NORTH CAROLINA TSERS PENSION SOLVENCY ANALYSIS

Prepared by:

Pension Integrity Project at Reason Foundation

August 31, 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

What Do TSERS Retirees Receive?

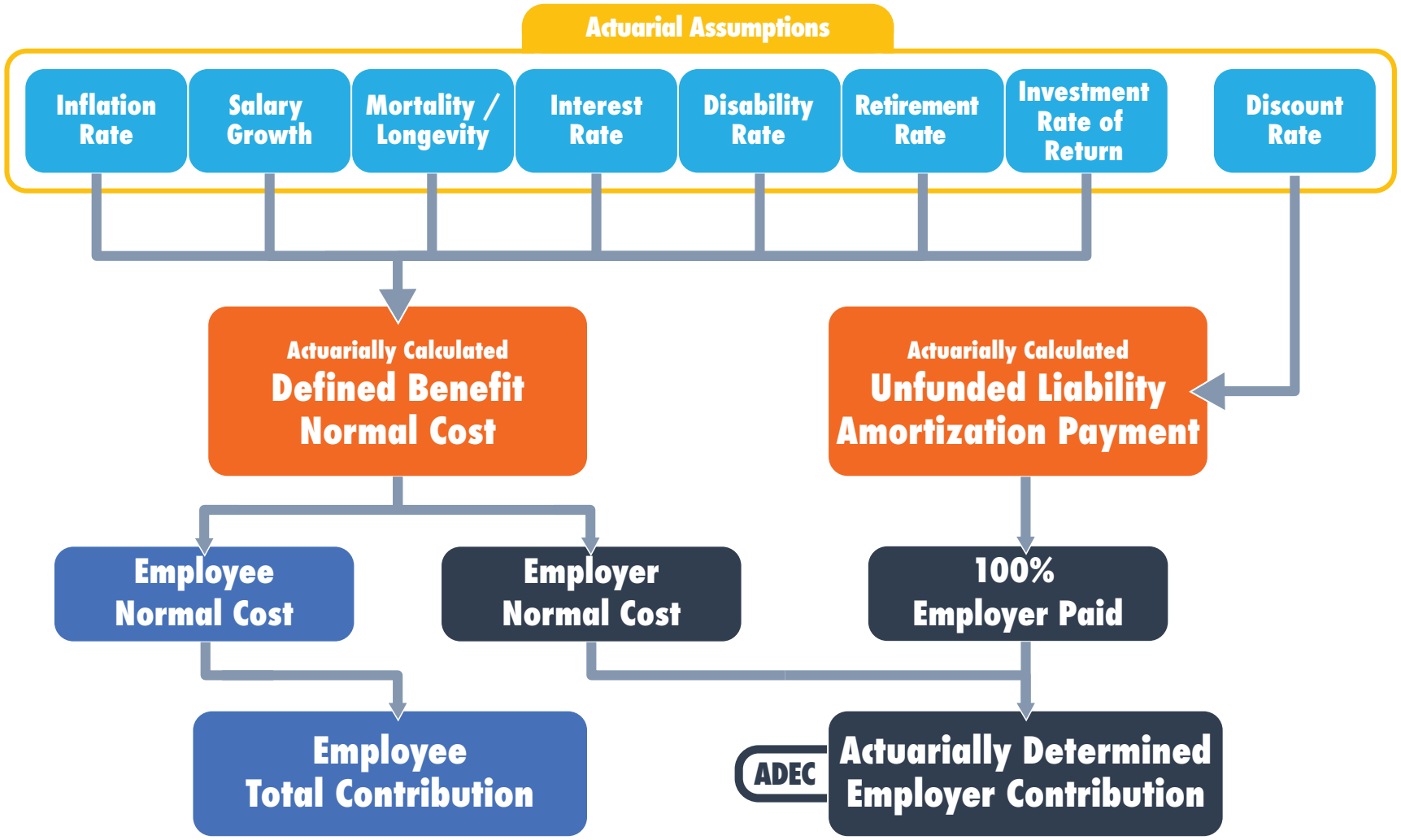
How much a worker receives in retirement benefits depends on how long they have worked in the public sector and their final average compensation at retirement.

