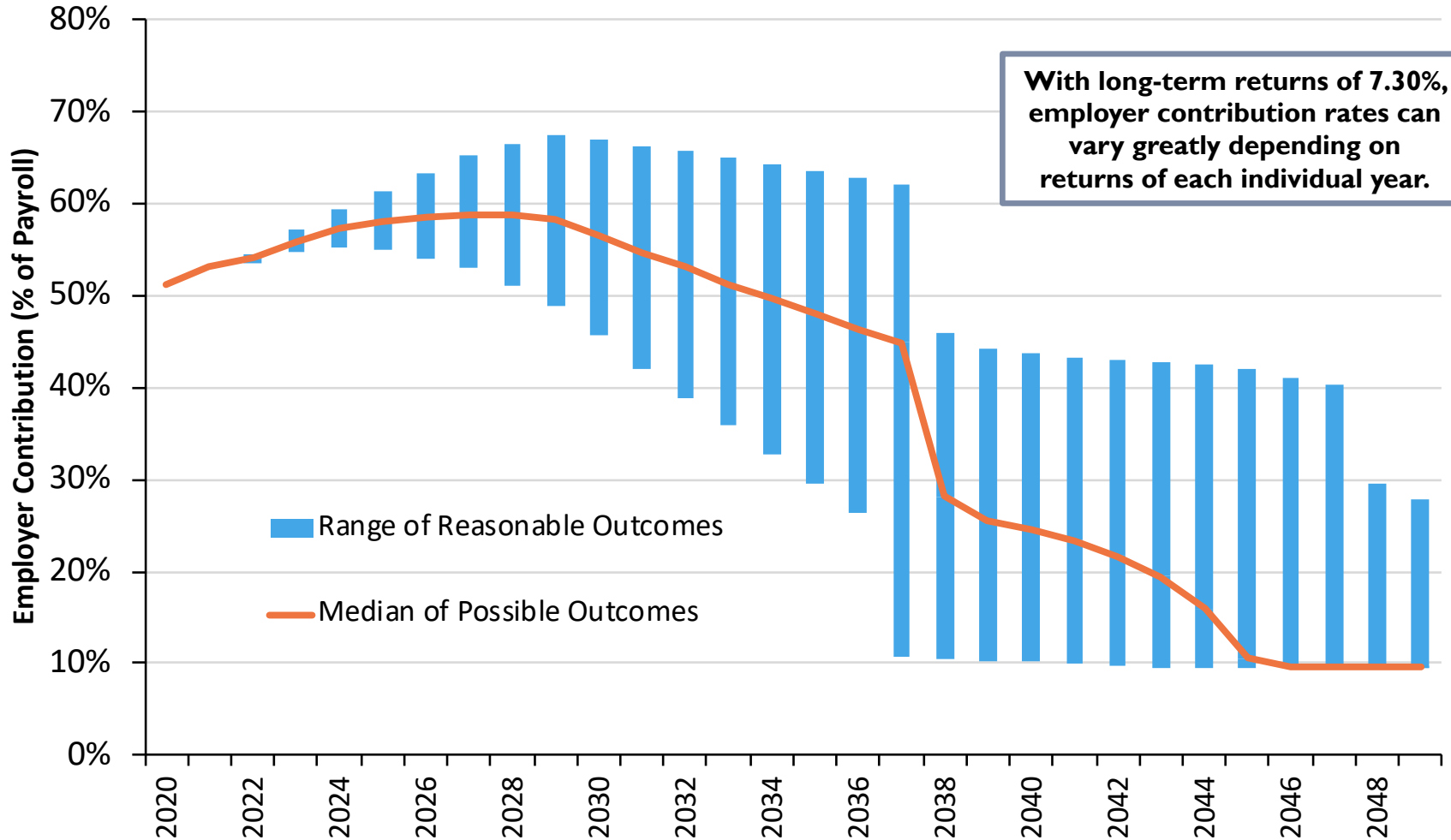


Source: Pension Integrity Project actuarial forecast of PSPRS plan based on PSPRS return and risk assumptions.
 Range of Reasonable Outcomes represents the 50% of possible outcomes closest to the median.

