TEACHER RETIREMENT SYSTEM OF TEXAS (TRS) PENSION SOLVENCY ANALYSIS

Prepared by:

Pension Integrity Project at Reason Foundation

October 28, 2020

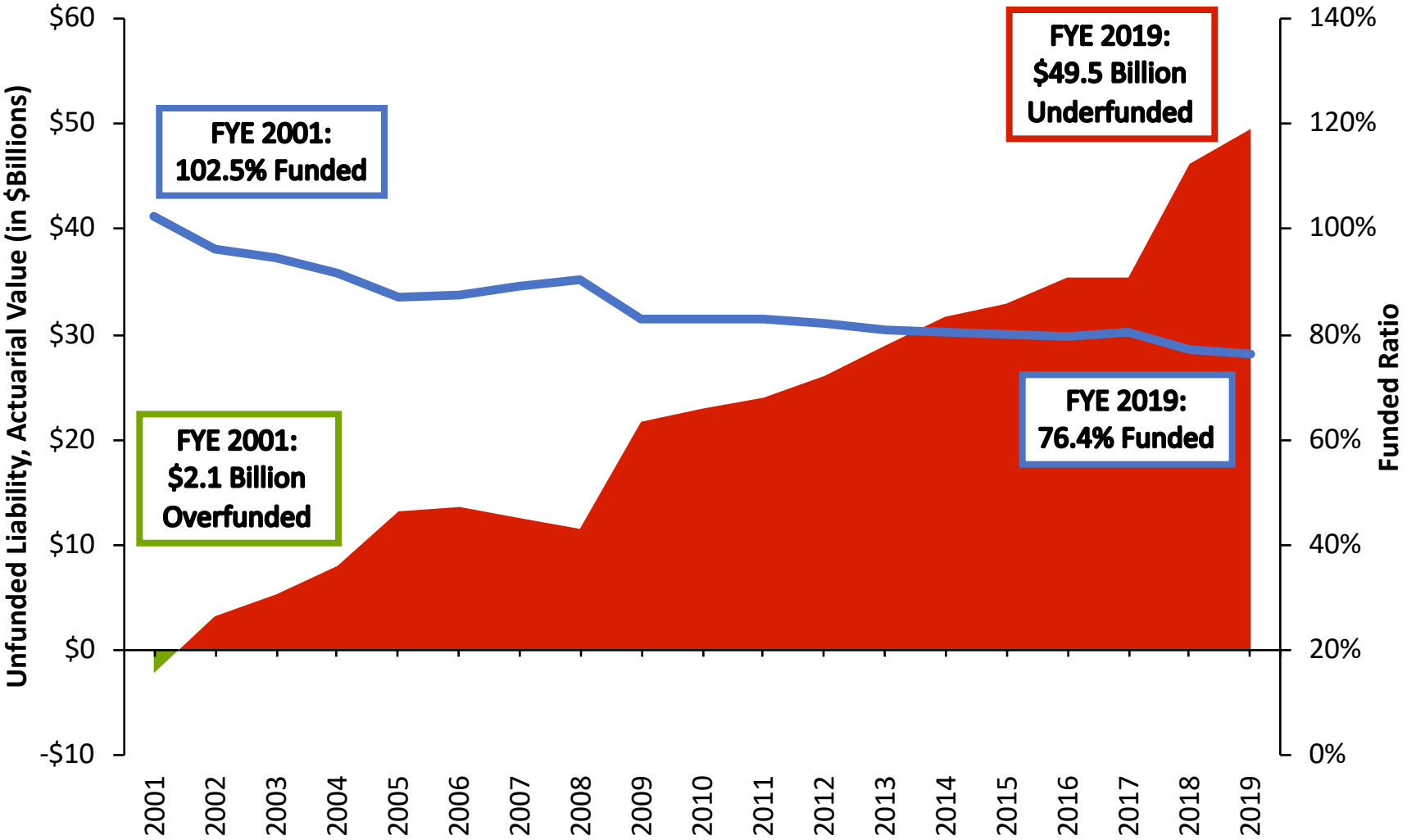
reason FOUNDATION

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:

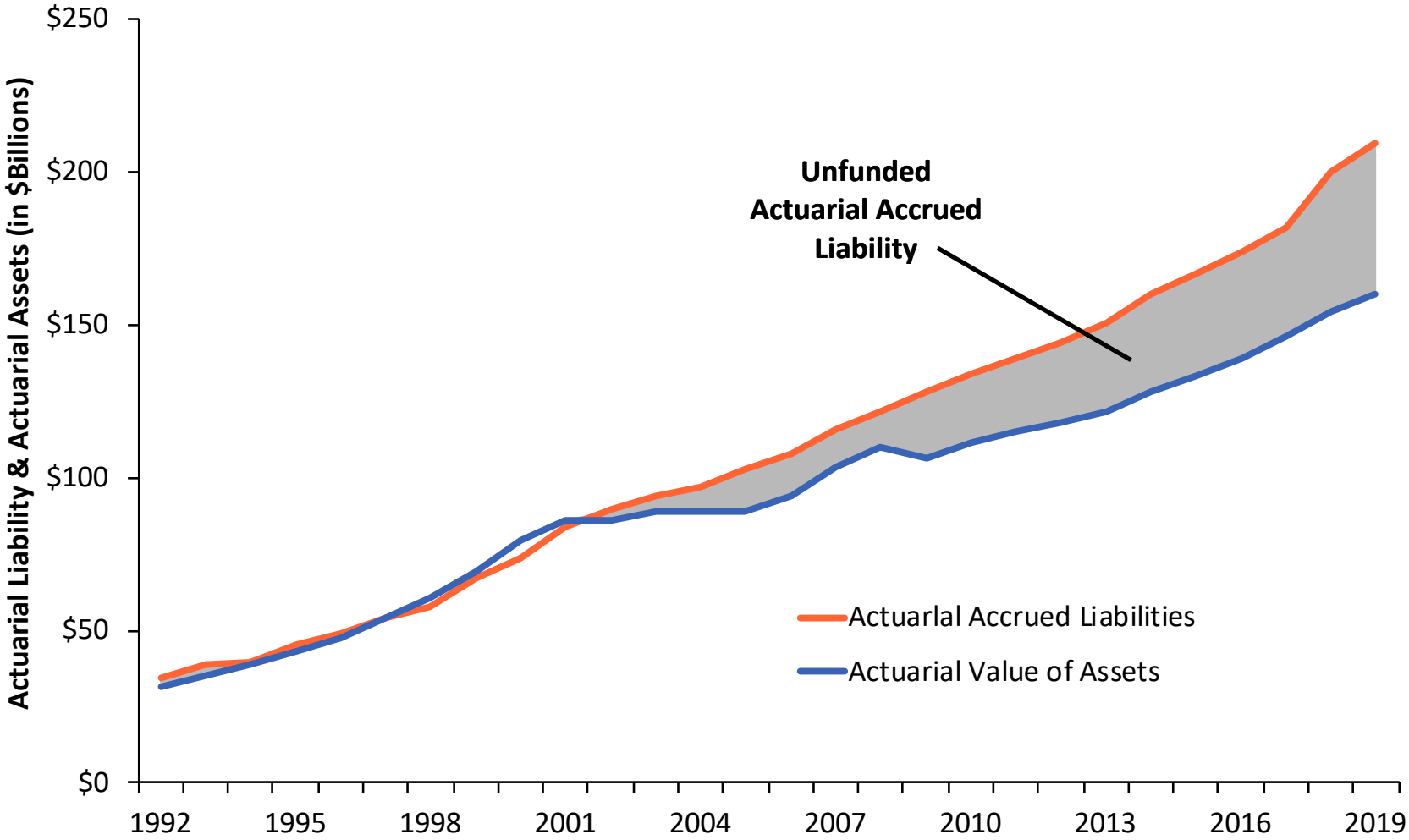
- *Customized analysis* of pension system design, trends
- *Independent actuarial modeling* of reform scenarios
- Consultation and modeling around *custom policy designs*
- Latest pension reform *research and case studies*
- *Peer-to-peer mentoring* from state and local officials who have successfully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

A History of TRS Solvency (2001-2019)



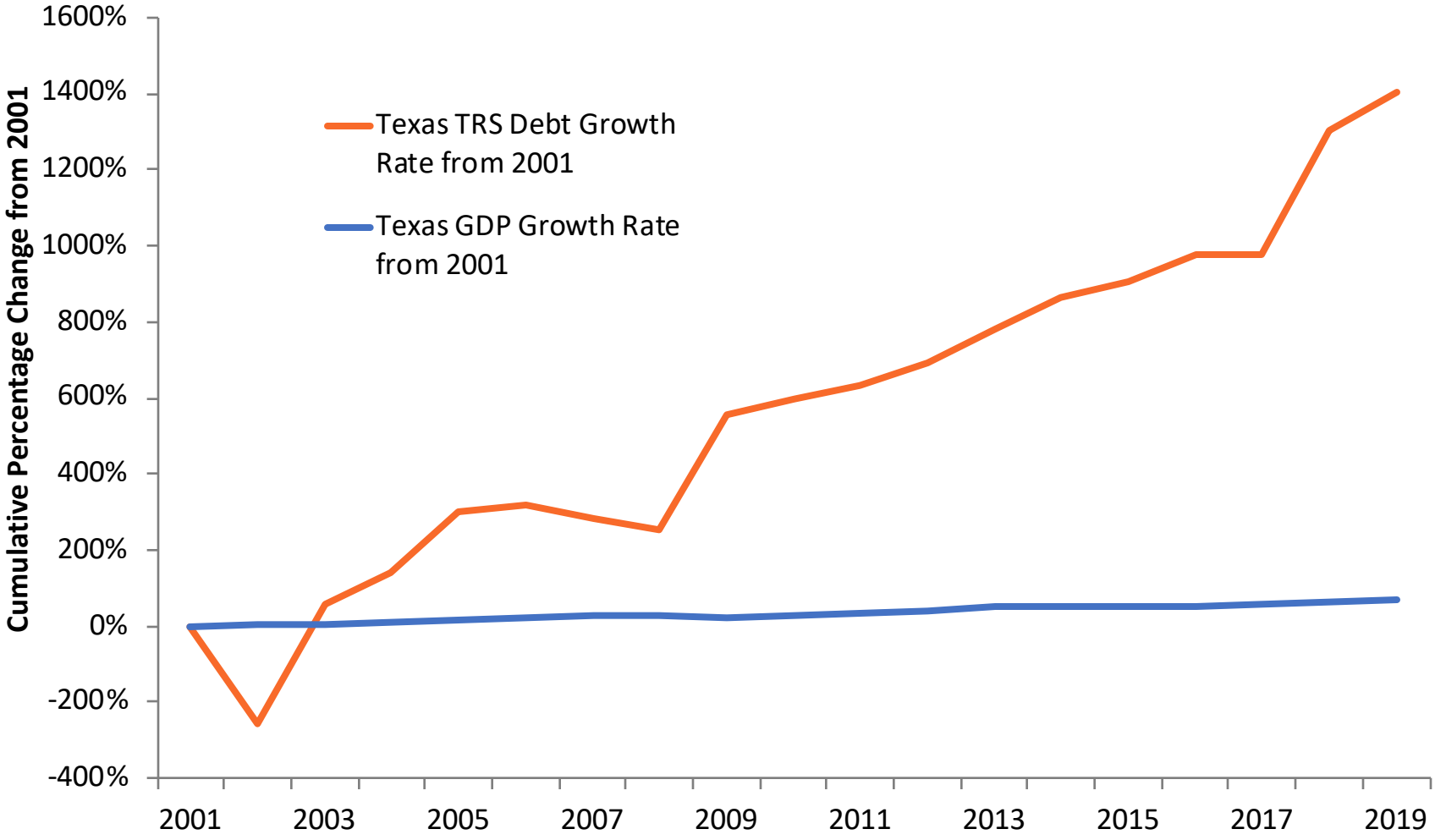
Source: Pension Integrity Project analysis of actuarial value of assets and actuarial accrued liability found in TRS actuarial valuation reports and CAFRs

TRS Liabilities are Growing Faster than Assets



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

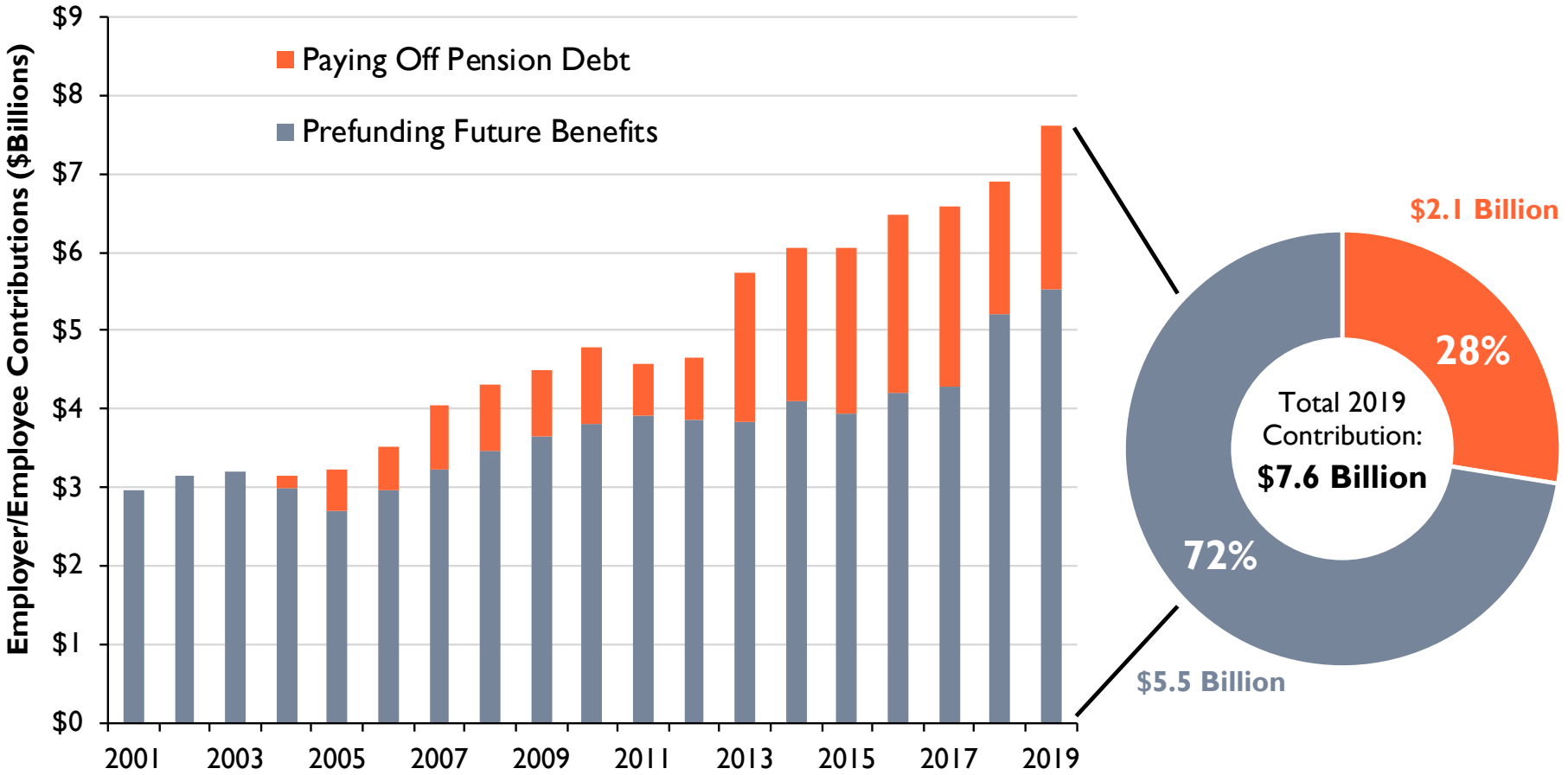
TRS Unfunded Liabilities are Growing Faster than the Texas Economy



Source: Pension Integrity Project analysis of TRS actuarial valuation reports and CAFRs, Federal Reserve of St. Louis Data for Texas' gross domestic product.