Specifically, the annual retirement allowance is determined by the following formula:

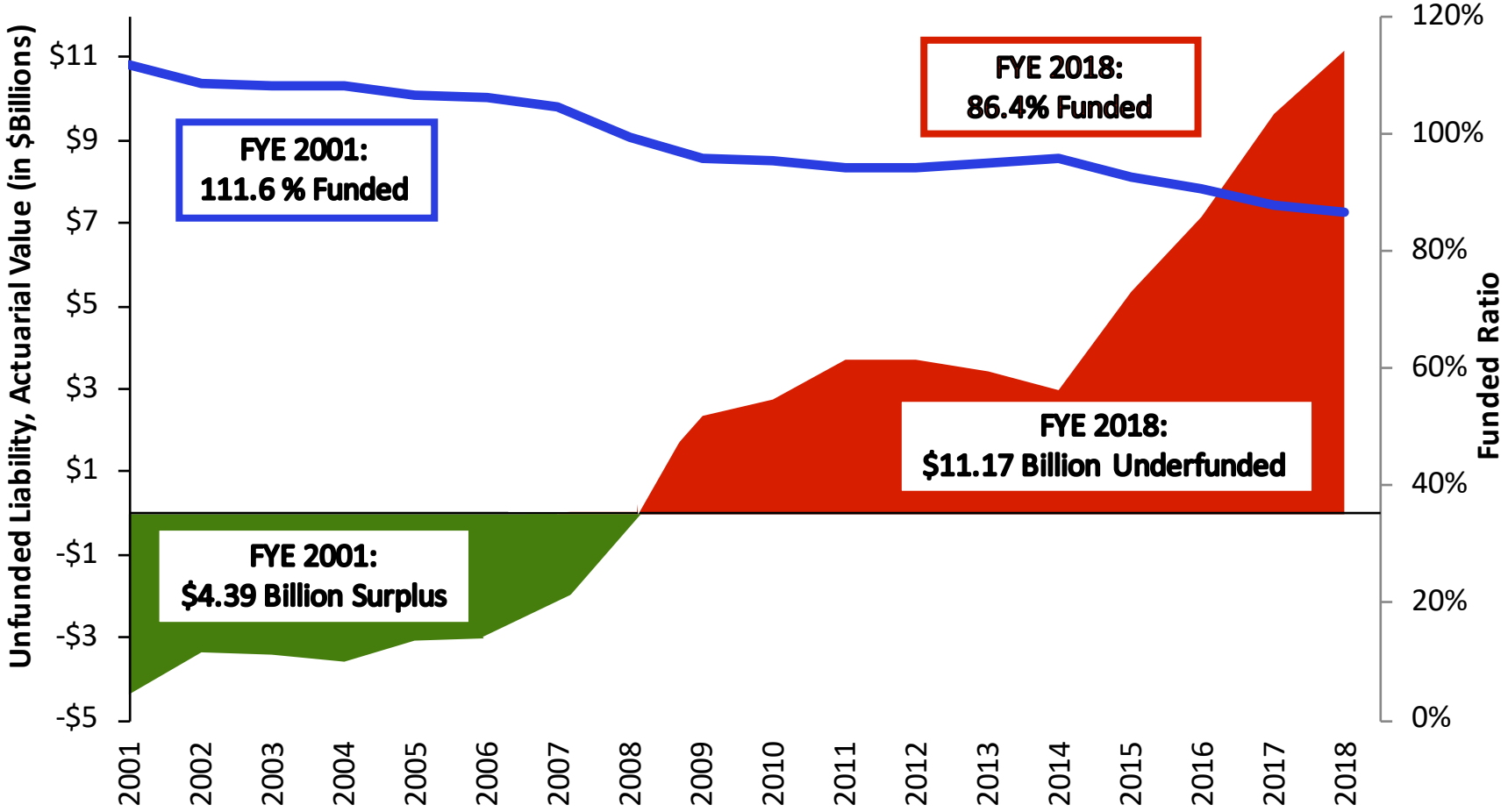
Annual Retirement Benefit =
Benefit Multiplier x Years of Service x Final Average Salary

Example:
1.82% multiplier x 30 years of service x $100,000 FAS =
$54,600 annual pension benefit