30-year Employer Contribution Forecast

If PSPRS Performs as Expected, Rates Can Still Vary

Based on Long-term Average Returns of 7.30%

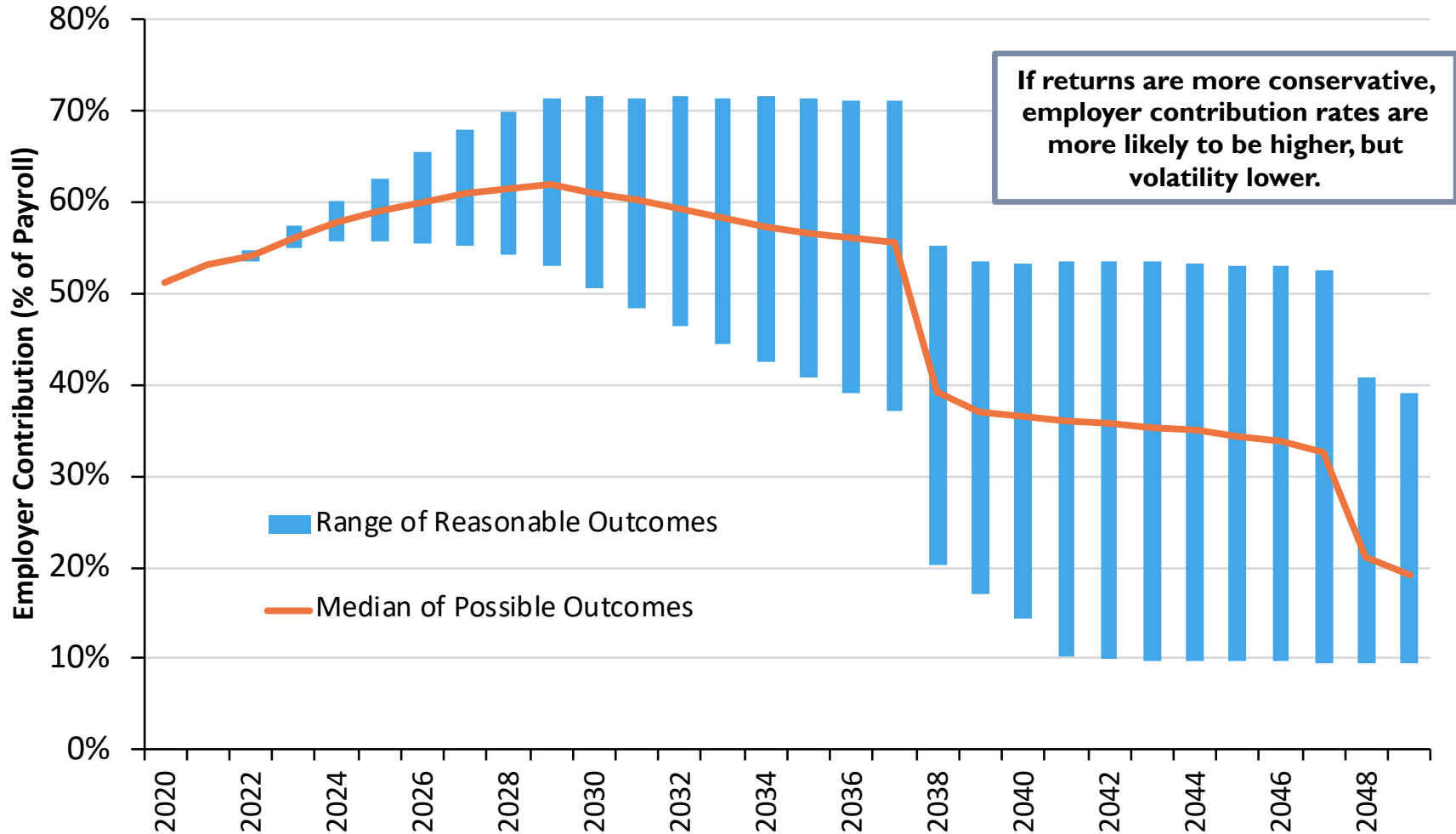


Source: Pension Integrity Project actuarial forecast of PSPRS plan based on PSPRS return and risk assumptions.
 Range of Reasonable Outcomes represents the 50% of possible outcomes closest to the median.

30-year Employer Contribution Forecast

If PSPRS Underperforms, Expect Higher Contribution Rates

Based on More Conservative Long-term Average Returns



If returns are more conservative, employer contribution rates are more likely to be higher, but volatility lower.

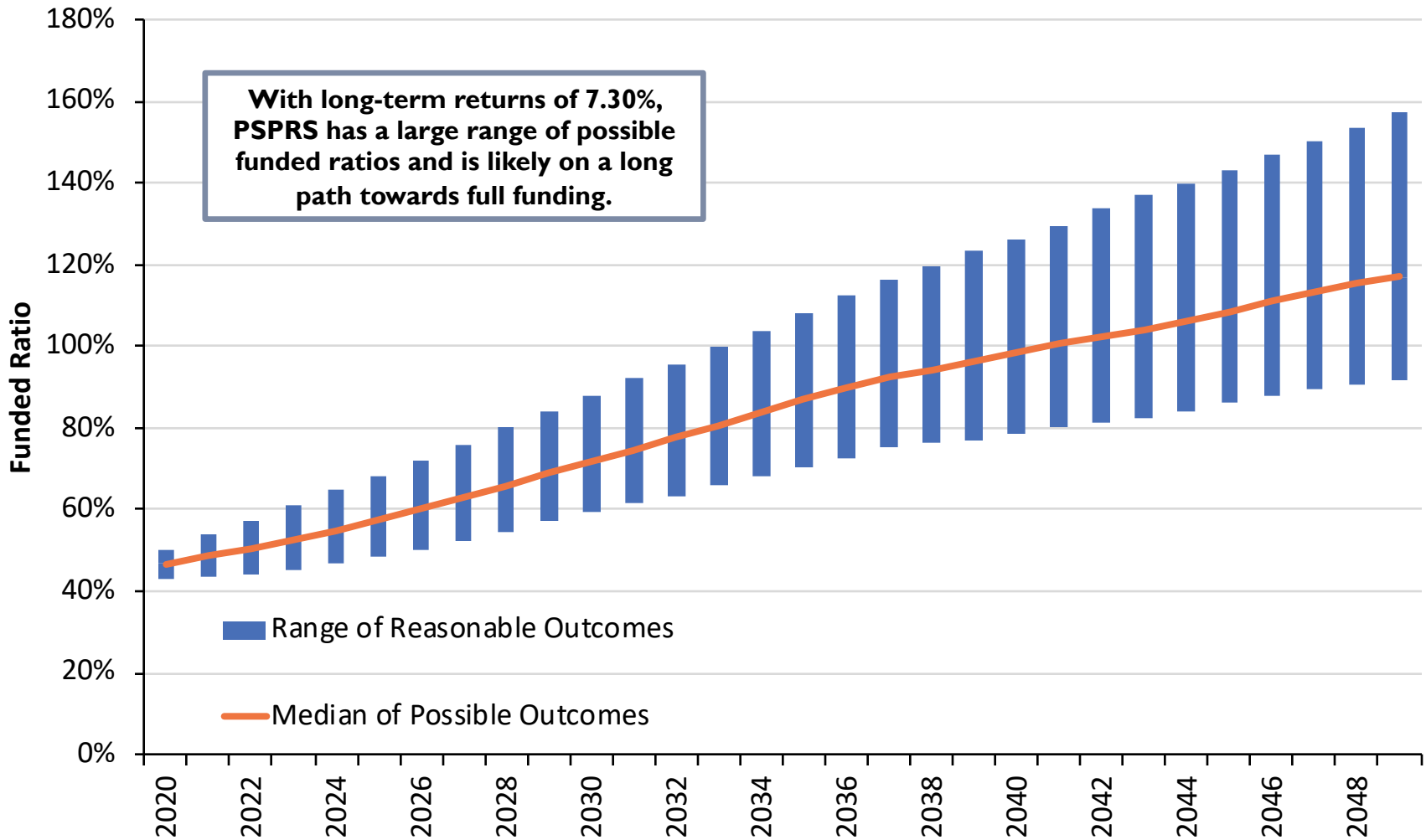
Source: Pension Integrity Project actuarial forecast of PSPRS plan based on PSPRS return and risk assumptions.