Prefunding Benefits vs. Debt Payments

TRS Payments to Amortize the Unfunded Liability are Growing



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

Makeup of TRS Contributions

	FY2019 Contributions	
	% of Payroll	$ Value
Total Employee	7.70%	$3,482,869,726
State Contribution	7.50%	$3,525,981,997
Supplemental Contribution - School Districts	1.50%	$588,827,787
Total Employer (Blended)	8.44%*	$4,114,809,784
Total TRS Contributions	16.14%	$7,597,679,510

10% Cap

The Texas Constitution caps state contributions to TRS at 10% of payroll, which can only be exceeded under an emergency declaration.

Article 16, Section 67(b)(3)

Senate Bill 12 of 2019 gradually increases employer contributions to 9.50% and member contributions to 8.25% by 2024 to fully fund accrued benefits in 29 years instead of 87 years, according to TRS.

* This is the reported blended rate using a base 7.50% base for all employers and an additional 1.50% for school districts not participating in Social Security.

Source: Pension Integrity Project analysis of TRS actuarial valuation reports.

Scheduled Contribution Increases Under SB12

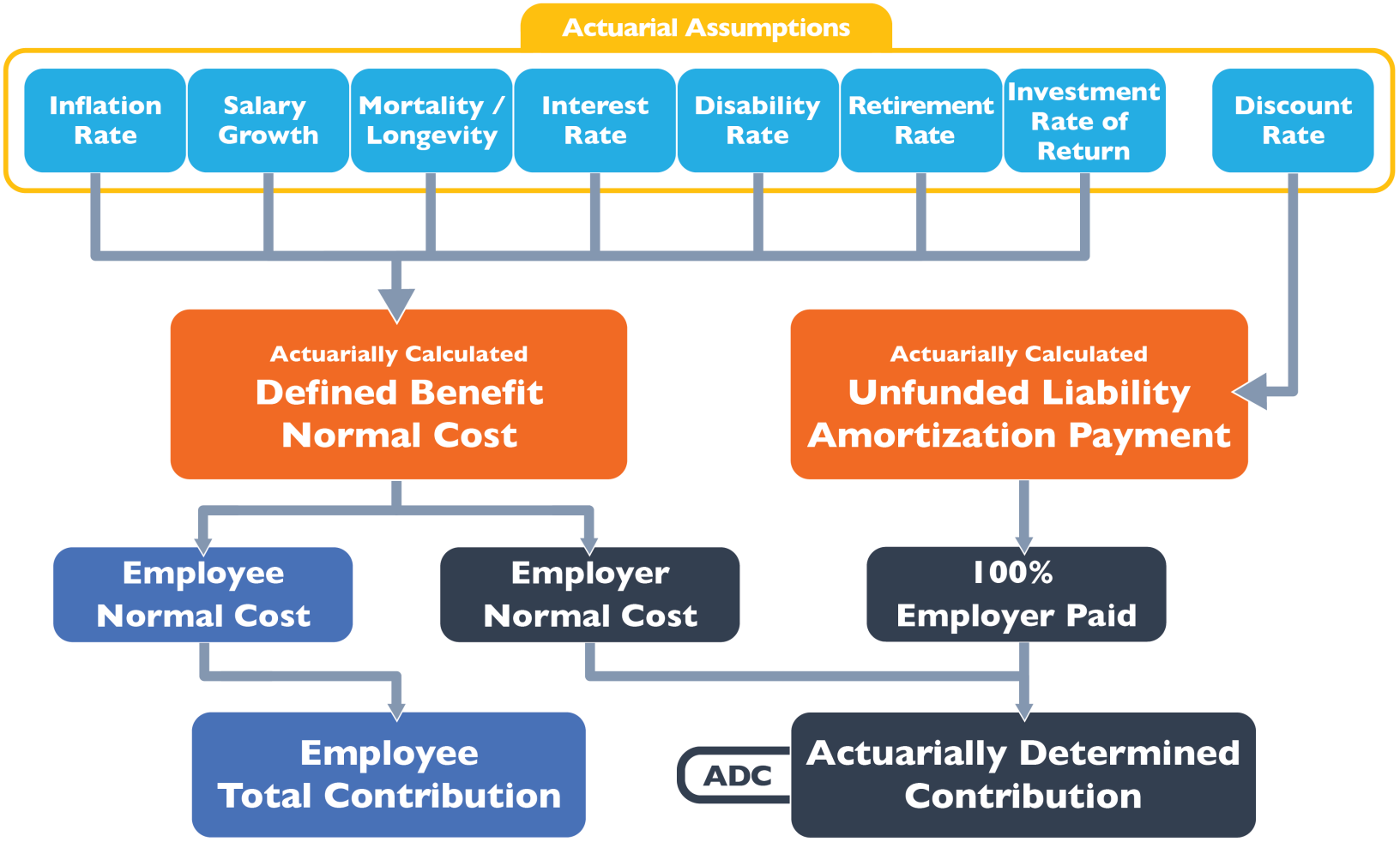
The base rate paid by the state covers all K-12 & higher education institutions. All education employers (school districts, charter schools, and regional education service centers) are required to pay an additional supplemental rate. All employer types combine to form the blended rate.

	Base Rate (State)	Supplemental Rate (District Only)	Blended Employer Rate	Employee Rate
2019	7.50%	1.50%	8.44%	7.70%
2020	7.50%	1.60%	8.50%	7.70%
2021	7.75%	1.70%	8.81%	8.00%
2022	8.00%	1.80%	9.12%	8.00%
2023	8.25%	1.90%	9.44%	8.25%
2024	8.25%	2.00%	9.50%	8.25%

Source: Pension Integrity Project analysis of TRS actuarial valuation reports.

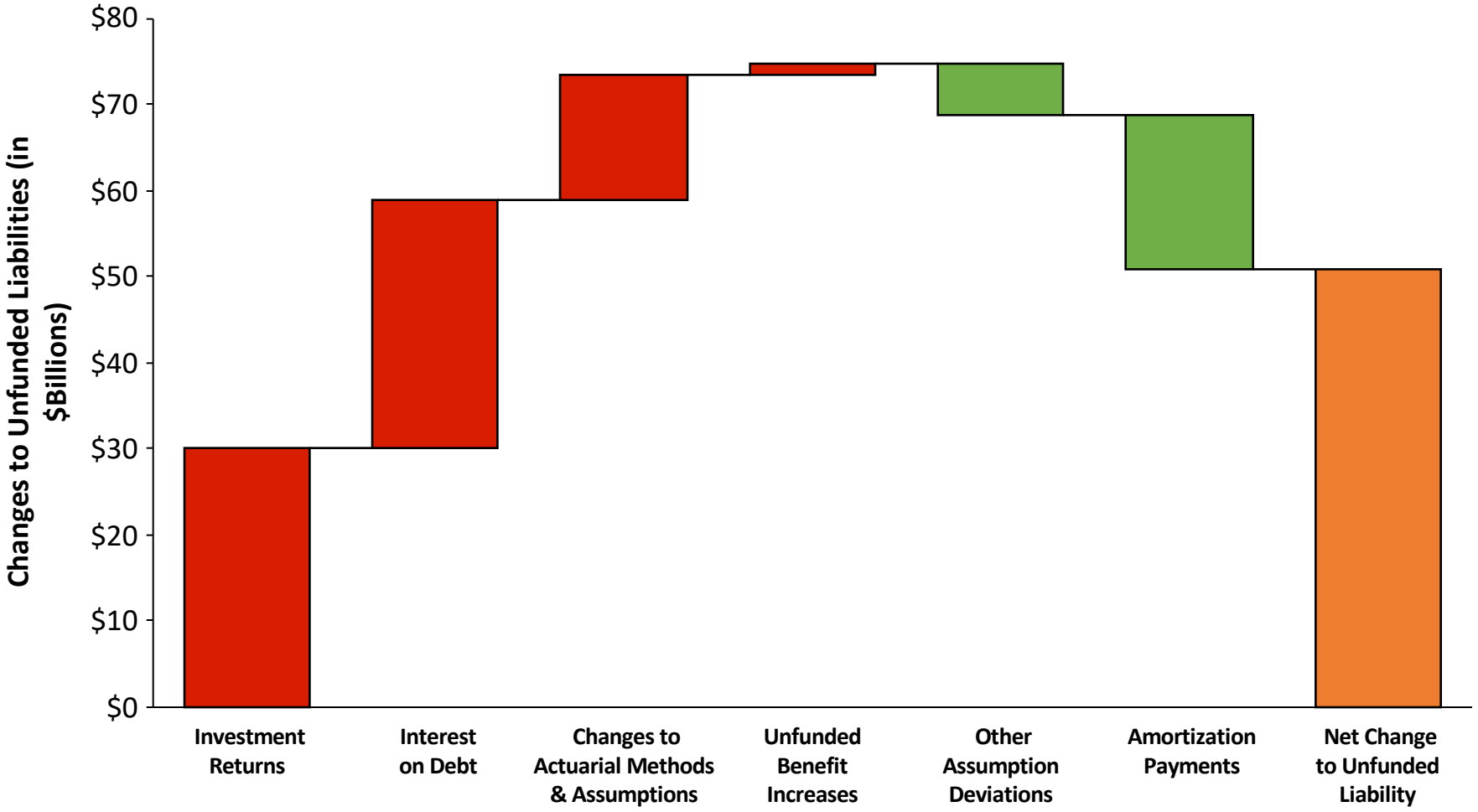
CHALLENGES CONTINUING TO FACE TRS

How a Pension Plan is Funded



The Causes of the Pension Debt

Actuarial Experience of TRS, 2001-2019



Source: Pension Integrity Project analysis of TRS CAFRs. Data represents cumulative unfunded actuarial liability by gain/loss category. "Interest on Debt" is the interest not accrued on the plan's assets due to asset experience falling below expectations.

Driving Factors Behind TRS Challenges

1. **Deviations from Investment Return Assumptions** have been the largest contributor to the TRS unfunded liability, adding $30.1 billion since 2001.

2. **Interest on Pension Debt** has added $28.7 billion to the unfunded liability since 2001.
   - *The use of statutorily established contribution rates instead of actuarially determined contributions has perpetuated the growth of unfunded liability*
   - *Accumulated interest on unfunded pension liabilities makes a pension more expensive*

3. **Changes in Actuarial Methods & Assumptions** have uncovered $14.5 billion in hidden and unfunded liabilities over the last two decades.

4. **Unfunded Benefit Increases** have added $1.5 billion in unfunded liabilities, mostly due to 2005 changes in TRS eligibility requirements.

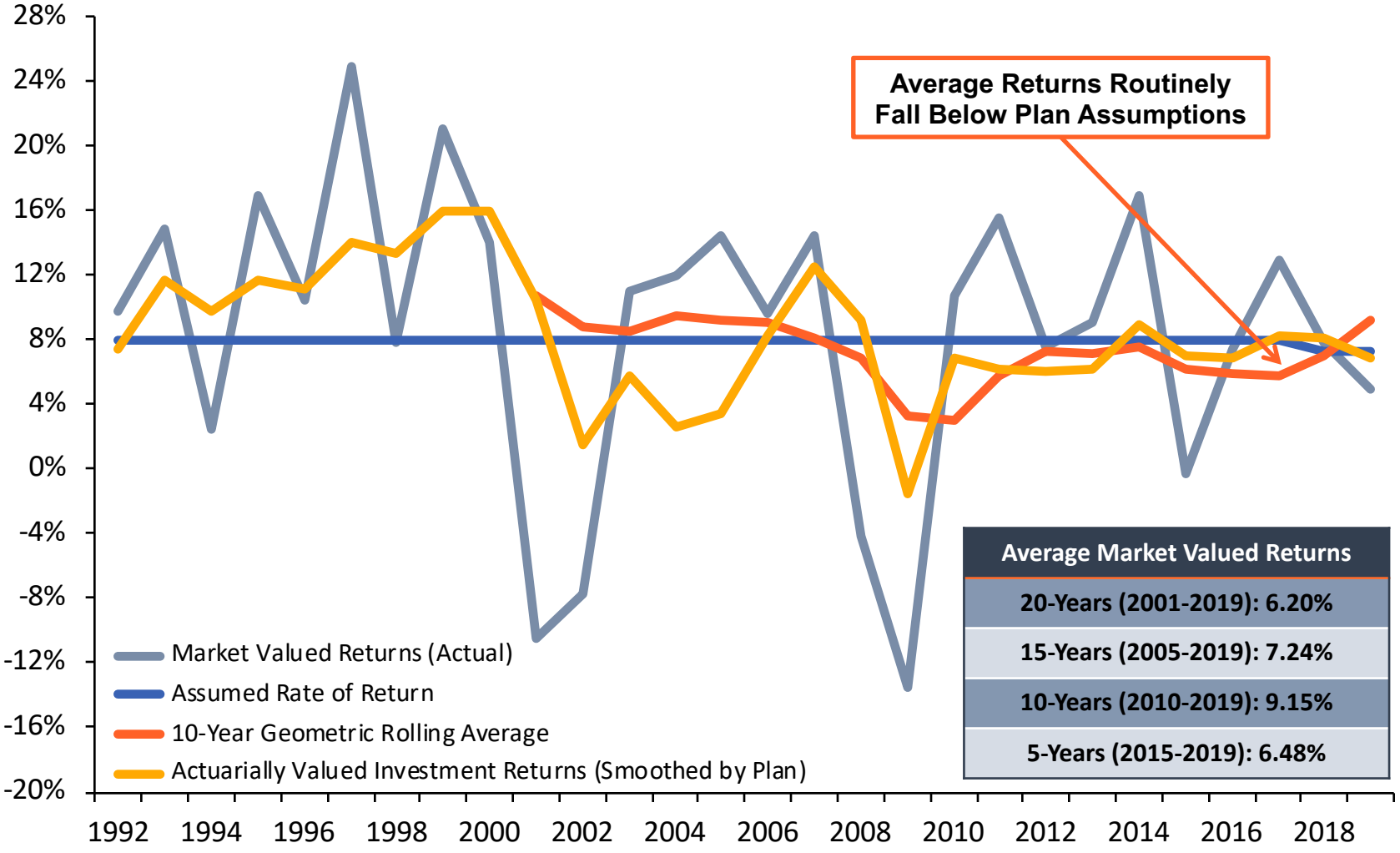
5. **Undervaluing Debt** through discounting methods has led to the tacit undercalculation of required contributions.

CHALLENGE 1: ASSUMED RATE OF RETURN

- **Unrealistic Expectations:** The return assumption used by TRS 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.