How a Pension Plan is Funded

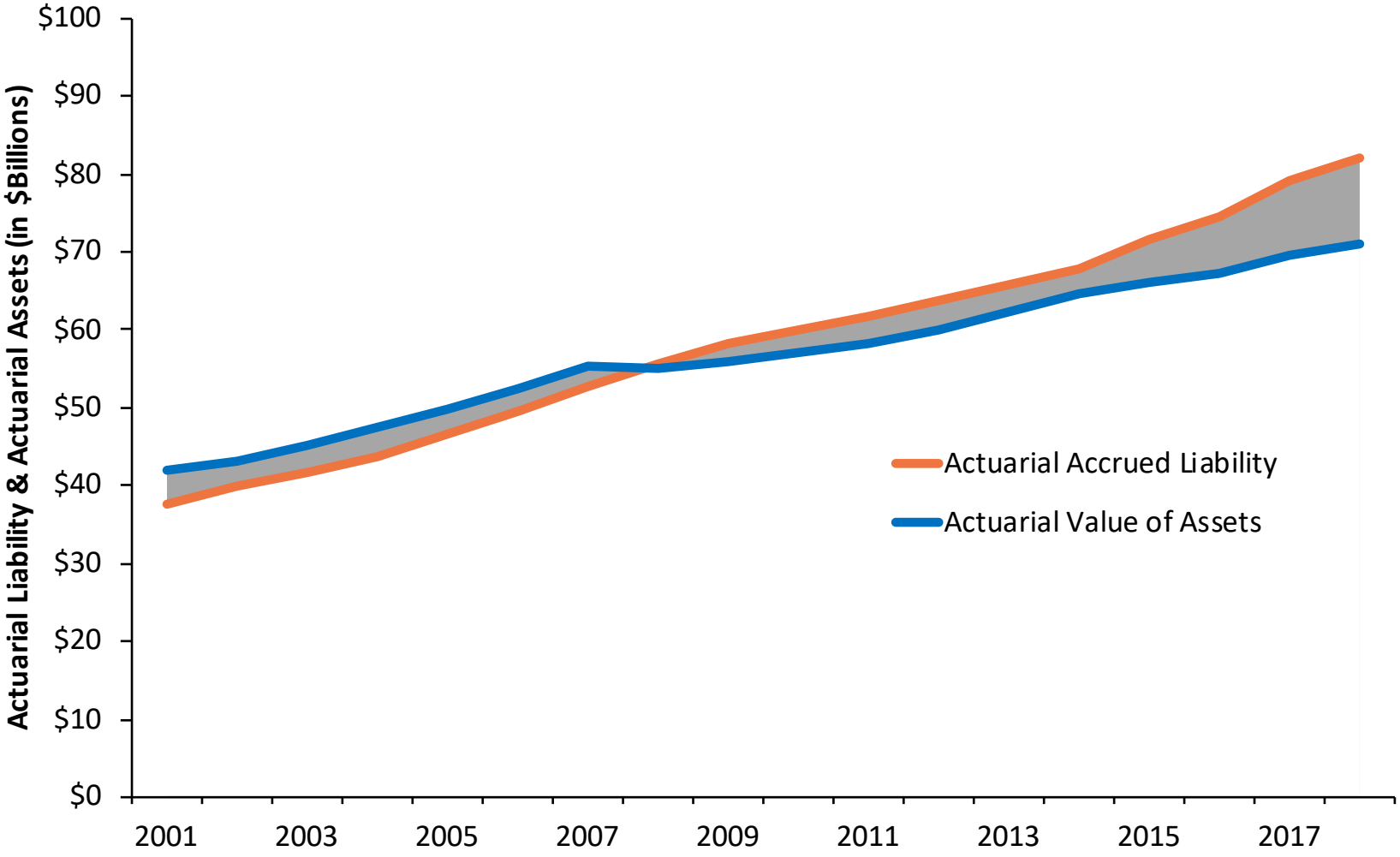


A History of Weakening Solvency (2001-2018)