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%

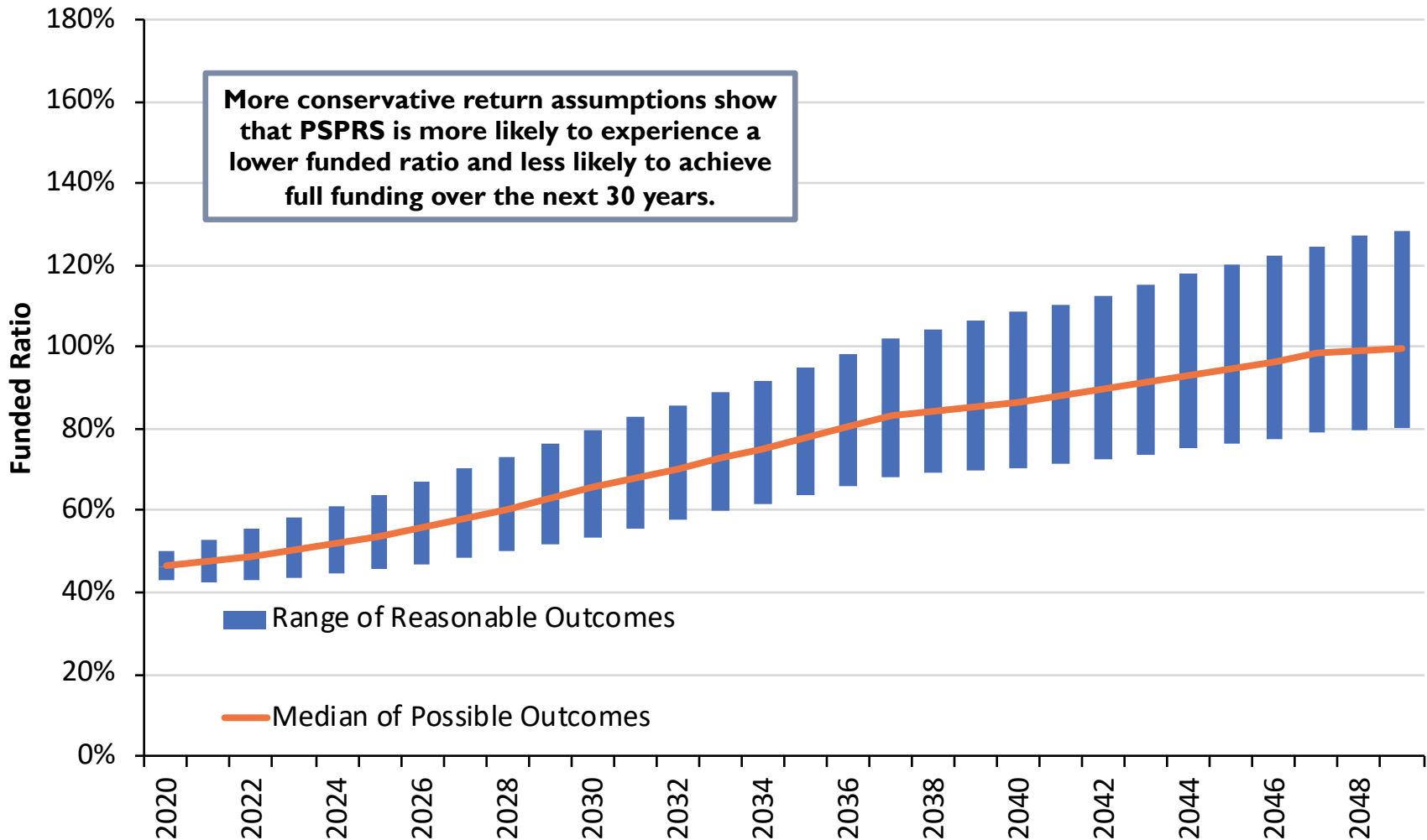


Source: Pension Integrity Project actuarial forecast of PSPRS plan based on PSPRS return and risk assumptions.
 Range of Reasonable Outcomes represents the 50% of possible outcomes closest to the median.

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
7.4% Assumed Return (FYE 2018 Baseline)	22.60%	14.95%	7.65%
7.3% Assumed Return (FYE 2019 Baseline)	23.09%	15.44%	7.65%
7.0% Assumed Return	24.63%	16.98%	7.65%
6.0% 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

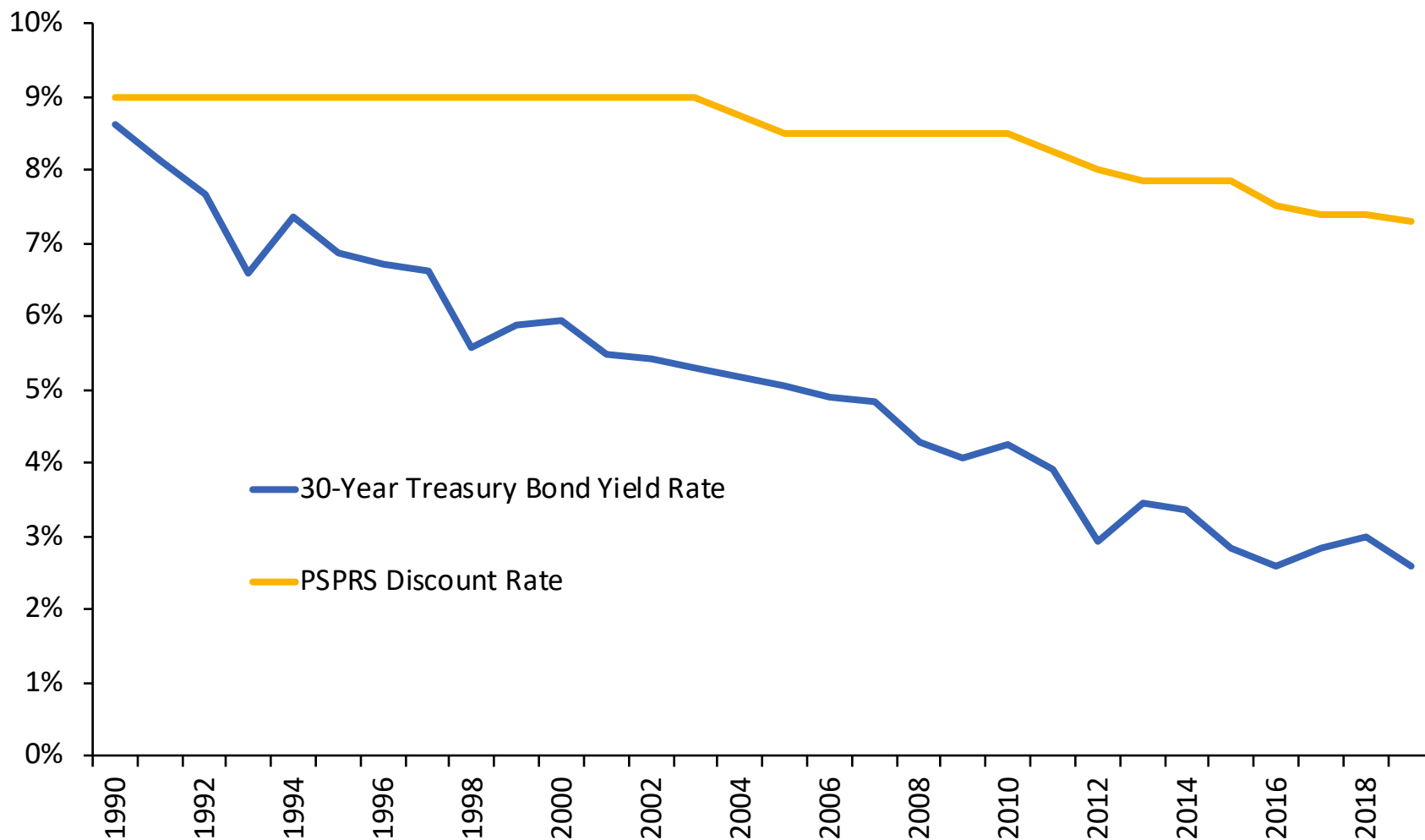
FYE 2018 Liability Under Varying Discount Rates