TRS Challenge I: Investment Returns

Investment Return History, 1992-2019



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

TRS Challenge I: Investment Returns

Investment Returns Have Underperformed

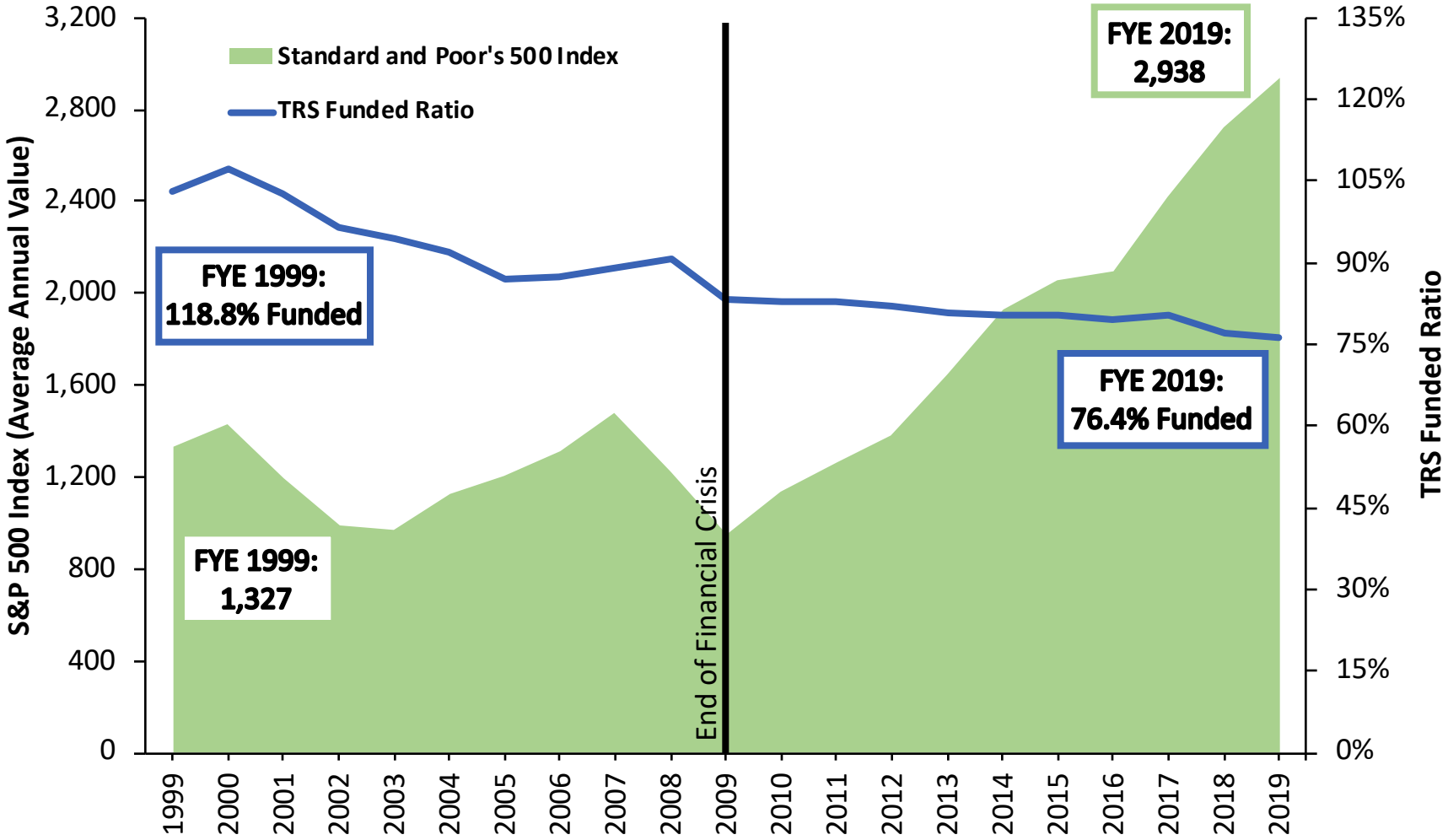
- TRS actuaries have historically used an 8% assumed rate of return to calculate member and employer contributions, adjusting expectations down to 7.25% in 2018 in response to significant market changes.
- TRS has expanded its equity holdings in a search for greater investment returns (i.e. greater yields) over the past decade.
- 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): 6.20%	20-Years (2000-2019): 6.91%
15-Years (2005-2019): 7.24%	15-Years (2005-2019): 6.85%
10-Years (2010-2019): 9.15%	10-Years (2010-2019): 7.14%
5-Years (2015-2019): 6.48%	5-Years (2015-2019): 7.42%

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

Source: Pension Integrity Project analysis of TRS actuarial valuation reports. Average market valued returns represent geometric means of the actual time-weighted returns.

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



Source: Pension Integrity Project analysis of TRS actuarial valuation reports and Yahoo Finance data.
Funded ratios are the actuarial value of assets divided by the actuarially accrued liability.

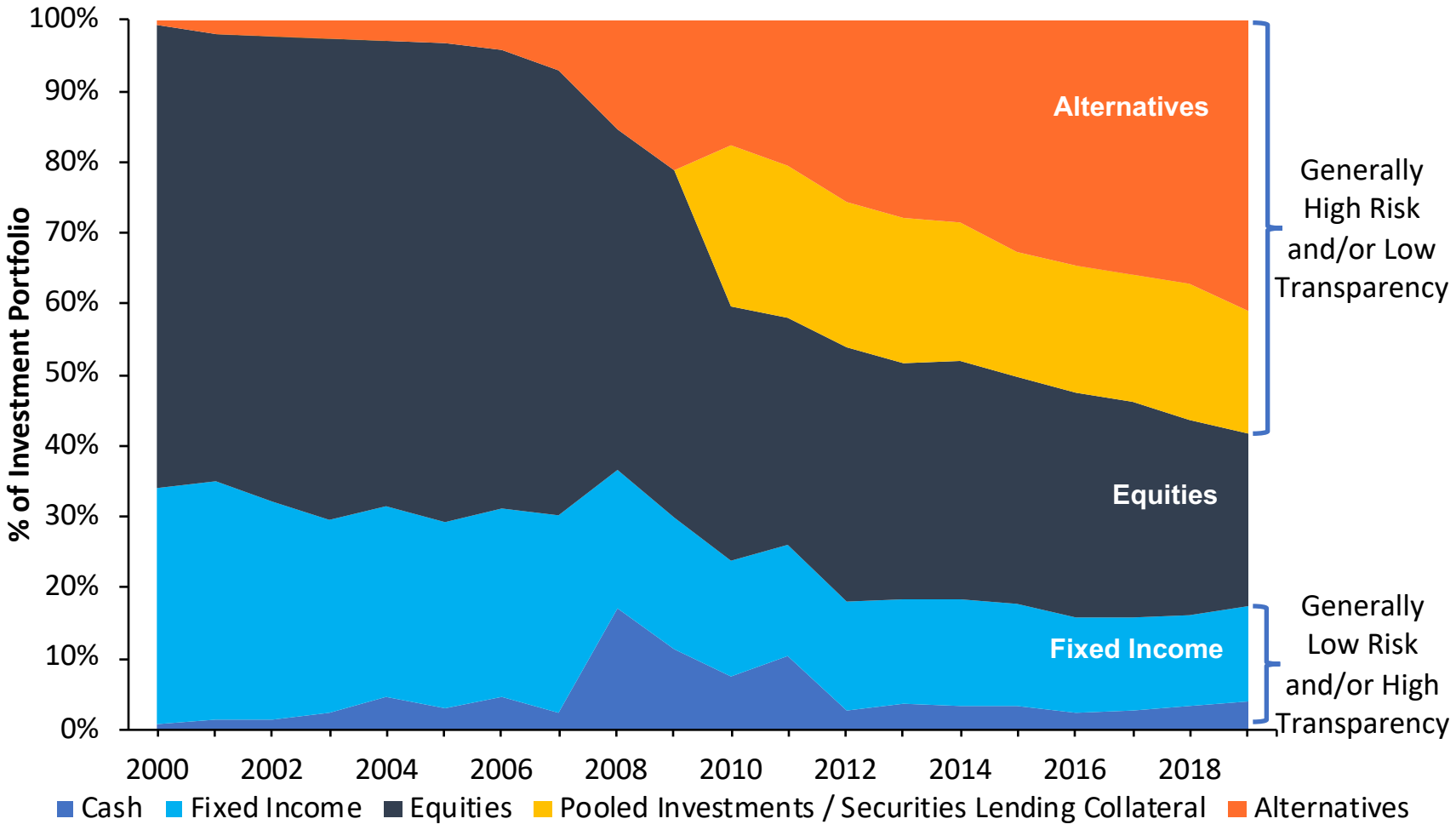
New Normal: The So-Called Recovery Has Already Happened, the Market Has Changed

The "new normal" for institutional investing suggests that achieving even a 6% average rate of return in the future 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 near 8% in the 1990s to consistently less than 3%.
   - New phenomenon: negative interest rates, designates a collapse in global bond yields.
   - The U.S. just experienced the longest economic recovery in history, yet average growth rates in GDP and inflation are below expectations.
2. McKinsey & Co. forecast the returns on equities will be 20% to 50% lower over the next two decades compared to the previous three decades.
   - Using their forecasts, the best-case scenario for a 70/30 portfolio of equities and bonds is likely to earn around 5% return.
3. TRS consulting actuaries presented to the board in Feb 2018 that "future price inflation, investment returns, overall wage growth, and individual salary increases are likely to be lower than currently assumed."

TRS Asset Allocation (2000-2019)

Expanding Risk in Search for Yield



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

Probability Analysis: Measuring the Likelihood of TRS Achieving Various Rates of Return

Possible Rates of Return	Probability of TRS Achieving A Given Return Based On:							
	TRS Assumptions & Experience		Short-to-Mid-Term Market Forecast				Long-Term Market Forecast	
	Based on TRS Assumptions	TRS 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%	39.8%	20.0%	28.2%	28.0%	18.3%	37.3%	51.3%	50.6%
7.25%	51.1%	30.1%	40.0%	38.5%	27.7%	48.4%	61.5%	61.7%
7.0%	54.6%	34.1%	43.9%	42.6%	31.4%	52.0%	65.0%	64.7%
6.5%	61.6%	42.4%	52.5%	50.7%	38.9%	59.0%	71.1%	71.4%
6.0%	68.8%	50.7%	61.3%	58.8%	46.8%	65.9%	76.6%	77.3%
5.5%	74.9%	59.0%	69.2%	66.2%	55.1%	72.4%	81.7%	82.4%
5.0%	80.7%	67.4%	76.5%	73.5%	63.0%	78.2%	85.8%	86.9%

Source: Pension Integrity Project Monte Carlo model based on TRS 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 TRS.
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 TRS Achieving Various Rates of Return

TRS Assumptions & Experience

- A probability analysis of TRS historical returns over the past 20 years (2000-2019) indicates a very modest chance (30%) of hitting the plan's 7.25% assumed return.
- TRS' own investment return forecasts imply a 51% chance of achieving their investment return target over the next 20 years.

Short-Term Market Forecast

- Returns over the short to medium term can outweigh long-term effects on funding and costs.
- Analysis of capital market assumptions publicly reported by the leading financial firms (BNY Mellon, JPMorgan, and Research Affiliates) suggests that over a 10-15 year period, TRS returns are likely to fall short of assumptions.

Long-Term Market Forecast

- Longer-term projections typically assume TRS 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 7.25% 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, while the probability of achieving an average return of 7.25% or higher is about 62%, the probability of earning a rate of return below 5% is about 14%.

RISK ASSESSMENT

- How resilient is TRS to volatile market factors?

Important Funding Concepts

Employer Contribution Rates

- *Statutory Contributions*: TRS employers make annual payments based on a rate set in state statute, meaning contributions are different from ADEC.
- *Actuarially Determined Employer Contribution (ADEC)*: Unlike statutory contributions, ADEC is the annual required amount TRS' consulting actuary has determined is needed to be contributed each year to avoid growth in pension debt and keep the fund solvent

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 TRS current 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 at 8.25% starting in 2024, as stipulated in 2019 Senate Bill 12. ADEC recession scenarios produce unfunded liabilities when over the 10% cap.

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 TRS 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 experts expect continued market volatility, and the Federal Reserve is expected to keep interest rates near 0% for years and only increase rates in response to longer-term inflation trends.

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 are unable to appropriate their full actuarially determined employer contributions amid budget stress, additional scenarios show the impact of a five-year employer contribution freeze.

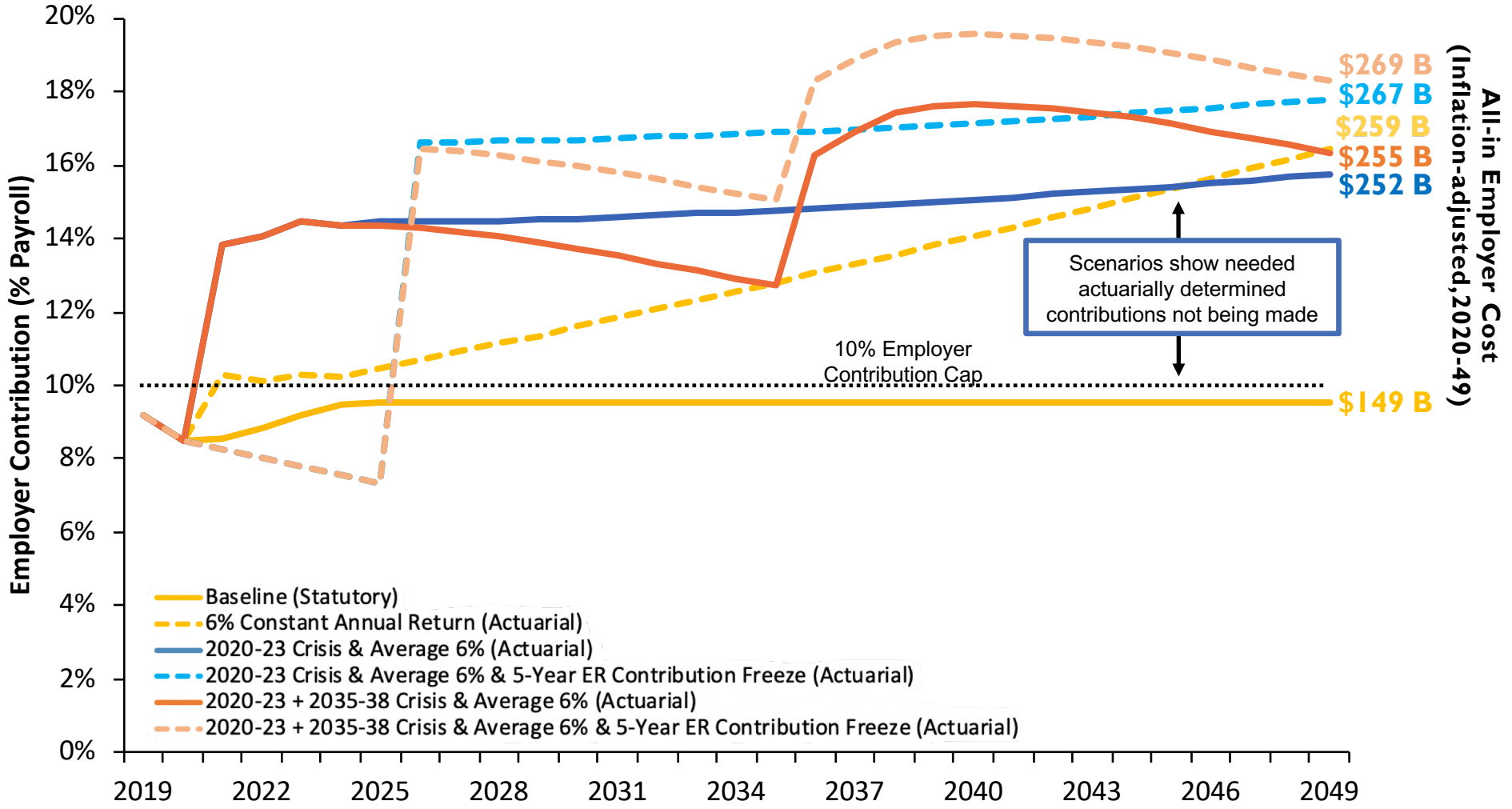
Stress Testing Scenarios:

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 1 + 5-Year Employer Contribution Freeze
5. Scenario 2 + 5-Year Employer Contribution Freeze

TRS Stress Testing: All-in Employer Cost Projections

How a Crisis Increases TRS Costs

Discount Rate: 7.25%, Assumed Return: 7.25%, Actual Return: Varying, Amo. Period: 30-Year, Layered