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

TSERS Liabilities are Growing Faster than Assets



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

TSERS REMAINS FINANCIALLY STRONG, BUT CHALLENGES LOOM

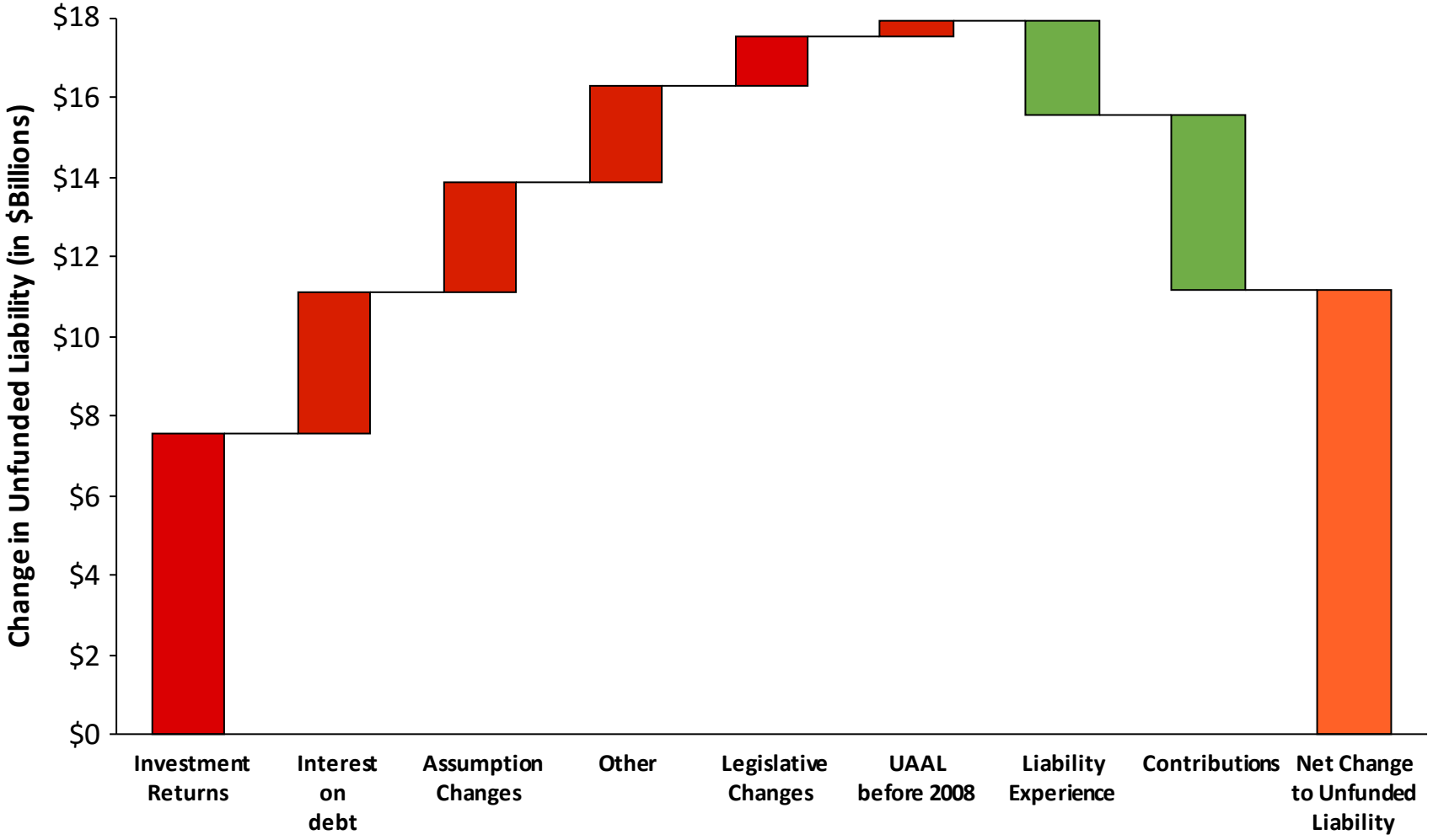
- Underperforming TSERS investments are contributing to declining solvency
- TSERS debt levels continue to rise despite a record 10-year bull market

Key Strengths of TSERS

- Funded ratio of *86.4%,* above national average of 72.6%
- Use of *7.0% assumed rate of return* (ARR), below national average of 7.2%
- Timely and full payment of *actuarially determined contributions*
  - *Employer Contribution Rate Stabilization Policy* is designed to pay down unfunded liabilities faster—requires a minimum annual employer contribution of either:
    - (1) last year's contribution + 0.35% of payroll, or
    - (2) the actuarially determined employer contribution, whichever is higher.
- The use of short, *12-year amortization schedules* to pay down new unfunded liabilities any given year, calculated on a *level-dollar* (equalized annual payment) basis
- Consistent use of updated *mortality tables*
- Ad hoc *cost-of-living-adjustments (COLA)* based on plan performance, granted at legislature's discretion