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

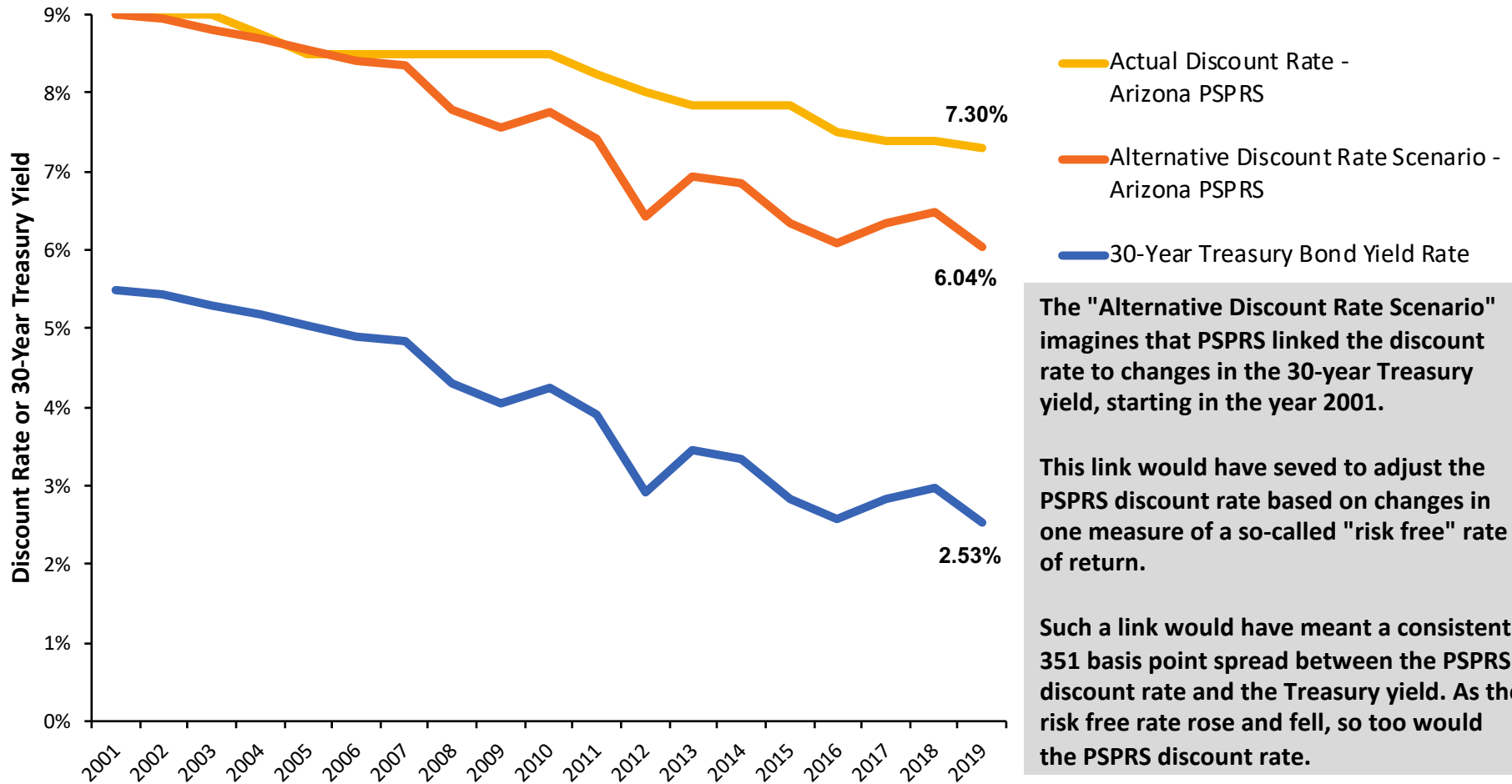
Source: Pension Integrity Project analysis of PSPRS GASB Statements. Figures are rounded.

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)



The "Alternative Discount Rate Scenario" imagines that PSPRS linked the discount rate to changes in the 30-year Treasury yield, starting in the year 2001.

This link would have served to adjust the PSPRS discount rate based on changes in one measure of a so-called "risk free" rate of return.

Such a link would have meant a consistent 351 basis point spread between the PSPRS discount rate and the Treasury yield. As the risk free rate rose and fell, so too would the PSPRS discount rate.

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



COUNTERFACTUAL ANALYSIS OF 2016 REFORM

- 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

- 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

- 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 a higher 25-year amortization policy and other employers opting to use a 30-year 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
\$15.207 billion	\$15.066 billion	The expected outcome is that the reforms will save PSPRS employers \$141 million 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.