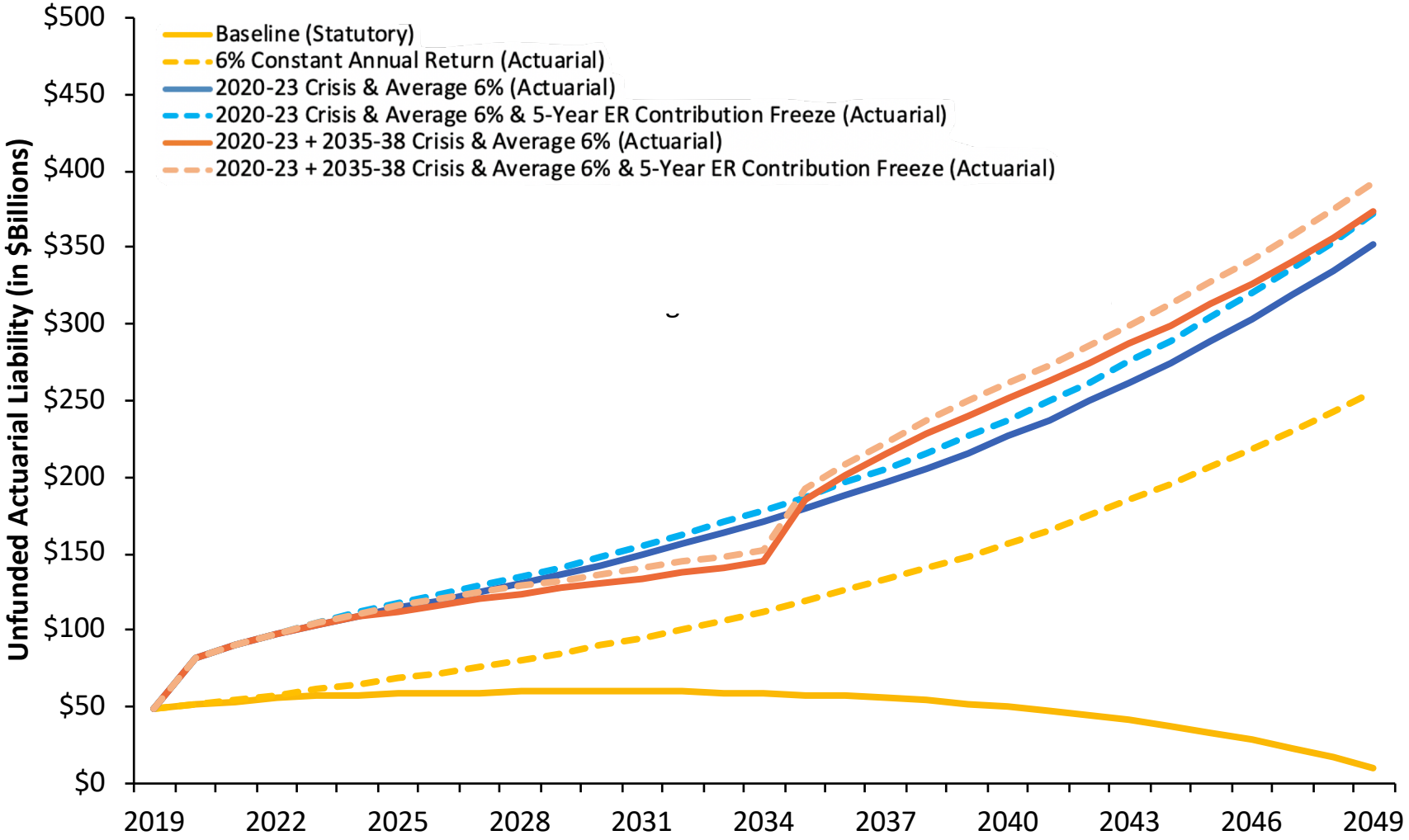


Source: Pension Integrity Project actuarial forecast of TRS. Values are rounded and adjusted for inflation. State is assumed to make 100% actuarially required contributions. The "All-in Cost" includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by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

TRS Stress Testing: Unfunded Liability Projections

Unfunded Liabilities Increase Under Crisis Scenarios

Discount Rate: 7.25%, Assumed Return: 7.25%, Actual Return: Varying, Amo. Period: 30-Year, Layered

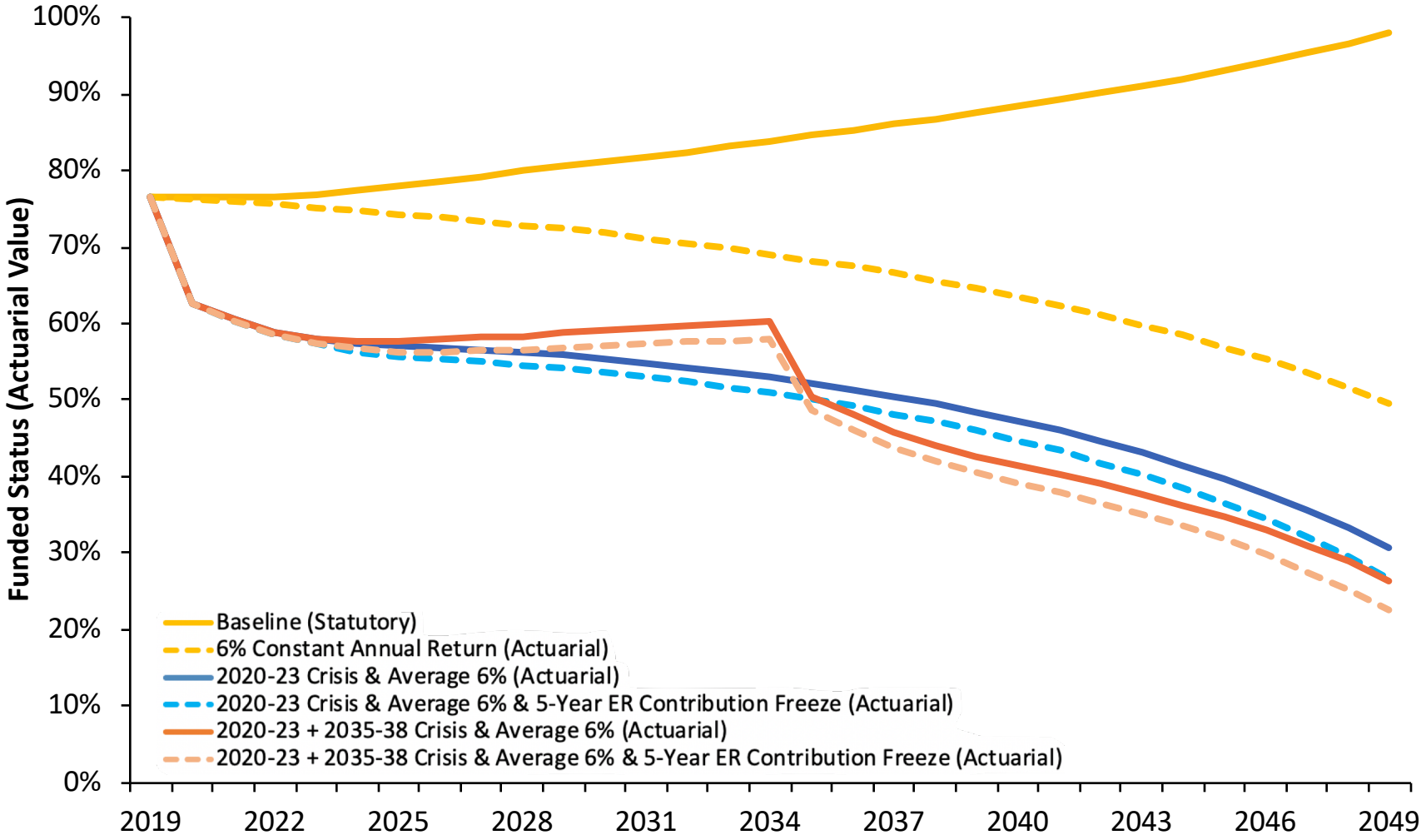


Source: Pension Integrity Project actuarial forecast of TRS. Values are rounded and adjusted for inflation. State is assumed to make 100% actuarially required contributions. The "All-in Cost" includes all employer contributions over the 30-year timeframe, and the ending unfunded liability accrued by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

TRS Stress Testing: Funded Ratio Projections

TRS Solvency Degrades Under Crisis Scenarios

Discount Rate: 7.25%, Assumed Return: 7.25%, Actual Return: Varying, Amo. Period: 30-Year, Layered



Source: Pension Integrity Project actuarial forecast of TRS. 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

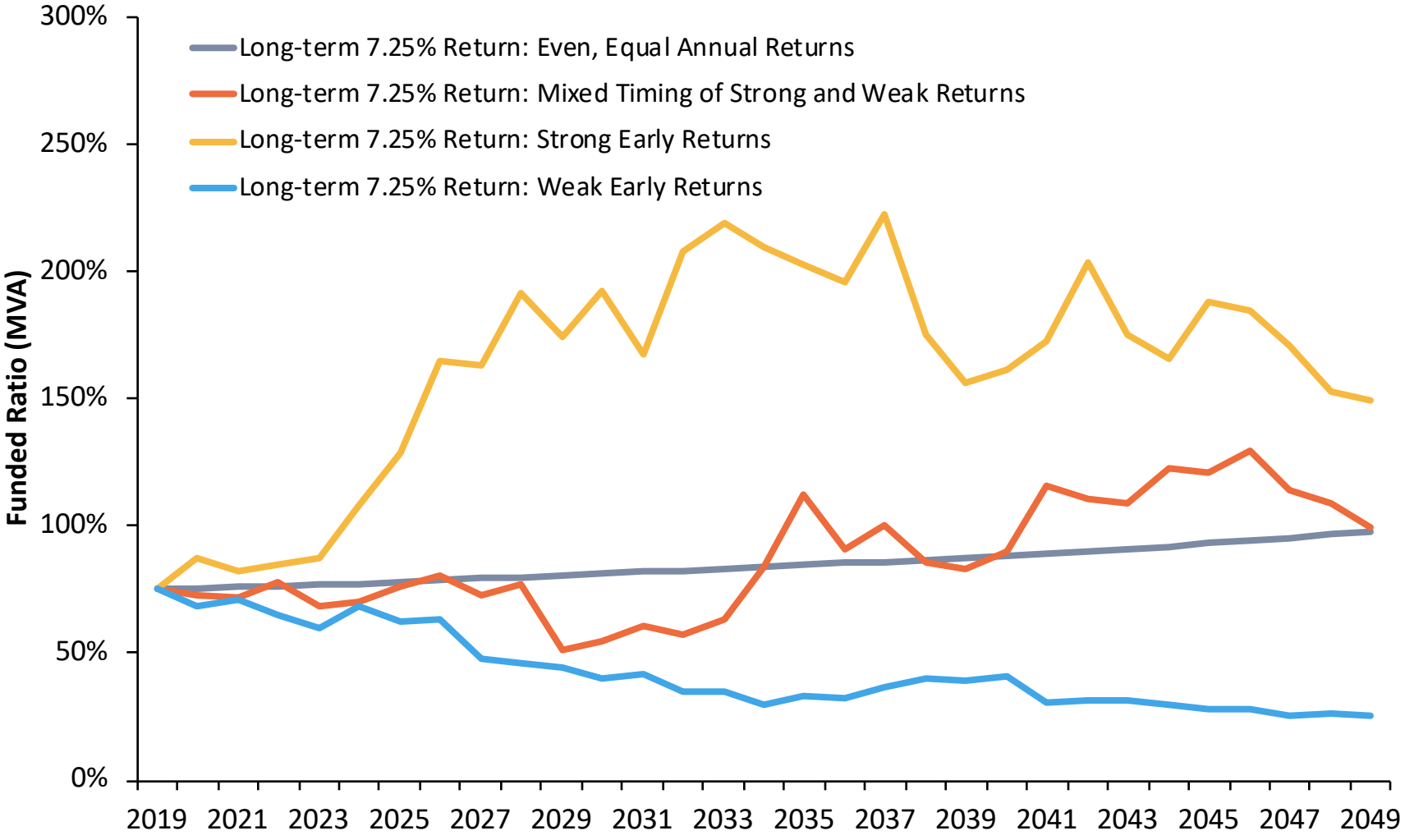
Scenarios	Statutory Contributions			Actuarial Contributions		
	30-Year Employer Contributions	2049 Unfunded Liability (Market Value)	Total All-in Employer Costs	30-Year Employer Contributions	2049 Unfunded Liability (Market Value)	Total All-in Employer Costs
Pre-Crisis Baseline	$148.7 B	$5.3 B	$154.0 B	$148.7 B	$0.5 B	$149.2 B
6% Constant Annual Return	$148.7 B	$136.2 B	$284.9 B	$202.8 B	$56.4 B	$259.2 B
2020-23 Crisis + Average 6%	$148.7 B	$182.7 B	$331.4 B	$230.8 B	$20.9 B	$251.7 B
Two Crises + Average 6%	$148.7 B	$191.4 B	$340.1 B	$239.7 B	$15.1 B	$254.9 B
2020-23 Crisis + Average 6% + 5-Year Cont. Freeze	$145.4 B	$193.1 B	$338.5 B	$242.2 B	$24.8 B	$267.0 B
Two Crises + Average 6% + 5-Year Cont. Freeze	$145.4 B	$201.8 B	$347.2 B	$250.6 B	$18.4 B	$269.0 B

Source: Pension Integrity Project actuarial forecast of TRS 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.

30-year Funded Ratio Forecast

All Paths to a 7.25% Average Return Are Not Equal

Long-Term Average Returns of 7.25%



Source: Pension Integrity Project actuarial forecast of TRS plan. Constant Returns = 7.25%, Strong early returns (TWRR = 7.20%, MWRR = 8.16%), Weak early returns (TWRR = 7.27%, MWRR = 5.22%), Mixed timing of strong and weak returns (TWRR = 7.26%, MWRR = 7.27%). Scenario assumes that TRS continues to contribute according statute. 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

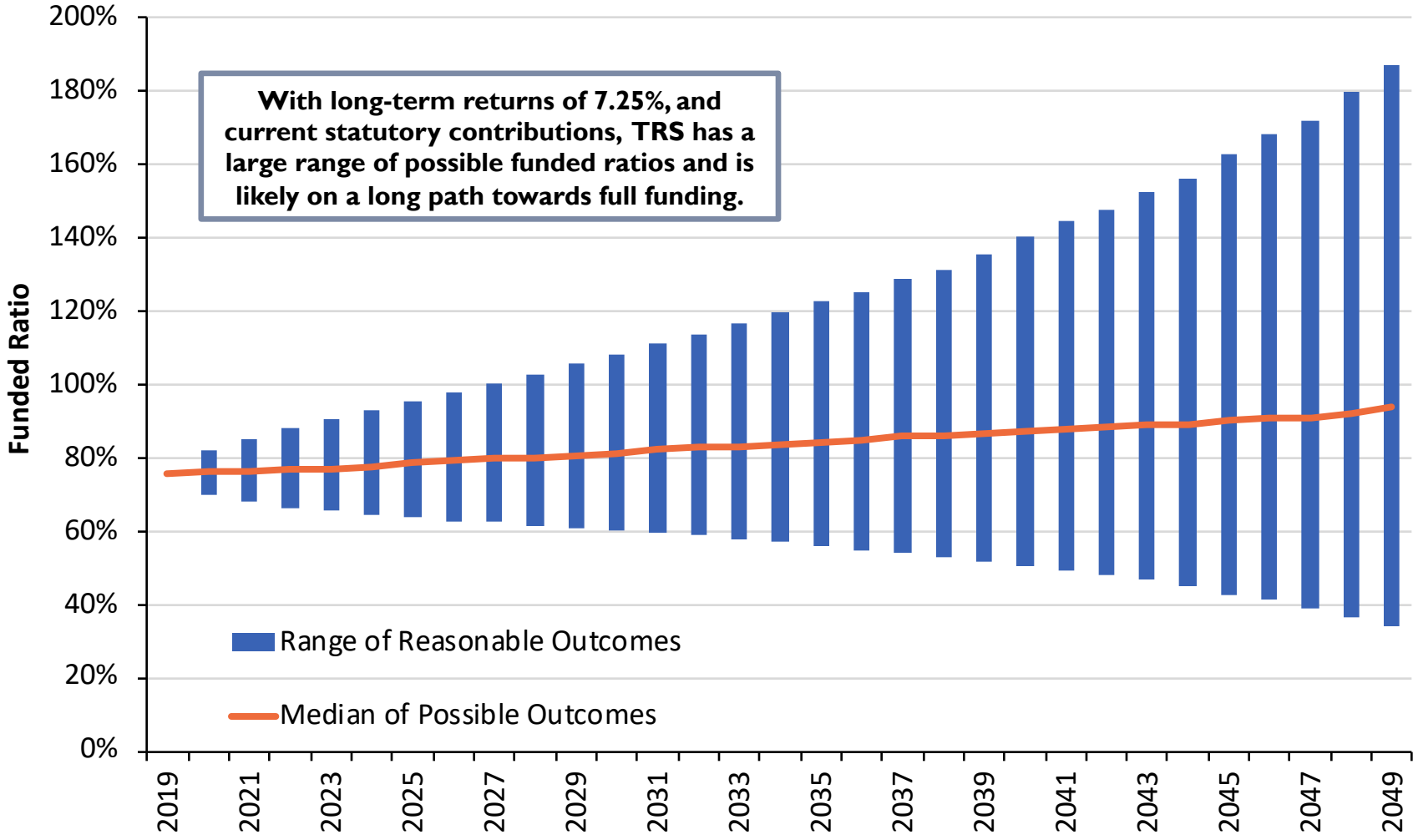
Why use it?