The Causes of the Pension Debt

Actuarial Experience of TSERS, 2008-2018



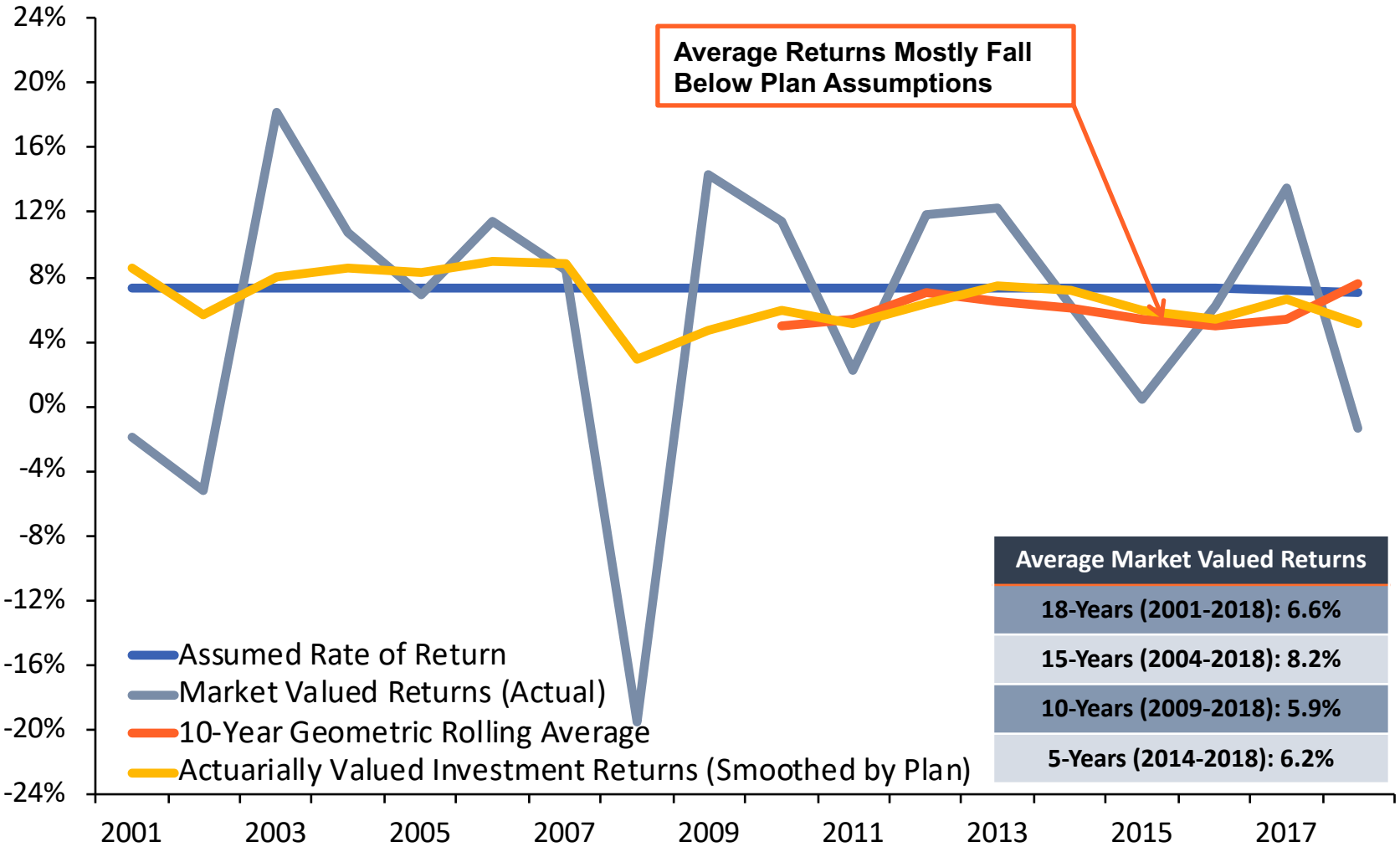
Source: Pension Integrity Project analysis of TSERS actuarial valuations. Data represents cumulative unfunded liability by gain/loss category.

Driving Factors Behind TSERS Challenges

1. **Deviations from Investment Return Assumptions** have been the largest contributor to the unfunded liability growth, adding $7.6 billion to the unfunded liability since 2008.
2. **Interest on debt** has resulted in a $3.5 billion increase in the unfunded liability since 2008.
3. **Changes in Assumptions** have uncovered around $2.8 billion in previously unrecognized unfunded liability since 2008.
4. **Other** factors include differences in methodologies and the changes in assumptions and methods based on the experience study conducted in 2015.
5. **Legislative changes** like cost-of-living adjustments (COLA) contributed another $1.2 billion to the unfunded liability.

TSERS Assumed Rate of Return

Investment Return History, 2001-2018



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

TSERS Investments Consistently Return Below Assumptions

- The TSERS assumed rate of return has decreased from 7.25% to 7.00% over the last several years.
- In search for higher investment returns, TSERS has steadily expanded into riskier assets since following the 2008 financial crisis.
- Despite the shift, the TSERS portfolio still has not delivered average returns consistent with the system's long-term assumptions:

Average Market Valued Returns	Average Actuarially Valued Returns
18-Years (2001-2018): 5.89%	18-Years (2001-2018): 6.63%
15-Years (2004-2018): 6.33%	15-Years (2004-2018): 6.15%
10-Years (2009-2018): 5.75%	10-Years (2009-2018): 6.21%
5-Years (2014-2018): 4.98%	5-Years (2014-2018): 6.10%

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.