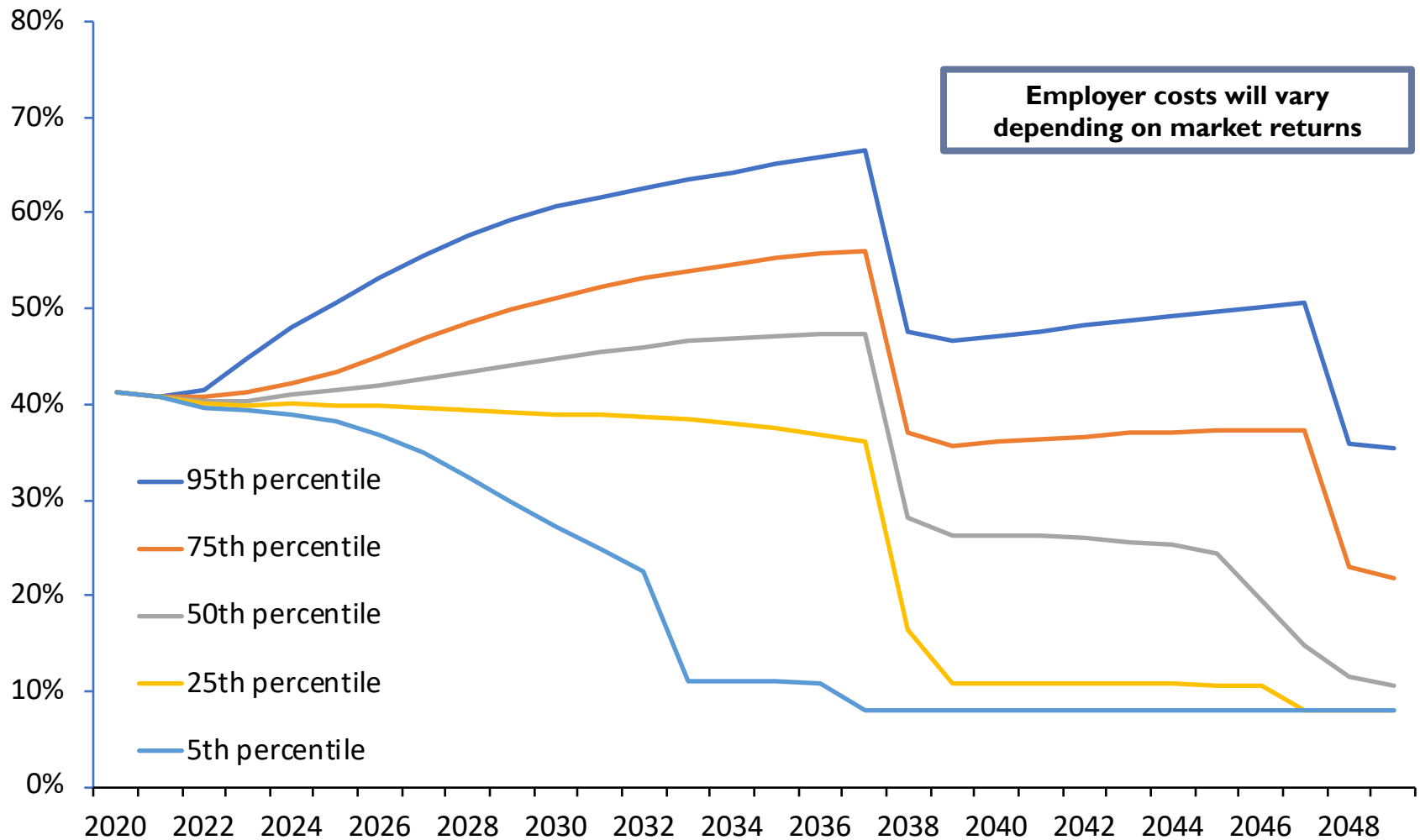
Comparison in Employer Cost

- 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

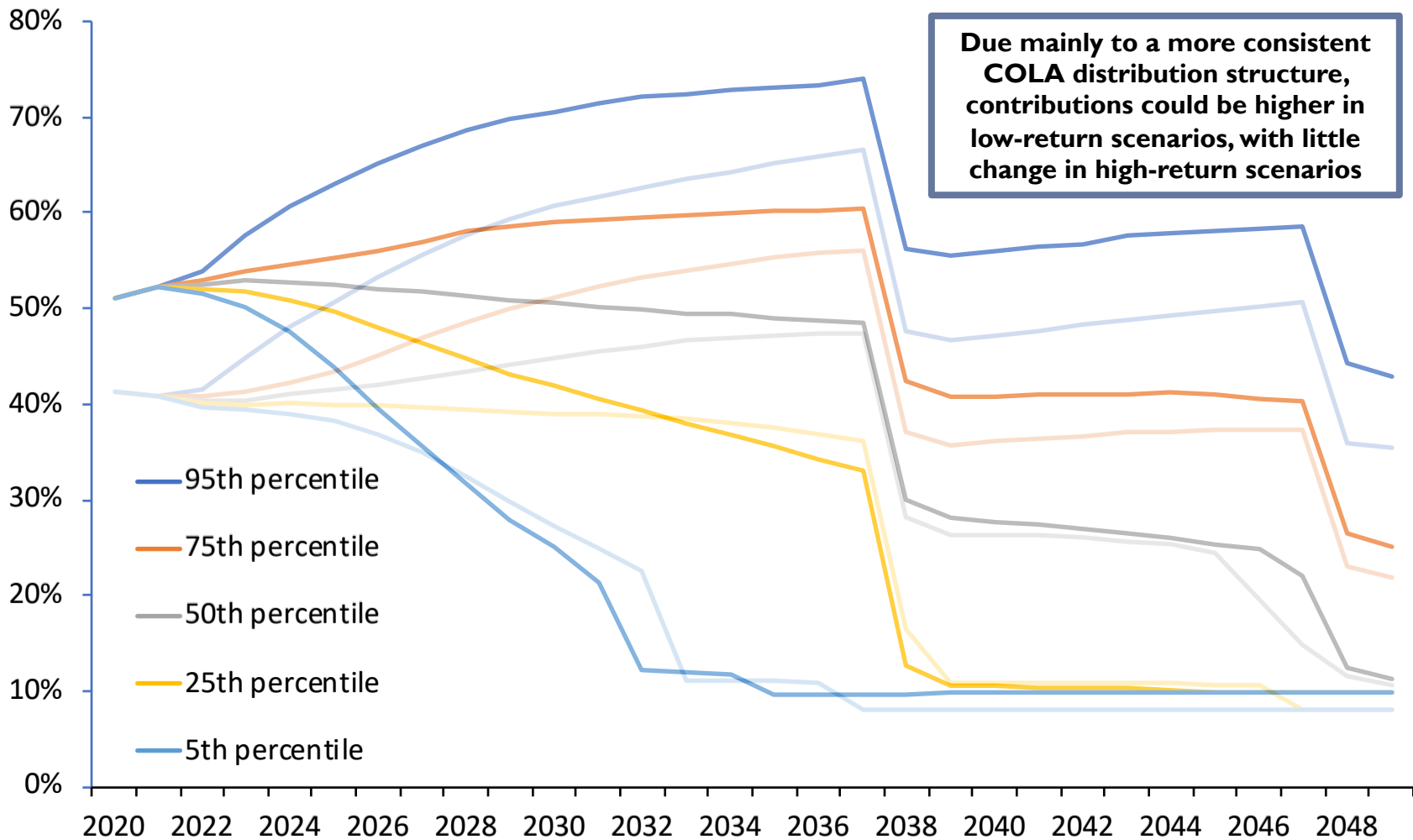
Shown as a Percentage of Payroll



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

Employer Contribution Scenarios: post-reforms