- 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 Funded Ratio Forecast (Statutory Contribution Policy)

Funded Ratios are Expected to Improve

Long-term Average Returns of 7.25%

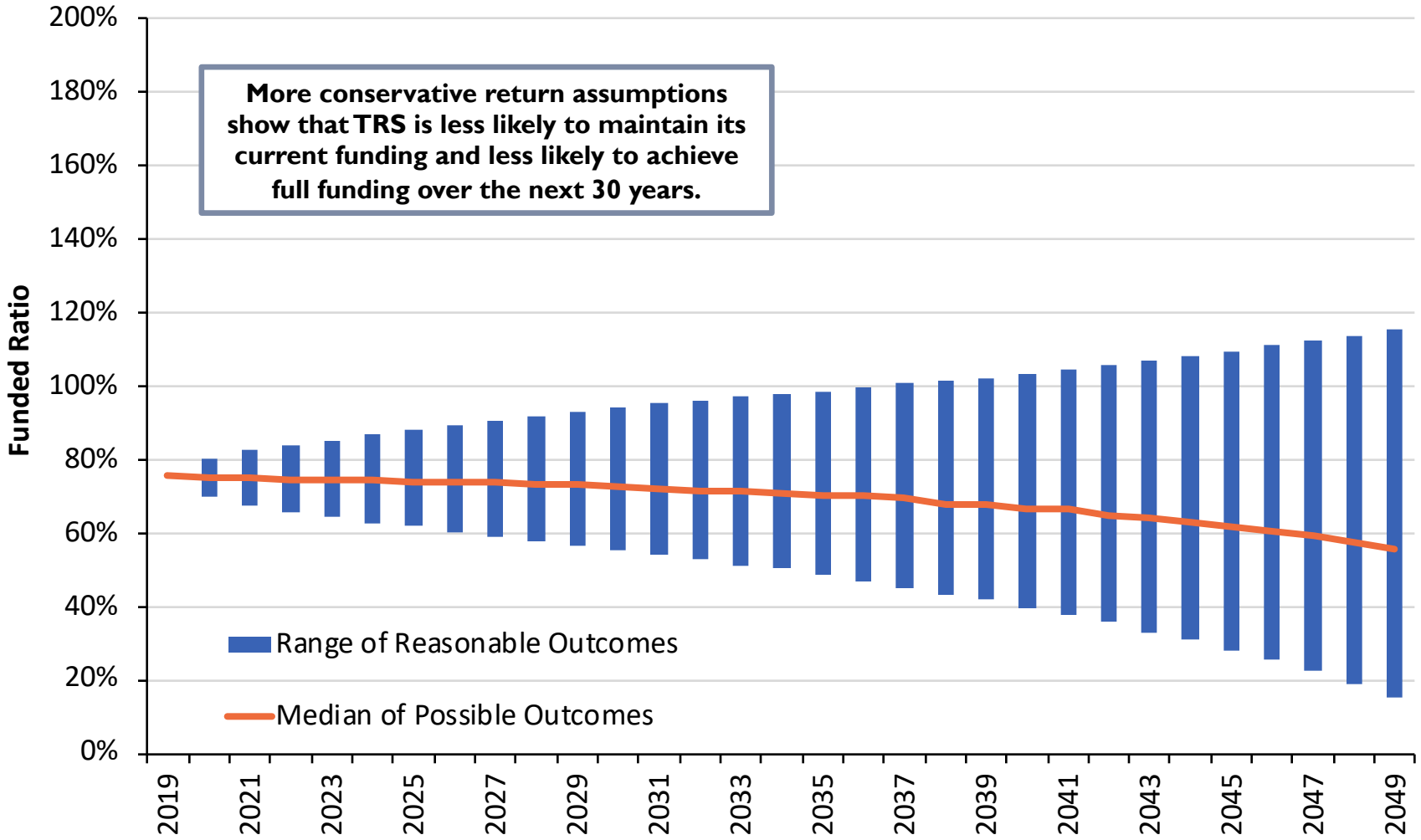


Source: Pension Integrity Project actuarial forecast of TRS plan based on TRS return and risk assumptions.
Range of Reasonable Outcomes represents the 50% of possible outcomes closest to the median.

30-year Funded Ratio Forecast (Statutory Contribution Policy)

How Do Missed Returns Impact Funded Ratios?

Based on More Conservative Long-Term Average Returns

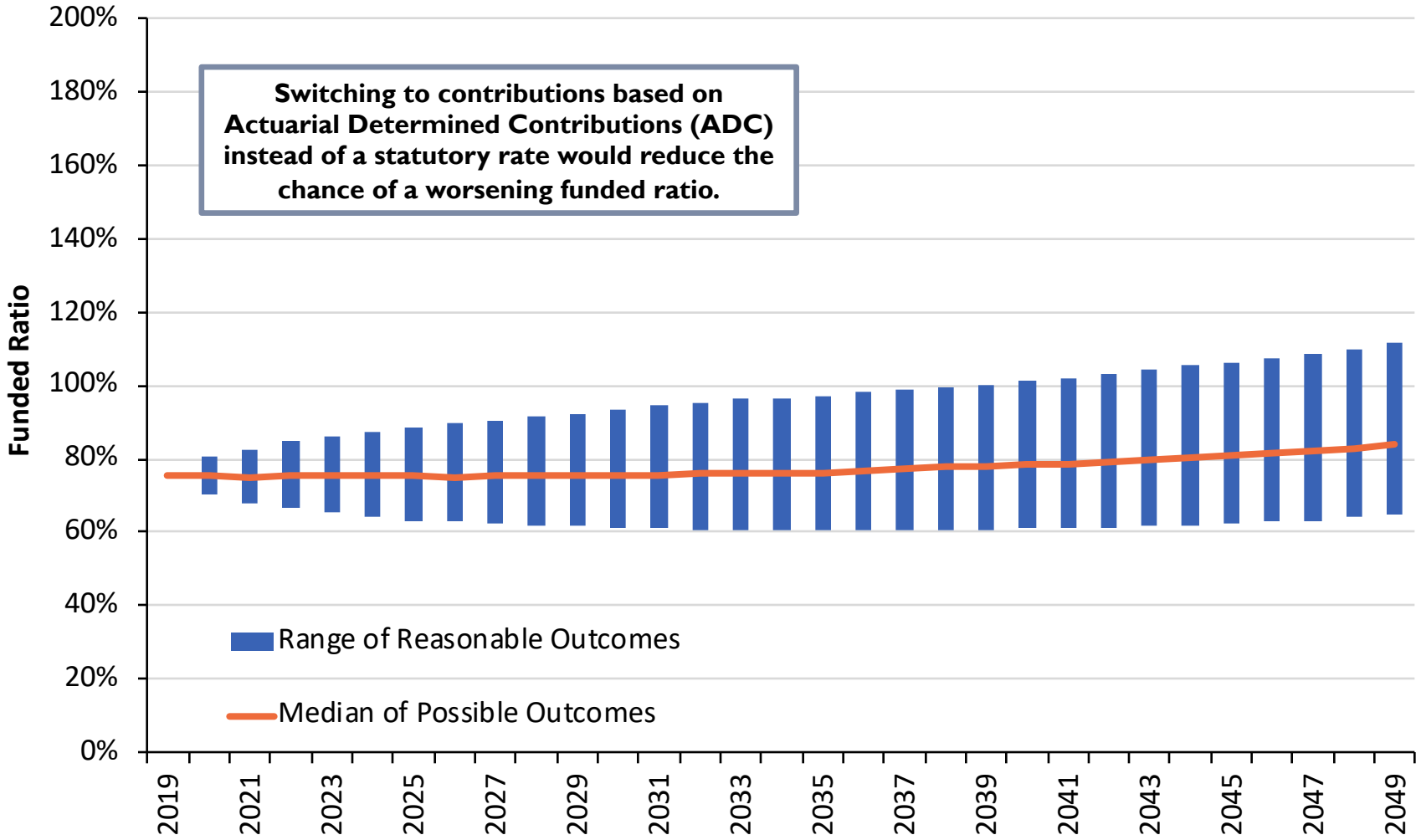


Source: Pension Integrity Project actuarial forecast of TRS plan using the return and risk assumptions of the Monte Carlo analysis. Conservative returns are 6.3%, which are the result of combining the long-term capital market assumptions from three prominent financial firms (see slide 20)

30-year Funded Ratio Forecast (Conceptual ADEC Contribution Policy)

How do Contribution Methods Affect Funding?

Based on More Conservative Long-term Returns and Actuarially Determined Contributions

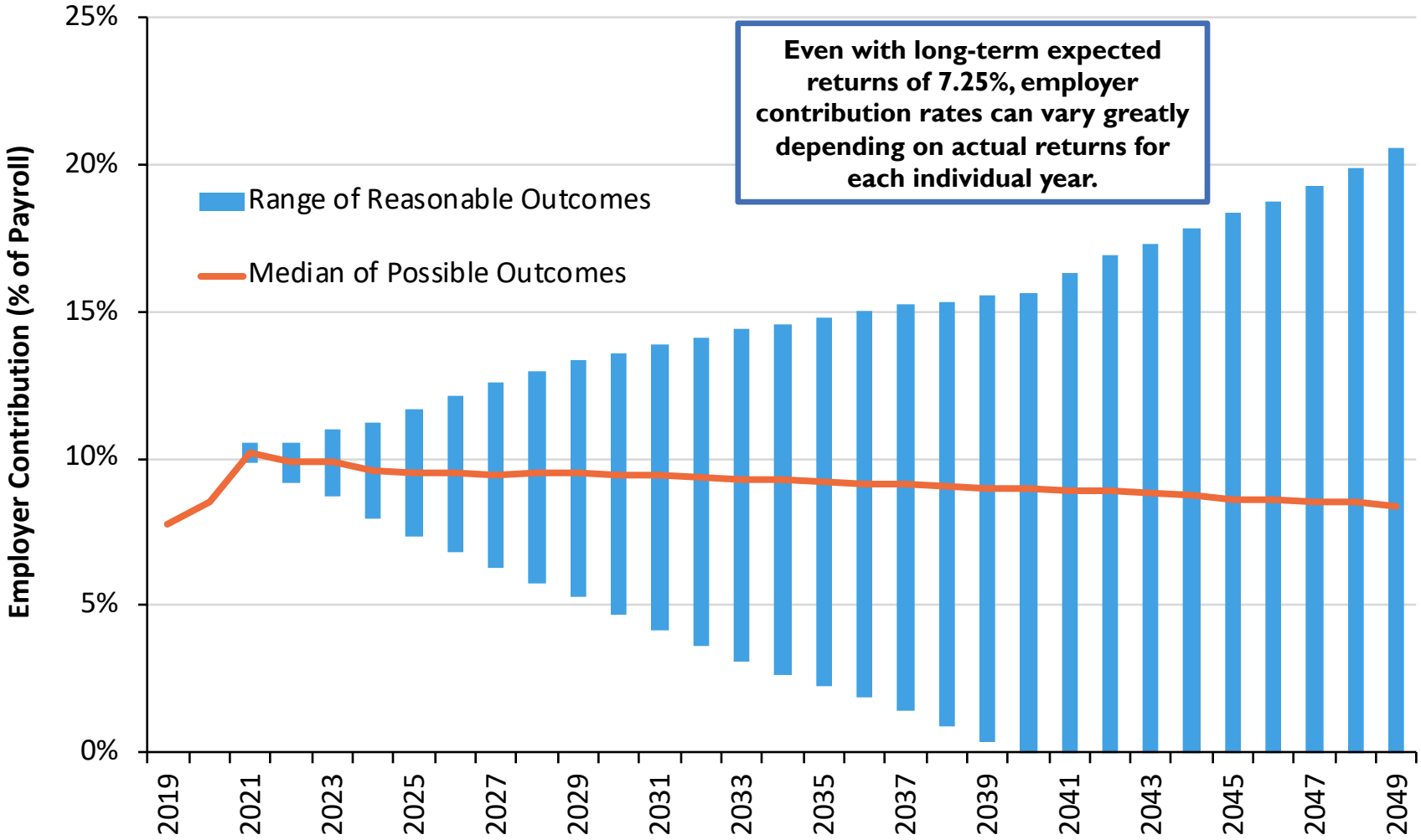


Source: Pension Integrity Project actuarial forecast of TRS plan using the return and risk assumptions of the Monte Carlo analysis. Conservative returns are 6.3%, which are the result of combining the long-term capital market assumptions from three prominent financial firms.

30-year Employer Contribution Forecast (Conceptual ADEC Contribution Policy)

If TRS Performs as Expected, Rates Can Still Vary

Long-Term Average Returns of 7.25%

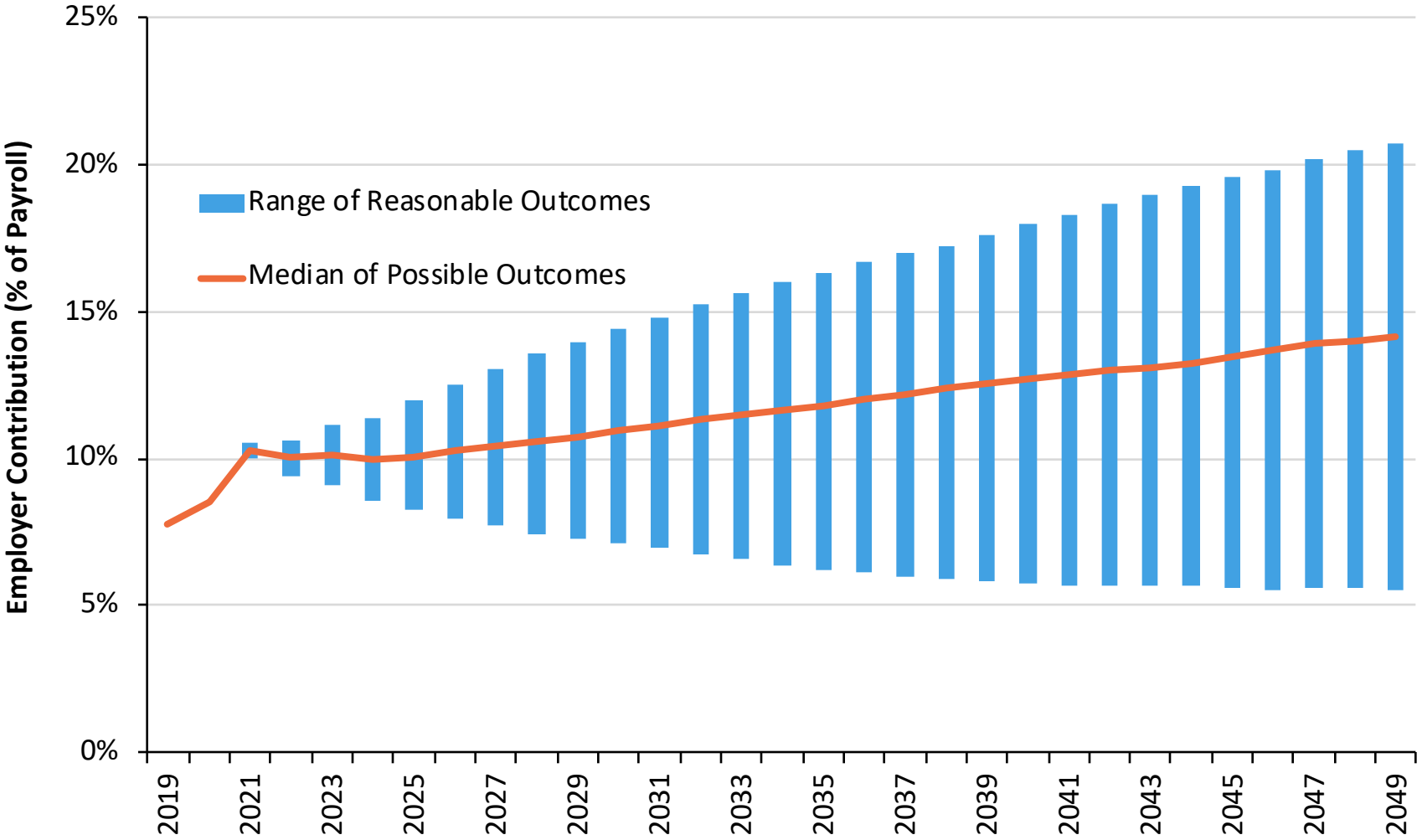


Source: Pension Integrity Project actuarial forecast of TRS plan based on TRS return and risk assumptions. Scenario assumes that the state pays 100% of the actuarially determined contribution each year. Range of Reasonable Outcomes represents the 50% of possible outcomes closest to the median.