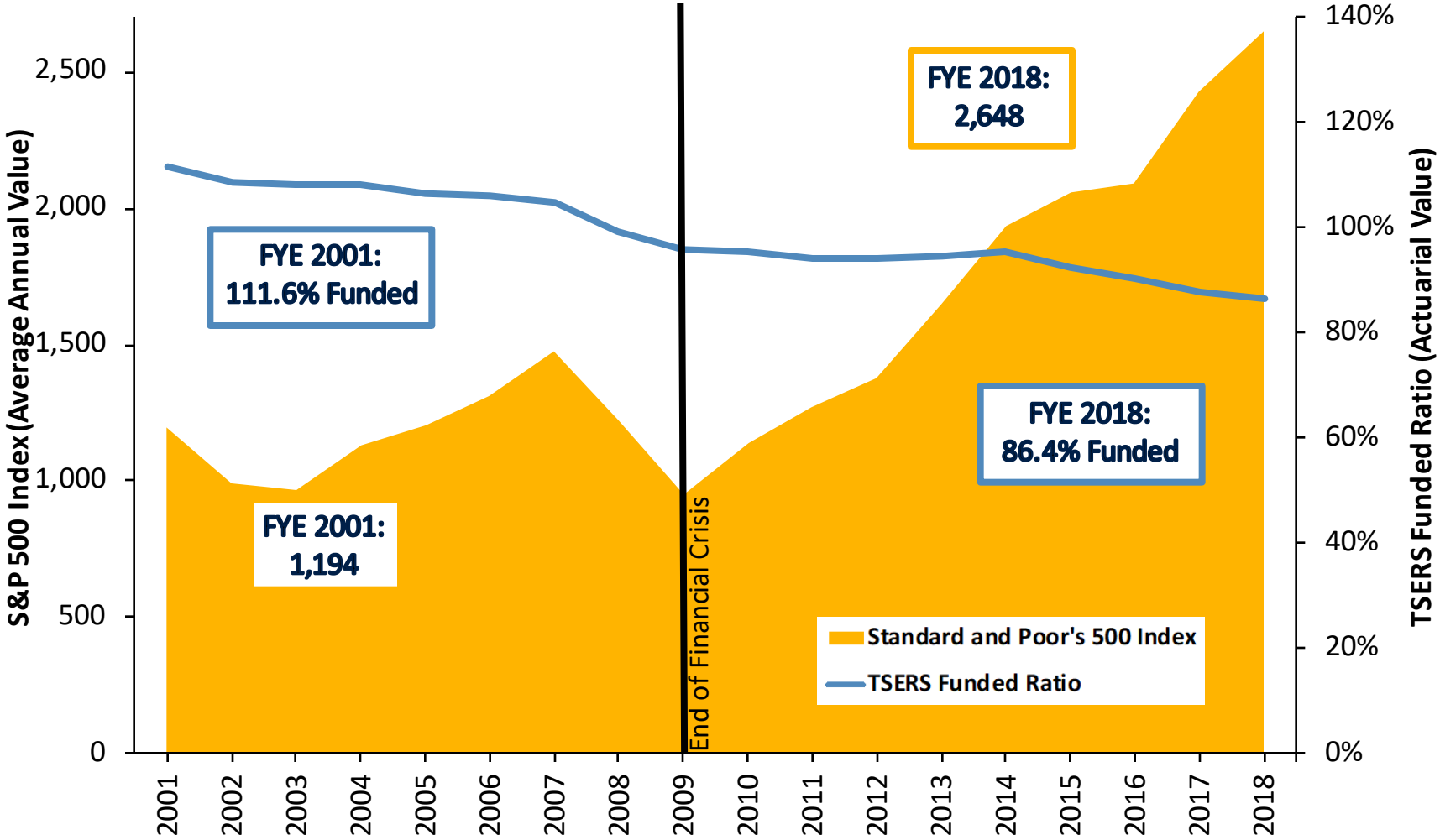
Source: Pension Integrity Project analysis of TSERS actuarial valuation reports.
Average market valued returns represent geometric means of the actual time-weighted returns.

New Normal: 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. TSERS has yet to recover from the 2009 recession, and now it will need to navigate the uncertainty and fallout of COVID-19.

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



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

New Normal: Forecasts for Future Returns are Significantly Lower than Past Returns