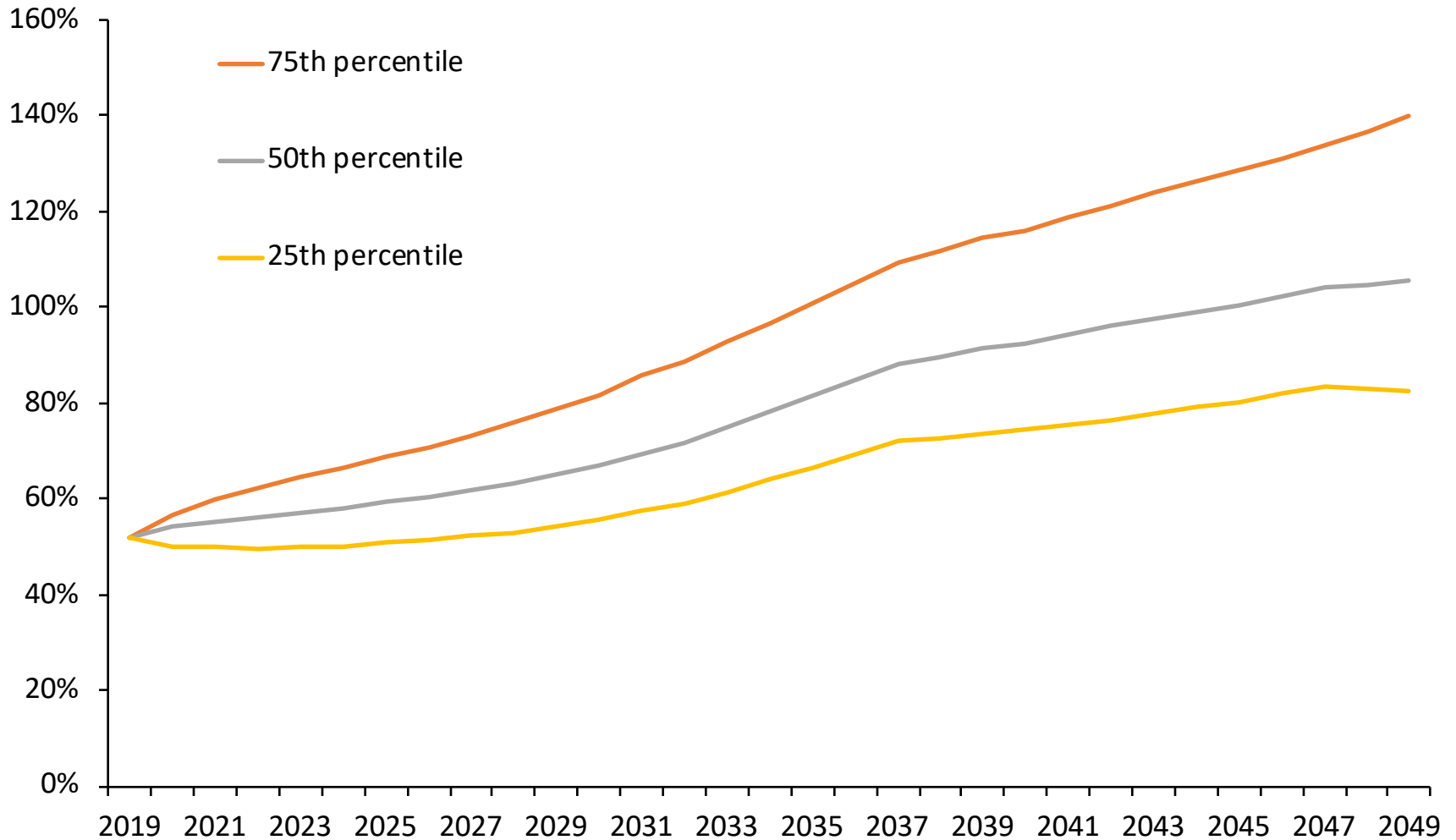
Shown as a Percentage of Payroll



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



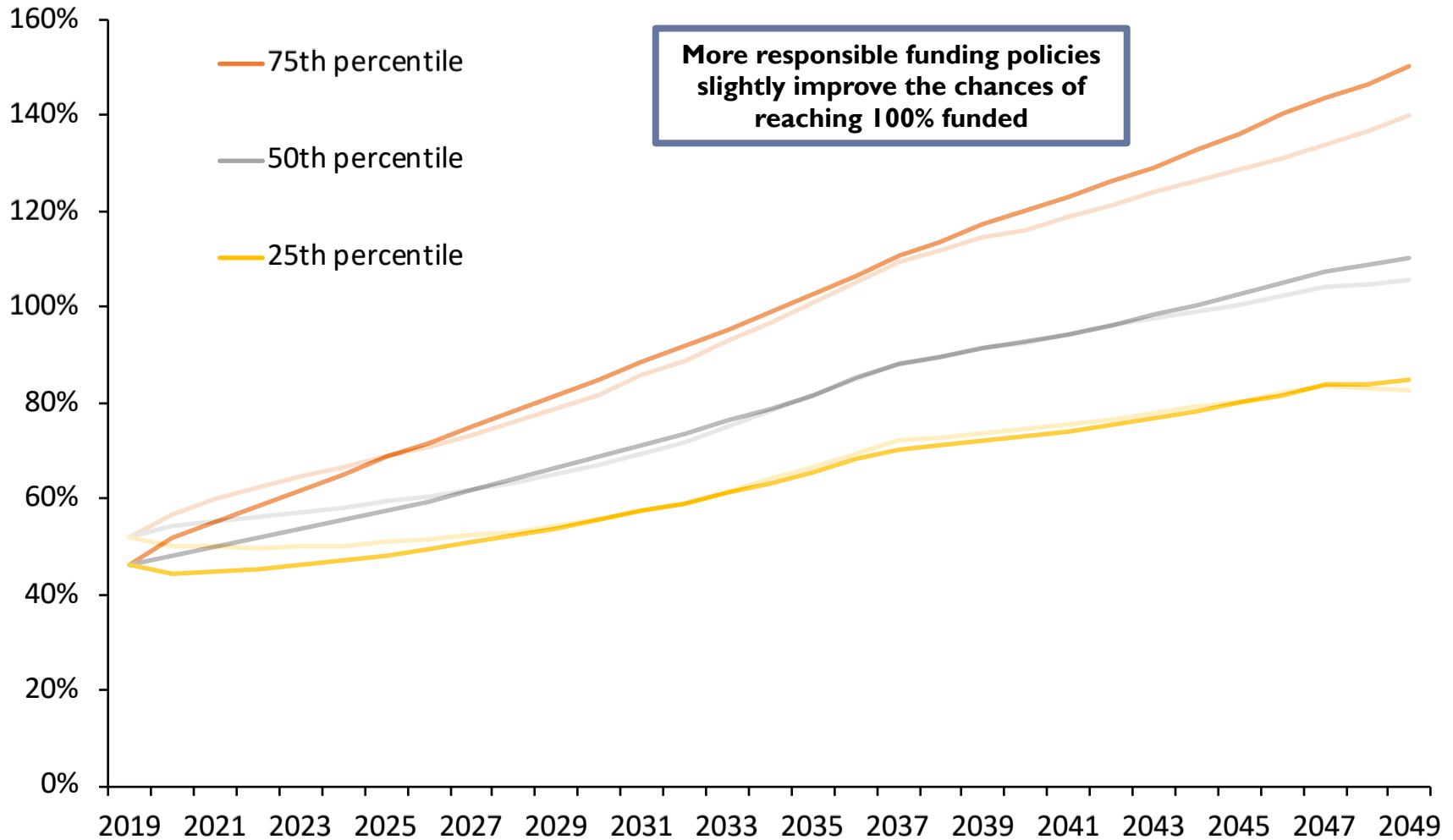
PSPRS Funding Scenarios: pre-reforms



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