30-year Employer Contribution Forecast (Conceptual ADEC Contribution Policy)

If TRS Underperforms, Expect Higher Contributions

More Conservative Long-term Average Expected Returns



Source: Pension Integrity Project actuarial forecast of TRS plan using the return and risk assumptions of the Monte Carlo analysis. Conservative returns are 6.3%, which are the result of combining the short-term and long-term capital market assumptions from prominent financial firms.

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

Amounts to be Paid in 2019-20 Contribution Fiscal Year, % of projected payroll

Assumed Return	Gross Normal Cost	Employer Normal Cost	Employee Normal Cost
7.25% (FYE 2019 Baseline)	11.65%	3.95%	7.70%
7.00%	12.33%	4.63%	7.70%
6.00%	15.46%	7.76%	7.70%
5.00%	19.38%	11.68%	7.70%

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 TRS CAFR.

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

STATE CONSTITUTIONAL PROVISIONS TO CONSIDER

Constitutional Limits to Consider

- The Texas Constitution creates a limit on the ”state” share of TRS required contributions. Article 16, Section 67(b)(3):
  - “*The amount contributed by a person participating in [TRS] may not be less than six percent of current compensation.* ***The amount contributed by the state may not be less than six percent nor more than 10 percent of the aggregate compensation*** *paid to individuals participating in the system*.”

- Since risk analysis, sensitivity analysis, and stress test analysis all point to the need for larger contributions in general, how those are distributed amongst the state, school district employers, and participants will be an important factor to consider.

Constitutional Limits to Consider

- The Texas Constitution provides an "emergency clause" allowing state contributions to TRS to exceed the 10% of payroll cap. Article 16, Section 67(b)(3):
  - "*In an **emergency, as determined by the governor, the legislature may appropriate such additional sums** as are actuarially determined to be required to fund [TRS] benefits authorized by law*."

- The need for higher contributions is likely to be on-going for at least the next 20 to 30 years. Thus, the use of an emergency clause would likely not be a viable solution should the legislature desire to contribute above the 10% of payroll cap on contributions.

Constitutional Limits to Consider

- The Texas Constitution requires that benefits should be financed in a way that is consistent with best practices. Article 16, Section 67(a)(1):
  - "***Financing of benefits must be based on sound actuarial principles.***"

- The definition of actuarially sound principles is not expressly defined, and there will be some variance amongst actuaries.
  - The Society of Actuaries Blue Ribbon Panel outlined best practices such as ensuring the amortization schedule is less than 30 years and paid off over a fixed period.

CHALLENGE 2: INSUFFICIENT CONTRIBUTIONS & DEBT MANAGEMENT POLICIES

- Since 2003, Texas' pension contributions have fallen short of the level TRS' actuaries have calculated is needed to ensure solvency, resulting in a need for much higher contributions today
- Interest accrued on TRS unfunded liabilities has surpassed annual amortization payments for decades

State Statutes Have Created a Structural Underfunding Challenge for TRS

1. Since 2003, employer contributions have routinely fallen below actuarially determined contribution (ADC) rates — shorting TRS need contributions 15 of the past 17 years.
   - This is because the employer contribution rate is *determined by statute.*
   - Best practice is to have contribution rates actuarially determined based on a targeted funding policy.

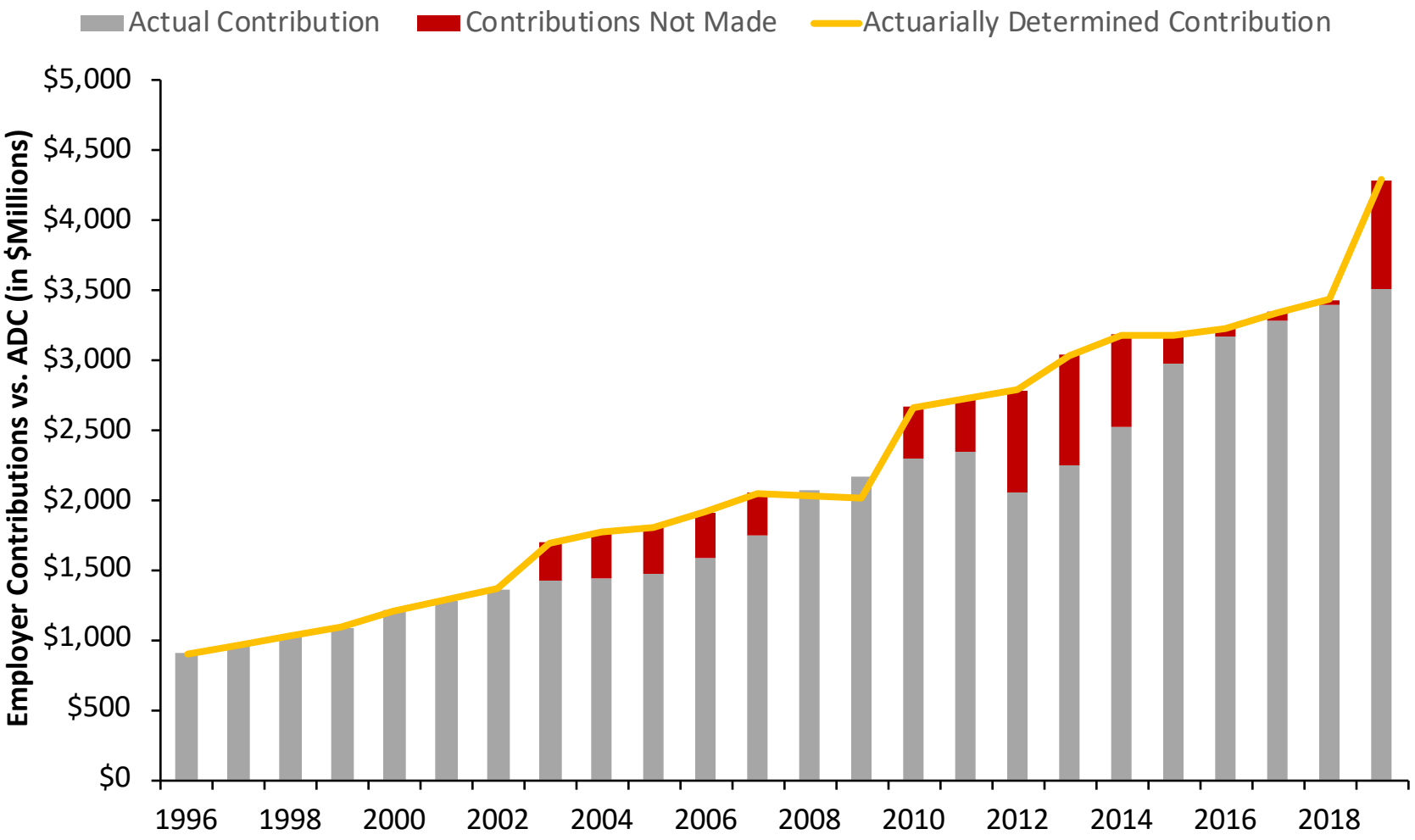
2. Negative amortization: The TRS actuary reports that contributions available to cover the unfunded liability are less than the interest accruing on the pension debt each year.

3. Under a more realistic 6% assumed return and discount rate the current contributions will take an infinite amount of years to amortize the current debt.

4. 2019: Employer ADEC v. Statute
   - Statutory Employer Contribution: 8.44% of payroll
   - Actuarially Determined Employer Contribution: 9.48% of payroll

Actuarially Determined Employer Contribution History, 1998-2019

Actual v. Required Contributions



Source: Pension Integrity Project analysis of TRS actuarial reports and CAFRs. Years are contribution fiscal years.

Impact of Senate Bill 12 of 2019

Contributions:

- Gradually increased both teacher (7.7% to 8.25%) and state (6.8% to 8.25%) contributions by 2024.
- Increase contributions from already cash-strapped local school districts not participating in Social Security from 1.5% to 2% by 2025.

TRS Amortization Period:

- Increased contributions rates committed more funds to TRS, causing the amortization period to drop from 87 years to 29 years.

Cost-of-Living-Adjustments (COLA):

- By law TRS is unable to issue a COLA to current retirees if plan actuaries calculate an amortization period longer than 30 years.
- The effect SB 12 had on the TRS amortization period allowed plan actuaries to calculate an amortization period shorter than 30 years for the 2020 valuation, freeing the legislature to issue the first COLA in over a decade by means of a 13th check capped at $2,000.

SB12 of 2019 neglected to address the structural and technical issues that prevented TRS from issuing a COLA for over a decade and continues to put future COLA payments in doubt.

Negative Amortization: Understanding the Current Funding Policy

- Contribution increases codified in SB12 of 2019 allowed TRS actuaries to use those increases to calculate a shorter amortization period, reducing the amount of time it would take to fully fund TRS from 87 years to 29 years.
- Given the impact of investment experience on the TRS amortization period, that 29-year forecast only reflects that one moment in time—prior to COVID-19 and its resulting market volatility, notably—and not the overall health of the system.

TRS Amortization Period History:

- 2019: 29 years
- 2018: 87 years
- 2017: 32 years
- 2012: Infinite
- 2007: 27 years
- 2002: Infinite

- The history of long TRS amortization periods is an indicator that plan amortization payments are not sufficient to pay down the unfunded liability and subsequent interest it accrues (i.e. *negative amortization).*
  - The Society of Actuaries recommends amortization periods of 15 to 20 years.
  - Longer periods result in larger long-term costs and less frequent cost-of-living adjustments to retirees, so the shorter the amortization period, the better.

Debt Management Policies

Shorting TRS Leads to Negative Amortization

1. Due to inadequate and capped statutory rates, TRS valuations have routinely shown amortization periods that have exceeded 30 years, taking TRS well outside industry best practices.

2. TRS officially maintains a 30-year, level percent open amortization target. And as of 2019 TRS's actual amortization period was 29 years, thanks to incoming contribution increases from 2019 legislation.

3. Long amortization periods are indicators that plan amortization payments are insufficient to pay down TRS unfunded liability and the interest that debt accrues.

4. Since 2004, employer contributions have fallen below the interest accrued on TRS's unfunded liability (negative amortization), leaving TRS to fall further behind its obligations in absolute terms.

5. Limiting TRS amortization period to no more that 20 years and addressing any new unfunded liabilities in a given year on separate schedules is the most direct way to limit the impact of unfunded liabilities long-term.

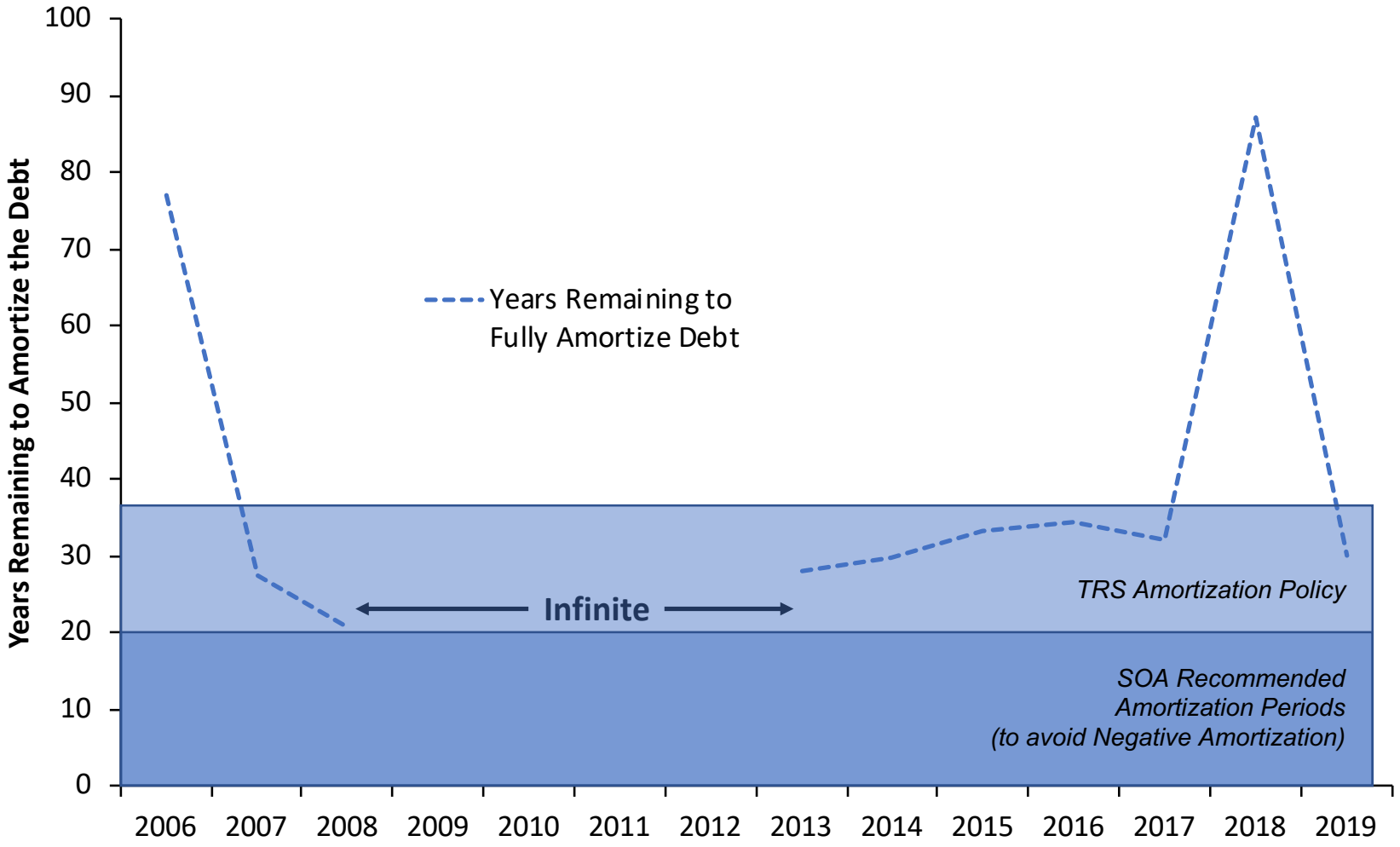
Quick Facts:

- The Society of Actuaries recommends amortizing new unfunded pension liabilities on a layered basis over a 15- to 20-year period.

Debt Management Policies

Long, Volatile Amortization Periods

TRS Negative Amortization Growth, 2006-2019



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

Debt Management Policies

Back-Loaded Pension Debt Payments

TRS uses a 30-year, level-percent of payroll amortization method to amortize accrued unfunded liability.