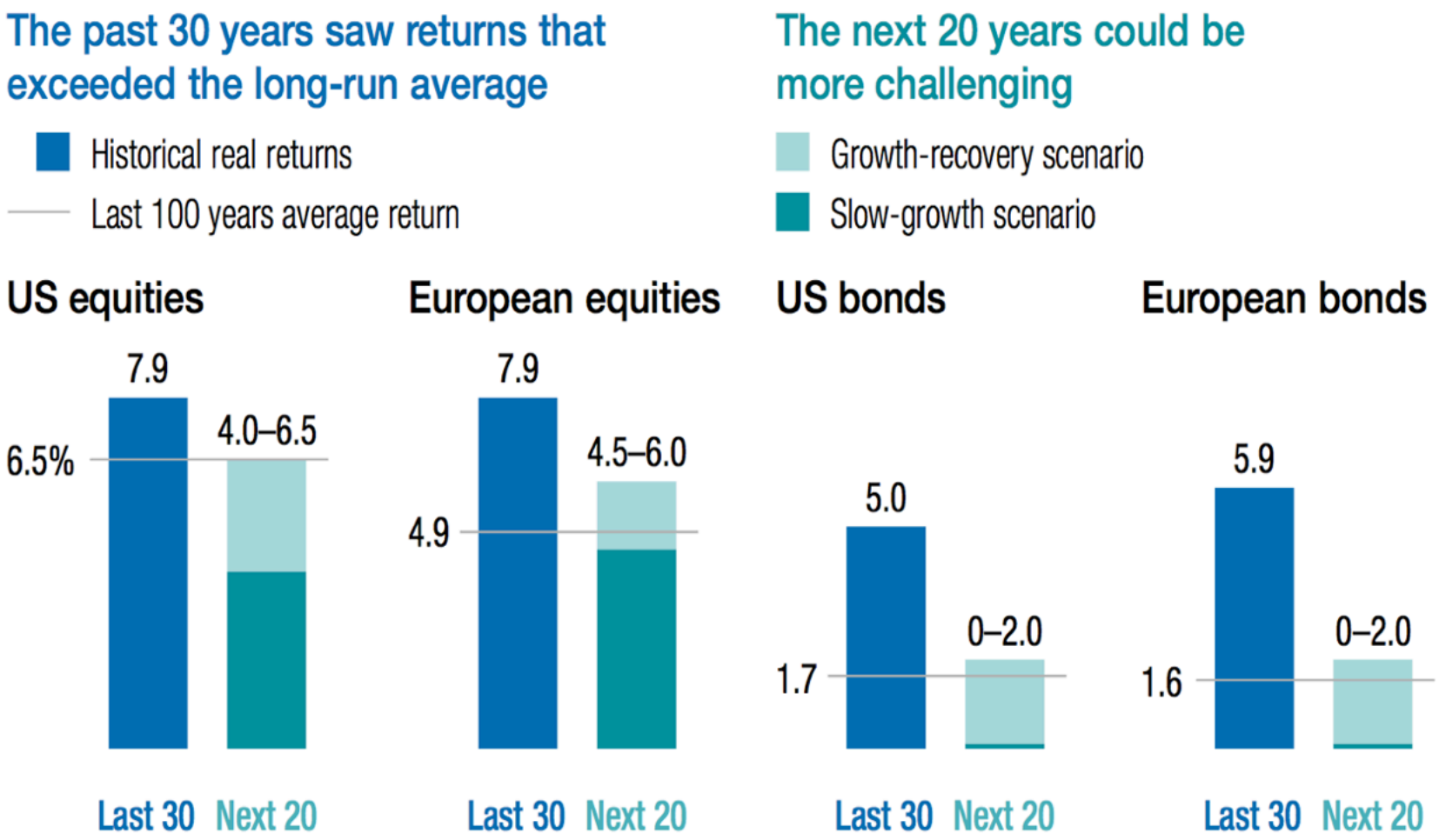
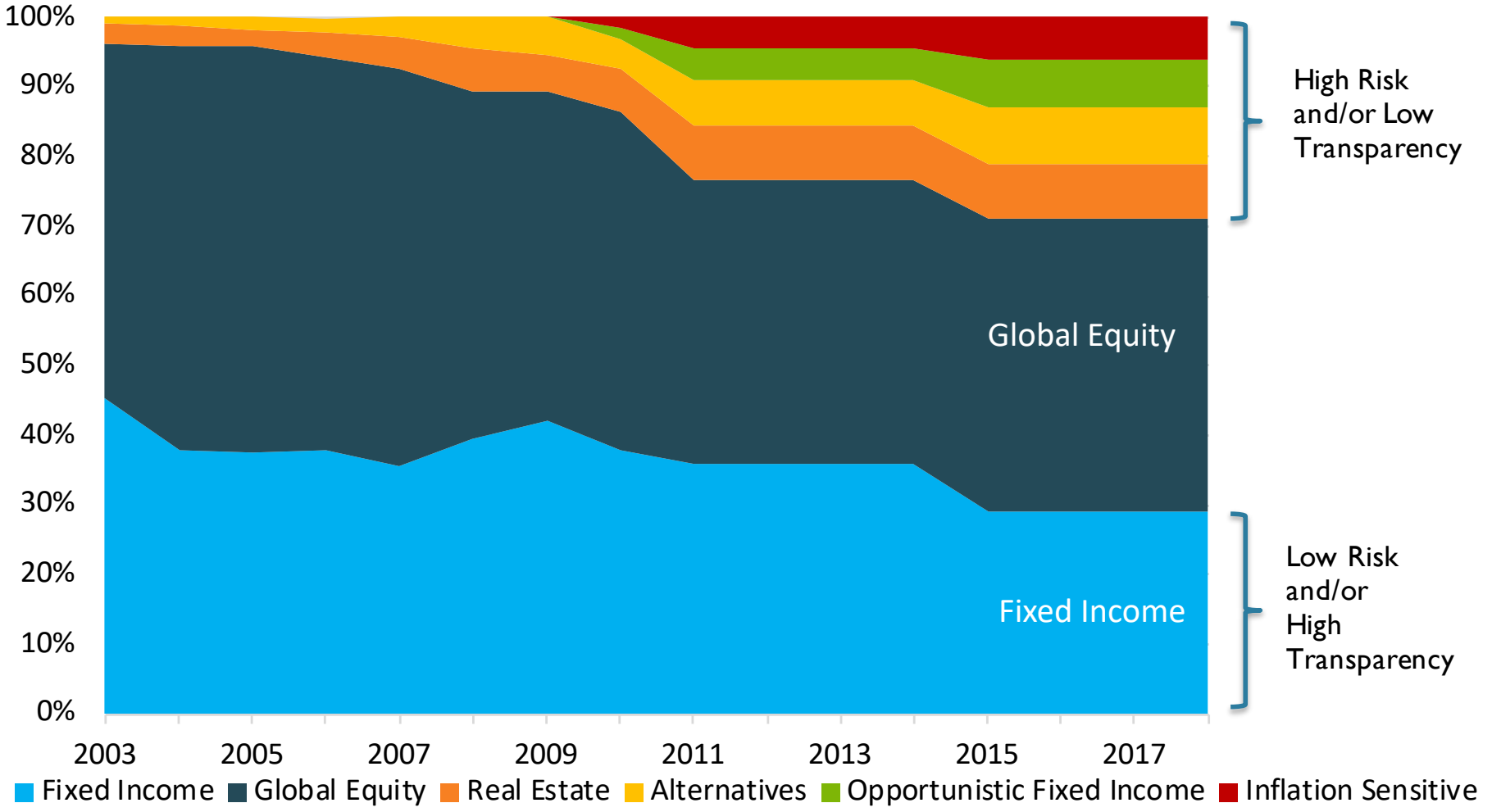