- Comparative Risk Analysis



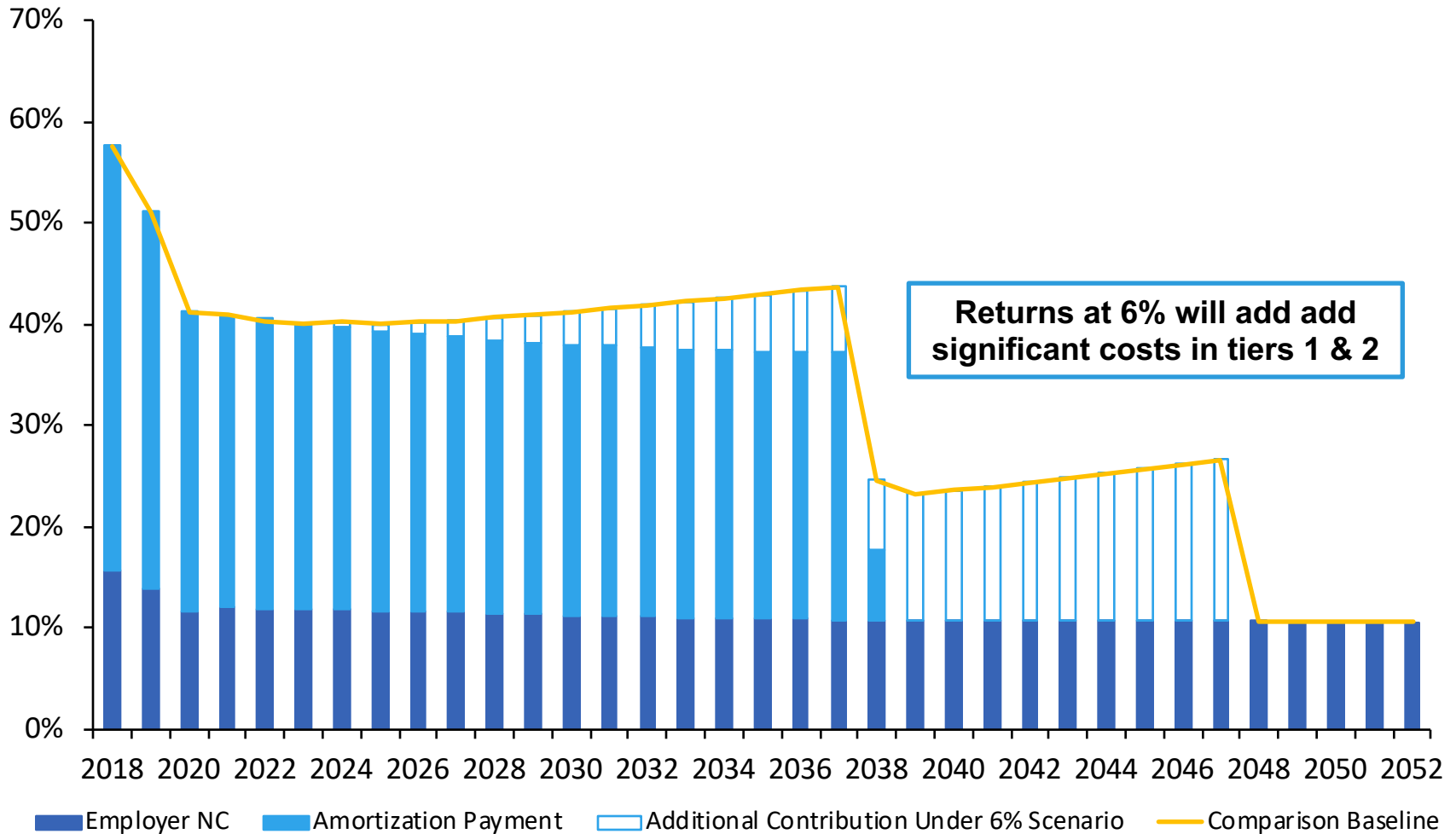
Changes in Employer Risk

- 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

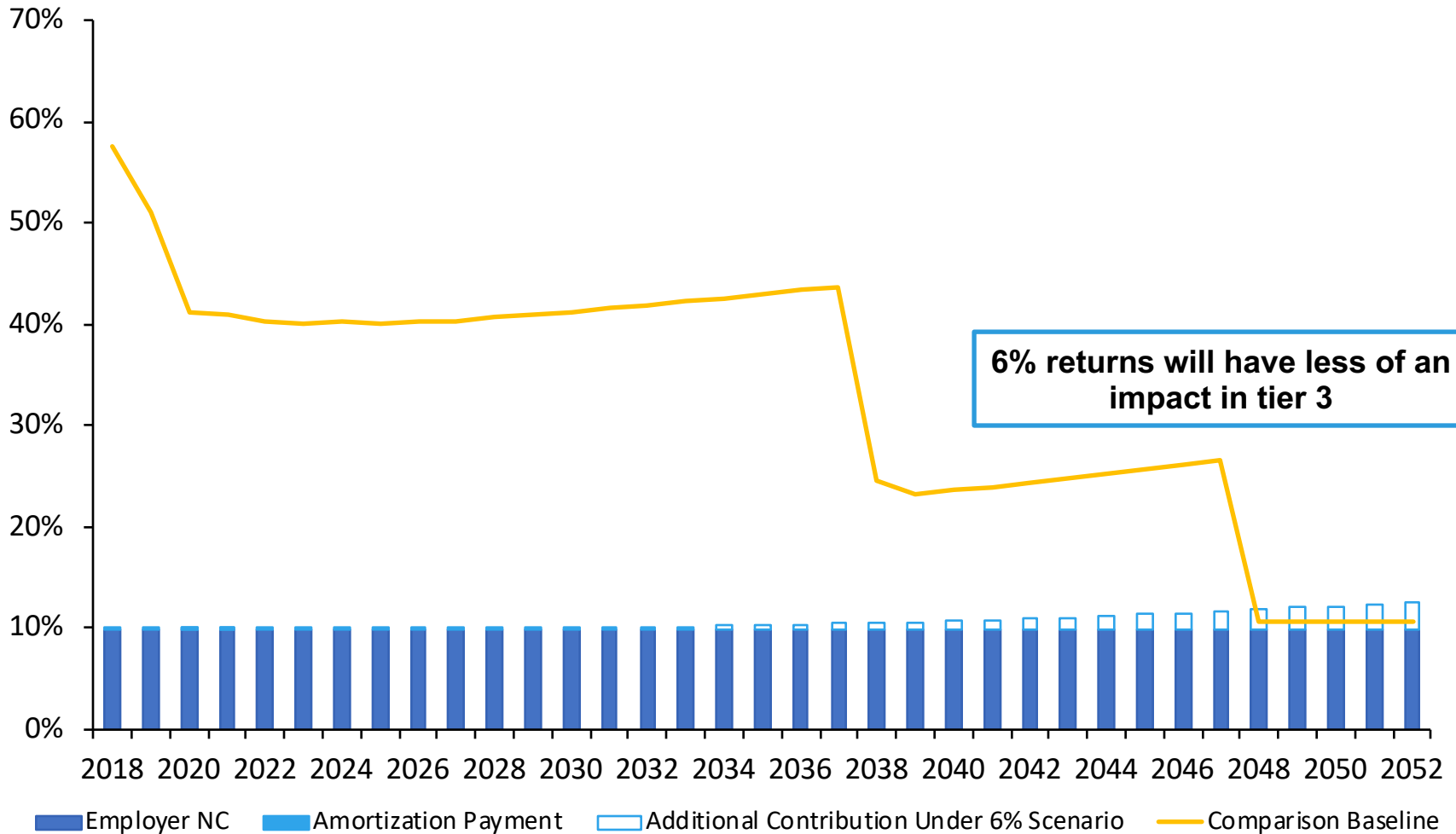


Source: Pension Integrity Project actuarial forecast of Arizona PSPRS.