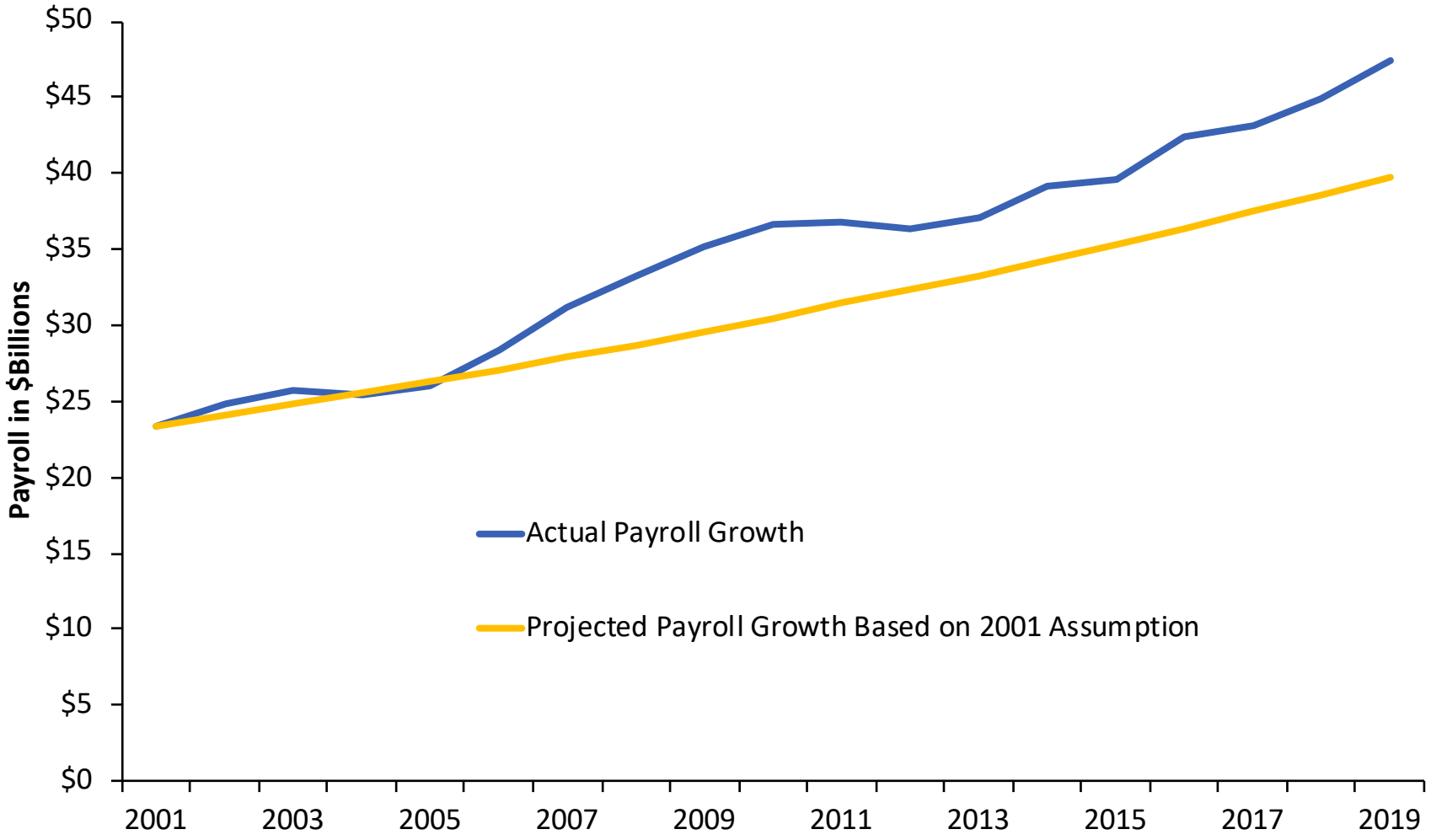
- What is level percent of payroll amortization?
  - Sets the amortization payment as a fixed share of total member payroll
  - Very sensitive to missed assumptions
  - Often results in back-loaded pension debt payments, especially if payroll growth slows
- What does a 30-year amortization period (or higher) mean?
  - The amount of time over which TRS spreads debt payments
  - Actuaries find amortizing new debt longer than 20 years stretches payments too thin
  - 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)

CHALLENGE 3: UNCOVERING HIDDEN COSTS

- 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 from Aggressive Actuarial Assumptions

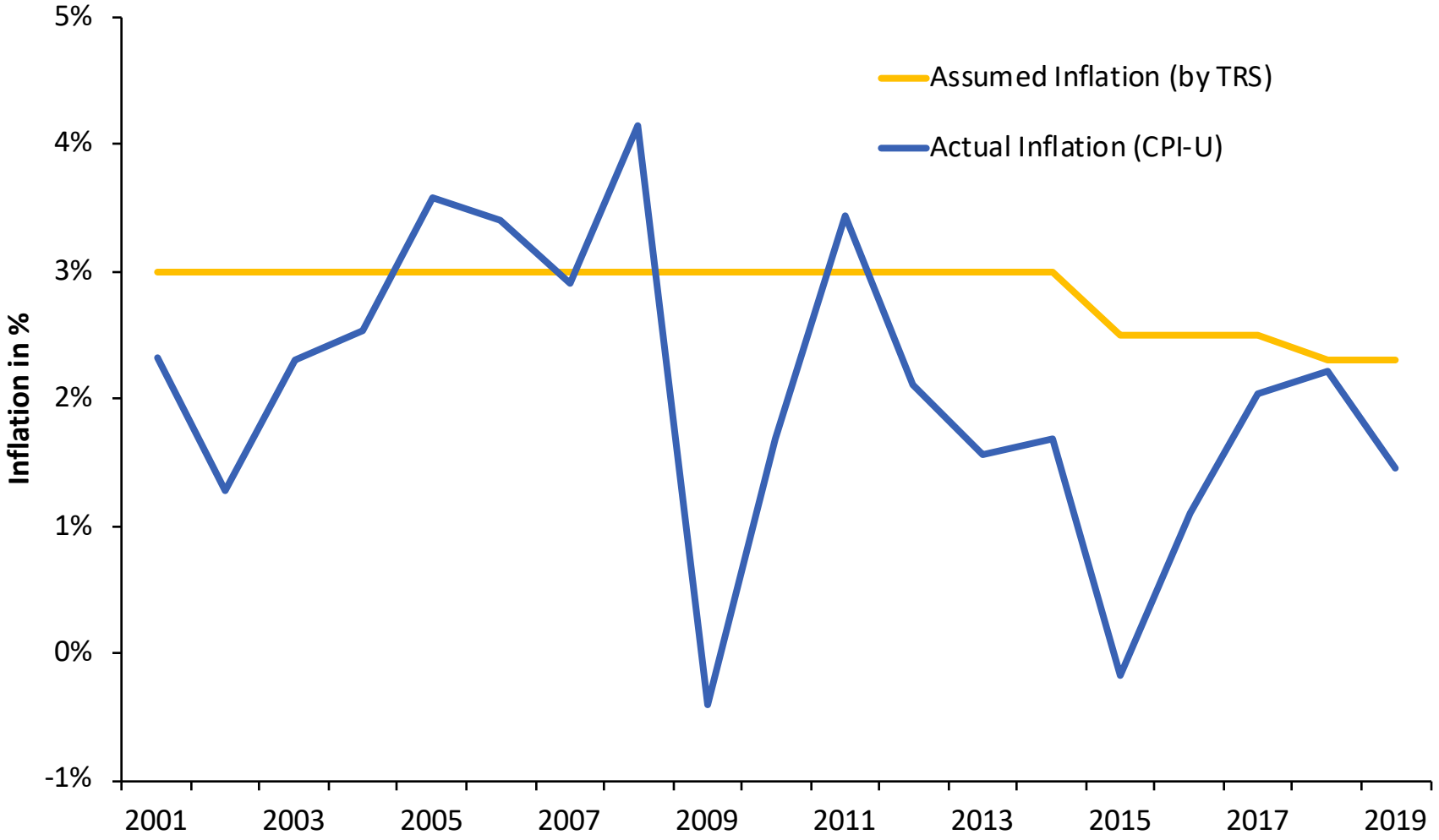
Actual Change in Payroll v. Assumption



Source: Pension Integrity Project analysis of TRS actuarial valuation reports and CAFRs. Years represent fiscal year ended dates.

Challenges from Aggressive Actuarial Assumptions

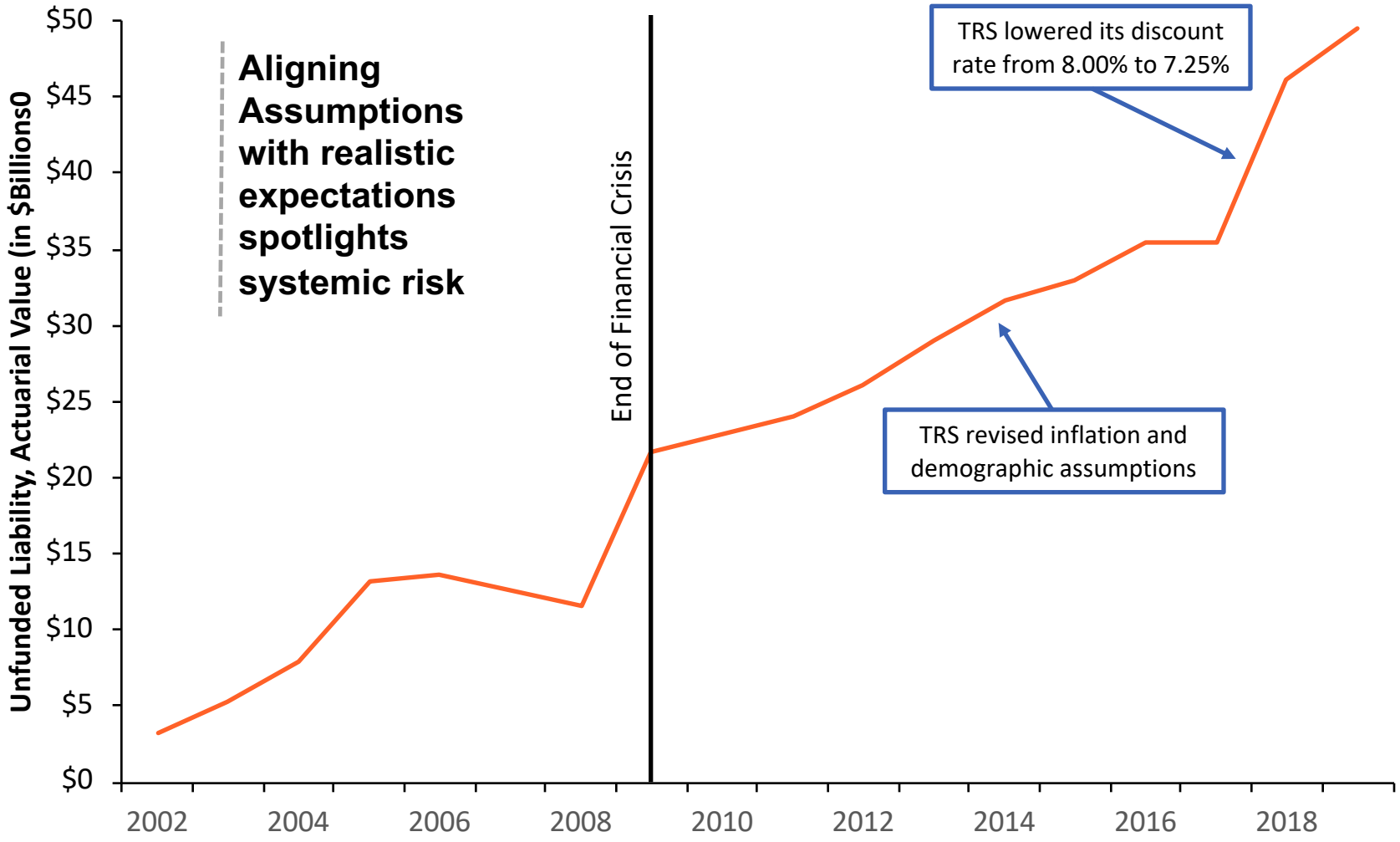
Actual Inflation v. Assumption



Source: Pension Integrity Project forecasting based on ERS actuarial valuation reports and CAFRs, and data from the Bureau of Labor Statistics.

Challenges in Making Prudent Assumptions

Recognition of More Accurate Debt Levels



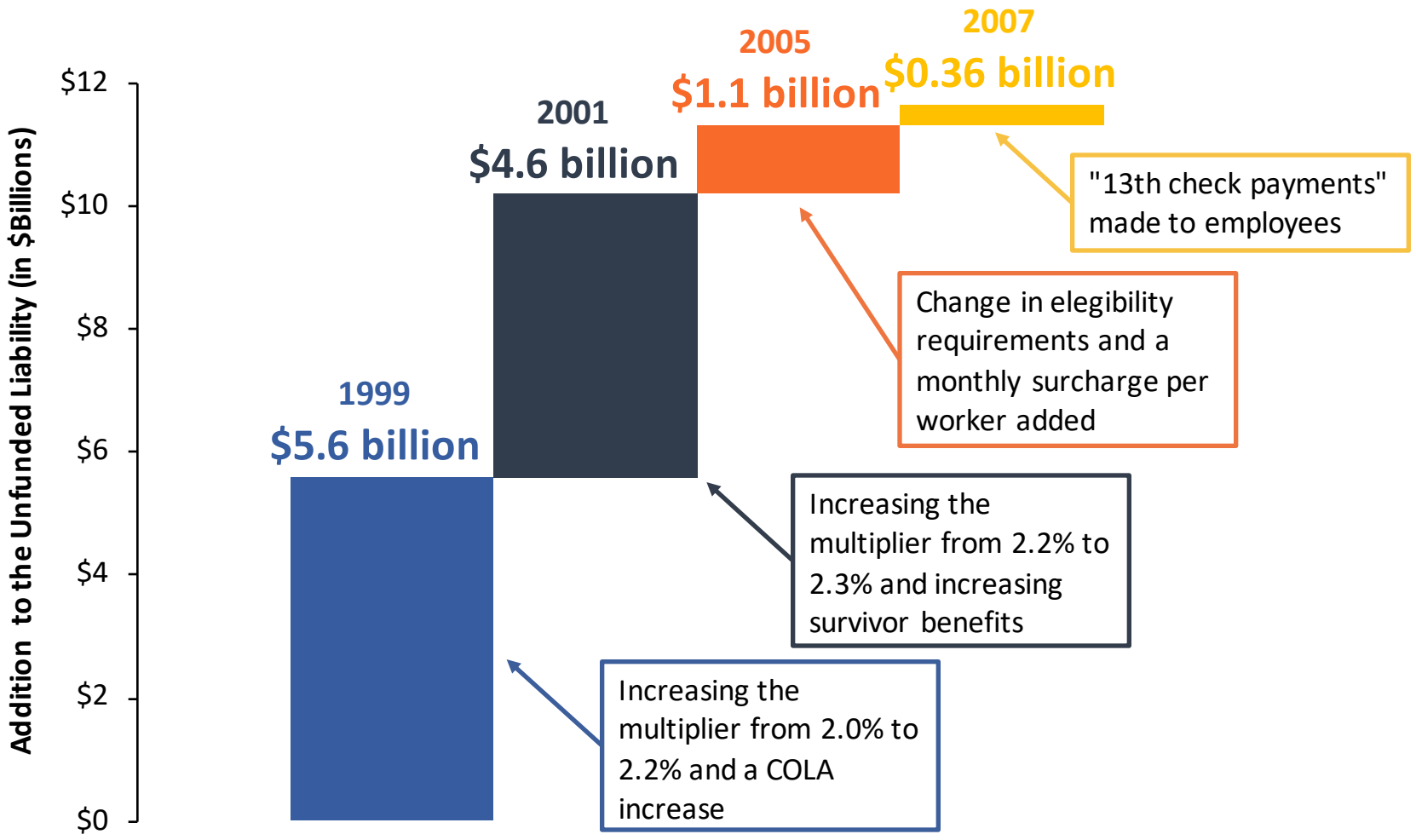
Source: Pension Integrity Project analysis of TRS actuarial reports and CAFRs.

CHALLENGE 4: UNFUNDED BENEFIT INCREASES

- $1.5 billion of the growth of the unfunded liability since 2001 came from legislative changes to the pension benefit structure that were not appropriately funded

Adjustments to Benefits 1998-2017

Addition to TRS Unfunded Liability



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

CHALLENGE 5: DISCOUNT RATE AND UNDERVALUING DEBT

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

TRS 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 TRS — 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 TRS 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.

TRS 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 Texas would pay out less than 100% of promised retirement income benefits to members and retirees.**
   - Article 16, § 66(d) of the Texas Constitution protects against impairment or reduction of accrued pension benefits "[A] change in service or disability retirement benefits or death benefits of a retirement system may not reduce or otherwise impair benefits accrued by a person…"

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.

TRS Pension Debt Sensitivity

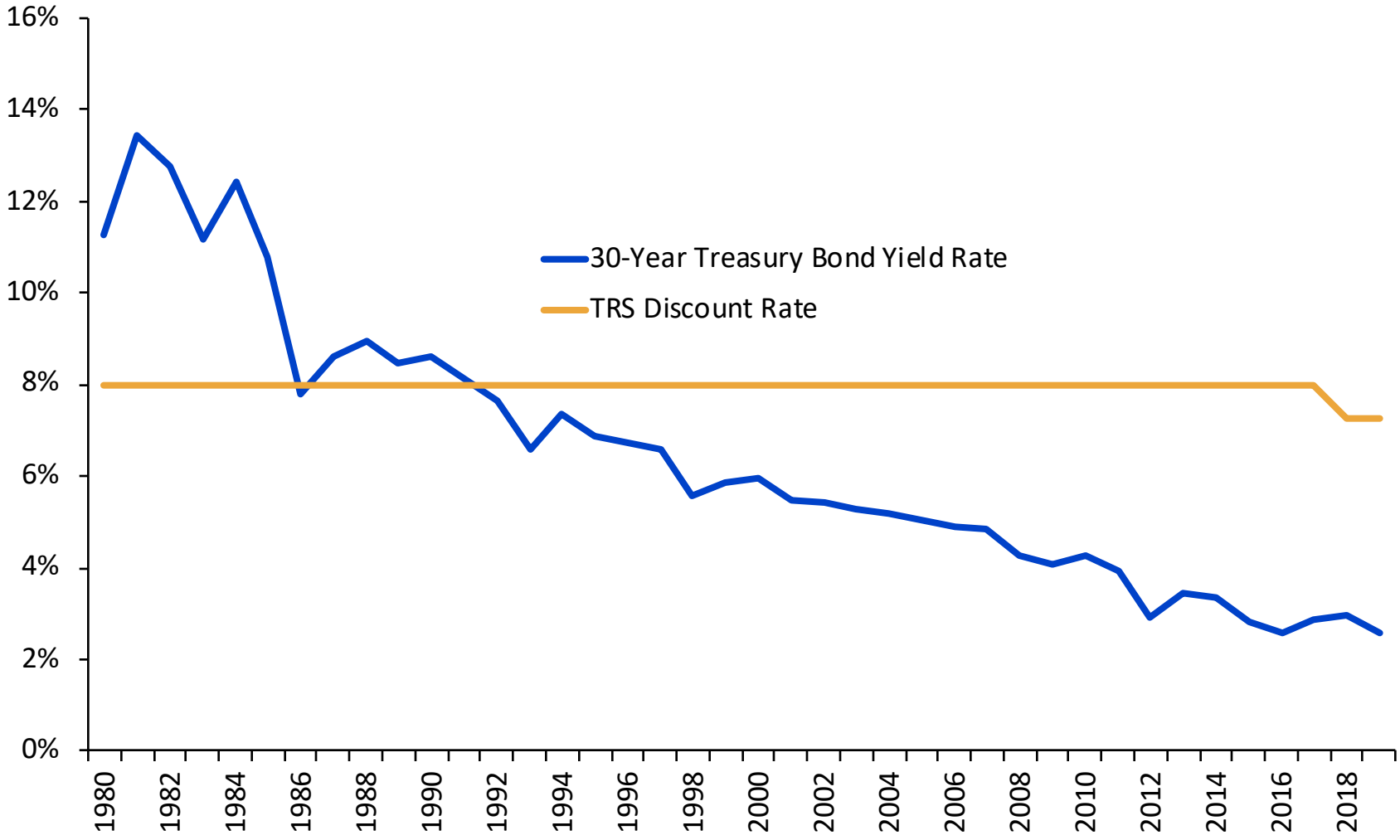
FYE 2019 Net Pension Liability Under Varying Discount Rates

Discount Rate	Funded Ratio (Market Value)	Net Pension Liability (Market Value)	Total Pension Liability
7.25% (FYE 2019 Baseline)	75%	$52 billion	$210 billion
7%	73%	$58 billion	$216 billion
6%	64%	$88 billion	$246 billion
5%	56%	$122 billion	$280 billion

Note: Both baseline and alternative unfunded liability figures should be considered approximate guides to unfunded liability projections under various discount rates. Any policy changes should be based on more precise actuarial liability forecasts using detailed plan data. Alternative unfunded liability is based on reported liability sensitivity from the FYE 2019 TRS CAFR.

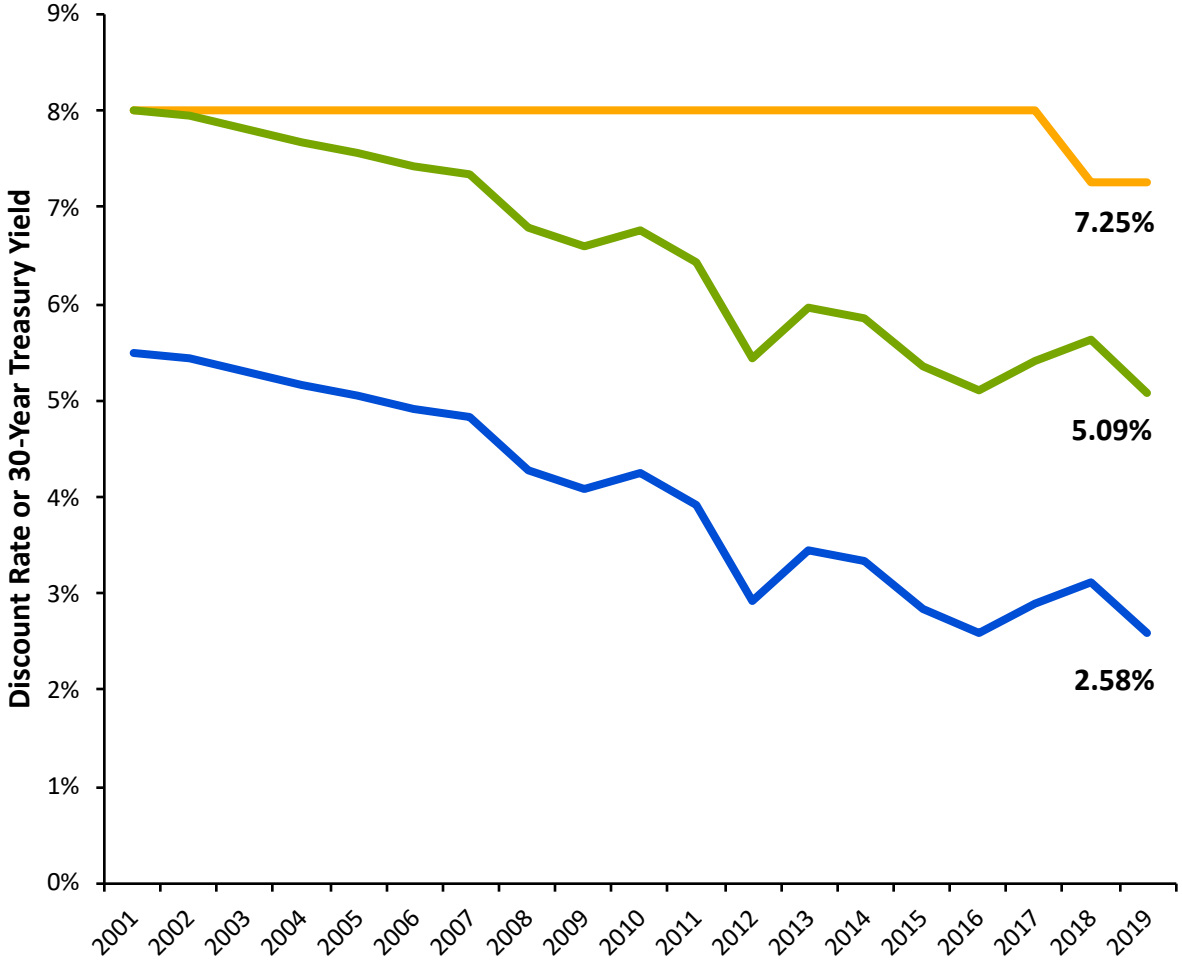
Source: Pension Integrity Project analysis of TRS GASB Statements.
Market values used are fiduciary net position. Figures are rounded.

Change in the Risk-Free Rate Compared to TRS Discount Rate (1980-2017)



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

Change in the Risk-Free Rate Compared to TRS Discount Rate (2000-2017)



The "Alternative Discount Rate Scenario" imagines that TRS 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 TRS discount rate based on changes in one measure of a so-called "risk free" rate of return.

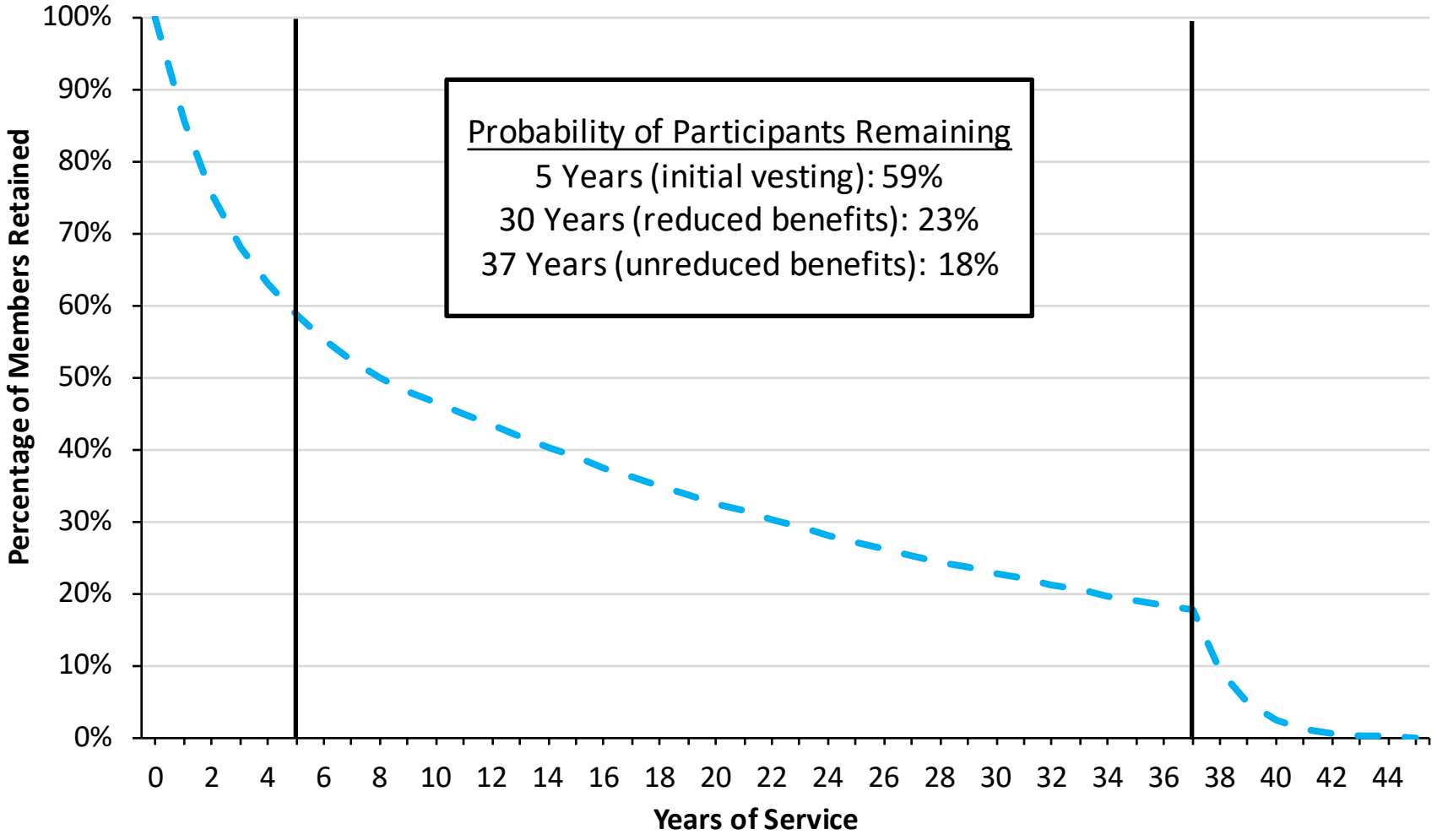
Such a link would have meant a consistent 251 basis point spread between the TRS discount rate and the Treasury yield. As the risk free rate rose and fell, so too would the TRS discount rate.

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

CHALLENGE 6: THE EXISTING BENEFIT DESIGN DOES NOT WORK FOR EVERYONE

- More than 70% of TRS members do not work long enough to earn a full pension
- The turnover rate for Texas teachers suggests that the current retirement benefit design is not effective at encouraging retention in the near-term, and may be pushing out teachers at the end of their careers.

Probability of Members Remaining in TRS



Source: Bellwether Education Partners benefit modeling and analysis of TRS Actuarial Valuations

Does TRS Retirement Plan Work for All Teachers?

- **41%** of new teachers leave before 5 years
  - TRS members need to work for 5 years before their benefits become vested.
  - Another 12% of new public employees who are still working after 5 years will leave before 10 years of service
- **23%** of all members hired will still be working after 30 years, long enough to qualify for reduced benefits
- Just **18%** of Texas teachers will "break even" on their pensions, according to TeacherPensions.org

Source: Bellwether Education Partners benefit modeling and analysis of TRS Actuarial Valuations

Recruiting and Retaining Teachers

- **Recruiting Teachers:**
  - There is little evidence that retirement plans — DB, DC, or other design — are a major factor in whether an individual wants to become a teacher or is recruited to a particular state
  - The most likely incentive to increase recruiting to the teacher work force is Increased salary.

- **Retaining Teachers:**
  - If the goal of the TRS pension plan is to retain teachers it is not working as intended, as 59% of teachers leave within 5 years.
  - After 20 to 25 years of service there is some retention effect, but the same incentives serve to push out teachers in a sharp drop off after 37 years of service.

Source: Turnover data cited based on Bellwether Education Partners review of TRS assumptions.

The Social Security Inconsistency

- The TRS actuary assumes that about 60% of teachers participate in Social Security.
  - Actual Social Security coverage may be much less than assumed
  - Coverage varies by school district preference in Texas
- The TRS benefit is the same no matter whether an employee has access to Social Security or not.
  - Employees outside Social Security do not have to make payroll contributions to SSA; but they do not receive benefits
- Employer contributions depend on whether or not they have employees participating in Social Security.
  - Since 2014, employers outside SSA make a 1.5% contribution to TRS

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

FRAMEWORK FOR SOLUTIONS & REFORM

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

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.
   - Reducing the amortization schedule would save the state billions in interest payments.

2. Adopt better funding policy, risk assessment, and actuarial assumptions.
   - These changes should aim at minimizing risk and contribution rate volatility for employers and employees.

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.

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

- **Current amortization policy for both state system targets time horizons that are too long**
  - The TRS board targets a 30-year window to pay off unfunded liabilities.
  - 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 TRS be funded on a certain time period under specific scenarios, such as alternative assumptions and/or stress test scenarios

2. Adopt Better Funding Policy, Investment Policy, and Actuarial Assumptions (1 of 2)

- **Funding Policy**
  - Switch from paying statutorily determined contributions to paying actuarially determined contribution
  - Determine what overall share employees will contribute, and what employers will contribute once the state reaches the 10% cap
  - Consider require that future employees that accrue defined benefits make contributions that are an explicit share of all plan costs (such as a 50-50 split) as actuarially determined, using short (10-year or less) periods to pay off any unfunded liabilities that might accrue

2. Adopt Better Funding Policy, Risk Assessment, and Actuarial Assumptions (2 of 2)

- **Risk Assessment and Actuarial Assumptions**
  - Look to lower the assumed return such that it aligns with more realistic probability of success
  - Adjust the portfolio to reduce high risk assets no longer needed with lower assumed return target
  - 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

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

- **TRS is not providing a path for retirement income security to all teachers and school employees**
  - For example, only 23% of teachers make it to the 30 years necessary for a reduced pension. And just 18% of teachers earn a full pension. This means the majority of teachers would be better served by having the choice of an alternative plan design — such as a DC plan or Cash Balance 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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