PSPRS Tier 3 Employer Contributions

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

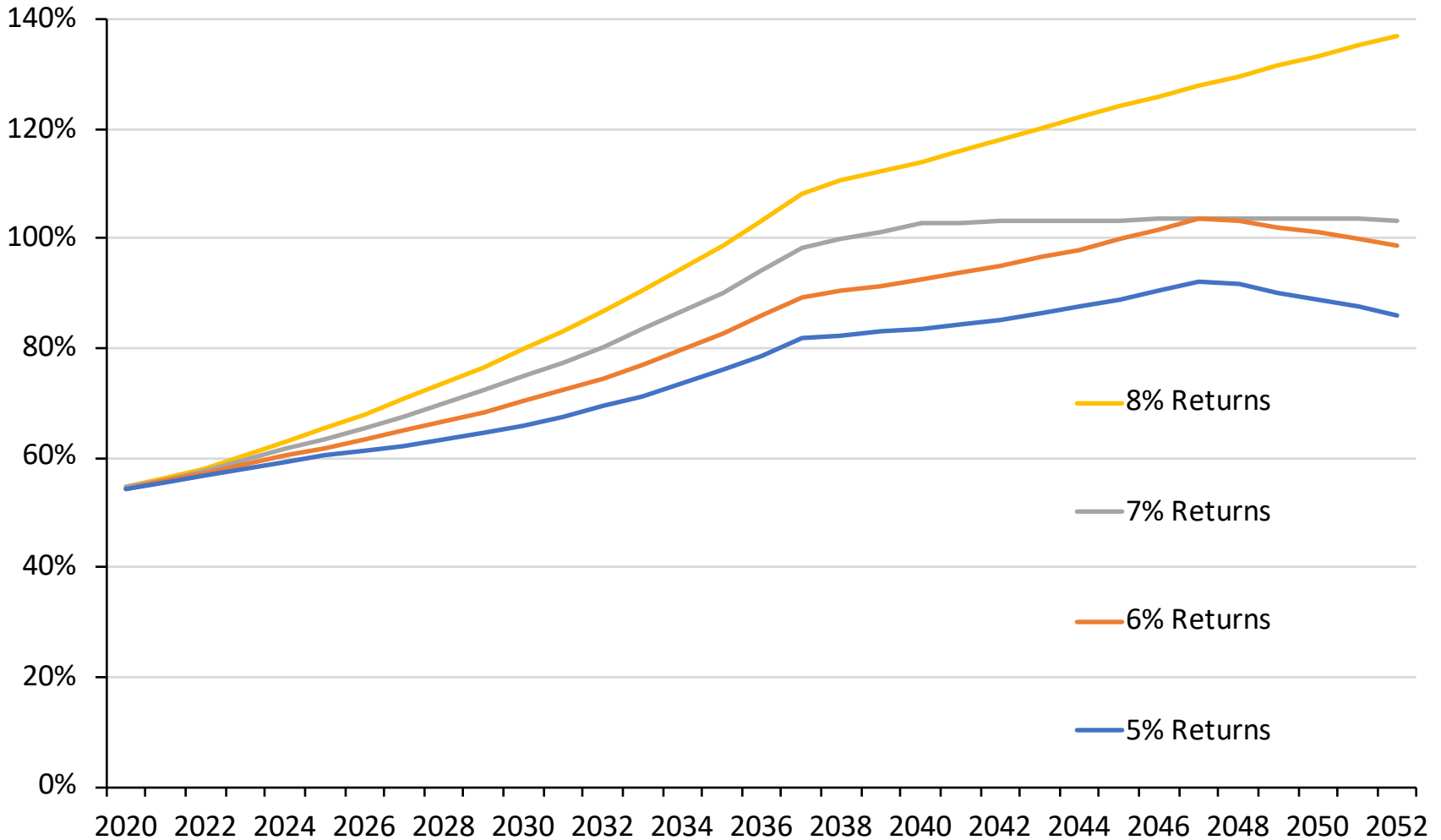


Source: Pension Integrity Project actuarial forecast of Arizona PSPRS.



PSPRS Tiers 1 & 2 Funding Stress Test

Forecasted funded ratios under various return scenarios

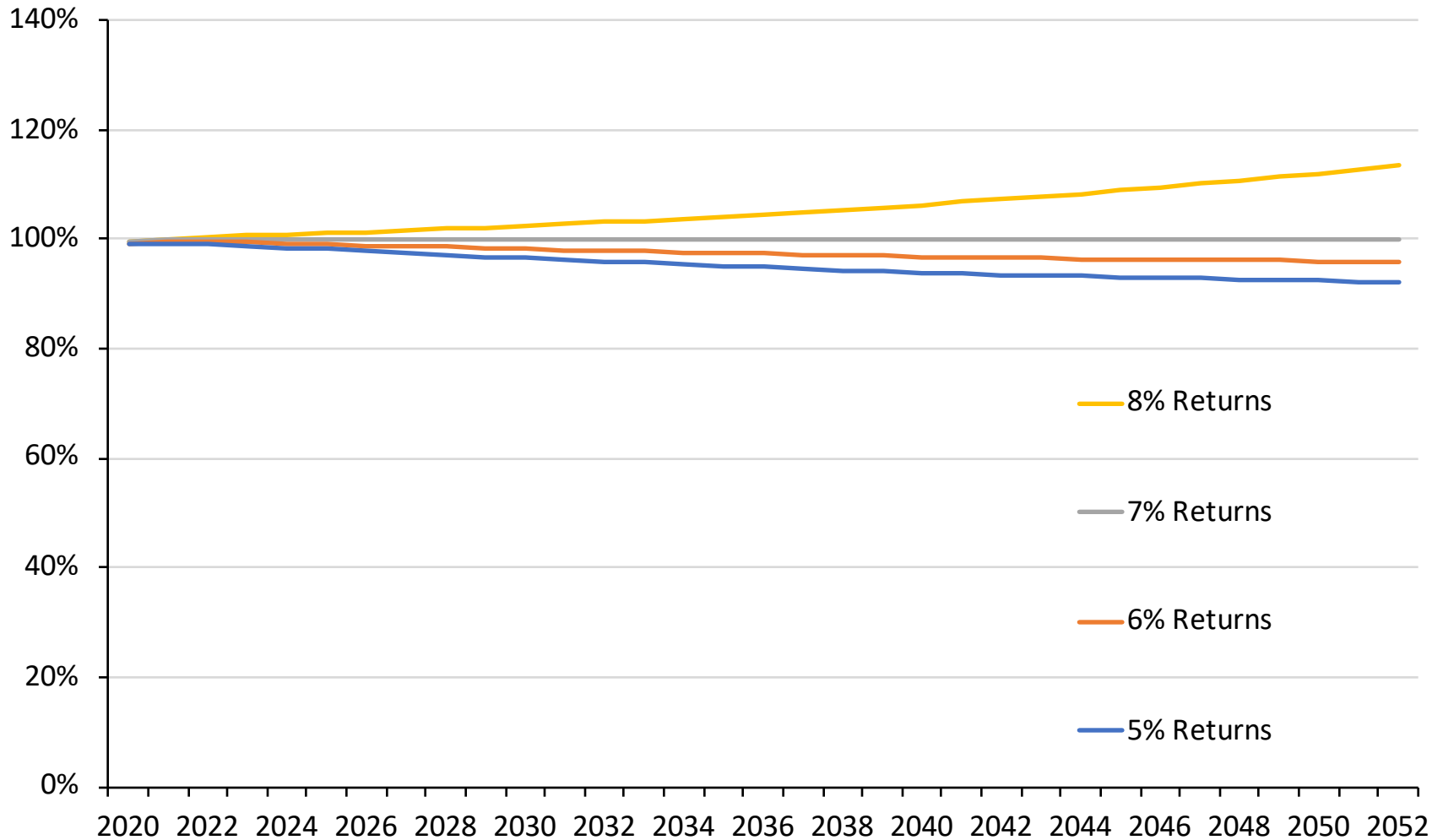


Source: Pension Integrity Project actuarial forecast of Arizona PSPRS.



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



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: Funding policy improvements adopted for all tiers. Tiers 1 and 2 have adopted layered level-dollar amortization on 15-year schedules. Tier 3 uses 10-year level-dollar layering.*
 - Notwithstanding positive changes, additional contributions to accelerate debt payment would further secure the fund and reduce long-term costs
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?

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