Image & Data Source: McKinsey & Company, *Diminishing Returns: Why Investors May Need To Lower Their Expectations* (May 2016)

TSERS Asset Allocation (2003-2018)

Expanding Risk in Search for Yield



Source: Pension Integrity Project analysis of TSERS actuarial valuation reports, CAFRs and quarterly Investment Performance Overviews. Alternative Investment are defined as investments in various limited partnerships and limited liability companies, hedge funds, U.S. Treasuries, and equities. Opportunistic Fixed Income Investments are debt-related strategies made primarily through limited partnerships or other limited liability vehicles as defined by General Statutes. Inflation Sensitive Investments assets acquired for the primary purpose of providing protection against risks associated with inflation made primarily through limited partnerships, other limited liability vehicles, or fixed income securities managed pursuant to General Statute.

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

Probability of TSERS Achieving A Given Return Based On:								
	North Carolina Forecast		Short-Medium Tern				Long Term	
Possible Rates of Return	TSERS Forecast	TSERS 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
8.00%	33%	22%	19%	20%	9%	20%	36%	37%
7.50%	41%	30%	25%	27%	13%	27%	44%	45%
7.00%	49%	39%	33%	34%	18%	34%	52%	54%
6.50%	58%	50%	41%	42%	25%	43%	59%	63%
6.00%	66%	60%	51%	51%	33%	51%	66%	71%
5.50%	73%	70%	60%	59%	42%	59%	73%	78%
5.00%	79%	78%	67%	67%	50%	67%	79%	83%
4.50%	85%	85%	75%	74%	59%	75%	84%	86%
4.00%	89%	90%	82%	80%	68%	81%	88%	92%

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

TSERS Forecast

- A probability analysis of TSERS historical returns over the past 17 years (2001-2018) indicates only a 50% chance of hitting the plan's 7.0% assumed return.
- ASRS actuaries calculate an approximately 50% (+/-) chance of achieving their investment return target each year.

Short-Term Market Forecast

- Returns over the short to medium term can have significant negative effects on funding outcomes for mature pension plans like TSERS.
- 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, TSERS returns are likely to fall short of assumptions.

Long-Term Market Forecast

- Longer-term projections typically assume TSERS investment returns will revert back to historical averages.
  - ✓ The "reversion to mean" assumption **should be viewed with caution** given historical changes in interest rates and other market conditions that increase uncertainty over longer projection periods, relative to shorter ones.
- Forecasts showing long-term returns near 7.0% 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 JP Morgan 10-15 year forecast the probability of achieving an average return of 7.0% or higher is about 34%, the probability of earning a rate of return 6% or above is 51%.

RISK ASSESSMENT

How resilient is TSERS to volatile market factors?

Important Funding Concepts

Employer Contribution Rates

- *Actuarially Determined Employer Contribution (ADEC)*: ADEC is the annual required amount TSERS' consulting actuary has determined is needed to be contributed each year to avoid growth in pension debt and keep TSERS solvent
- *Employer Contribution Rate Stabilization Policy*: TSERS uses a funding policy mechanism designed to pay down unfunded liabilities faster, requiring a minimum annual employer contribution of either: (1) last year's contribution + 0.35% of payroll, or (2) the ADEC, whichever is higher.

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 TSERS' current assumptions using the plan's existing contribution and funding policy and shows the status quo before the 2020 market shock

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 TSERS Using Crisis Simulations

Stress on the Economy:

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

Methodology:

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

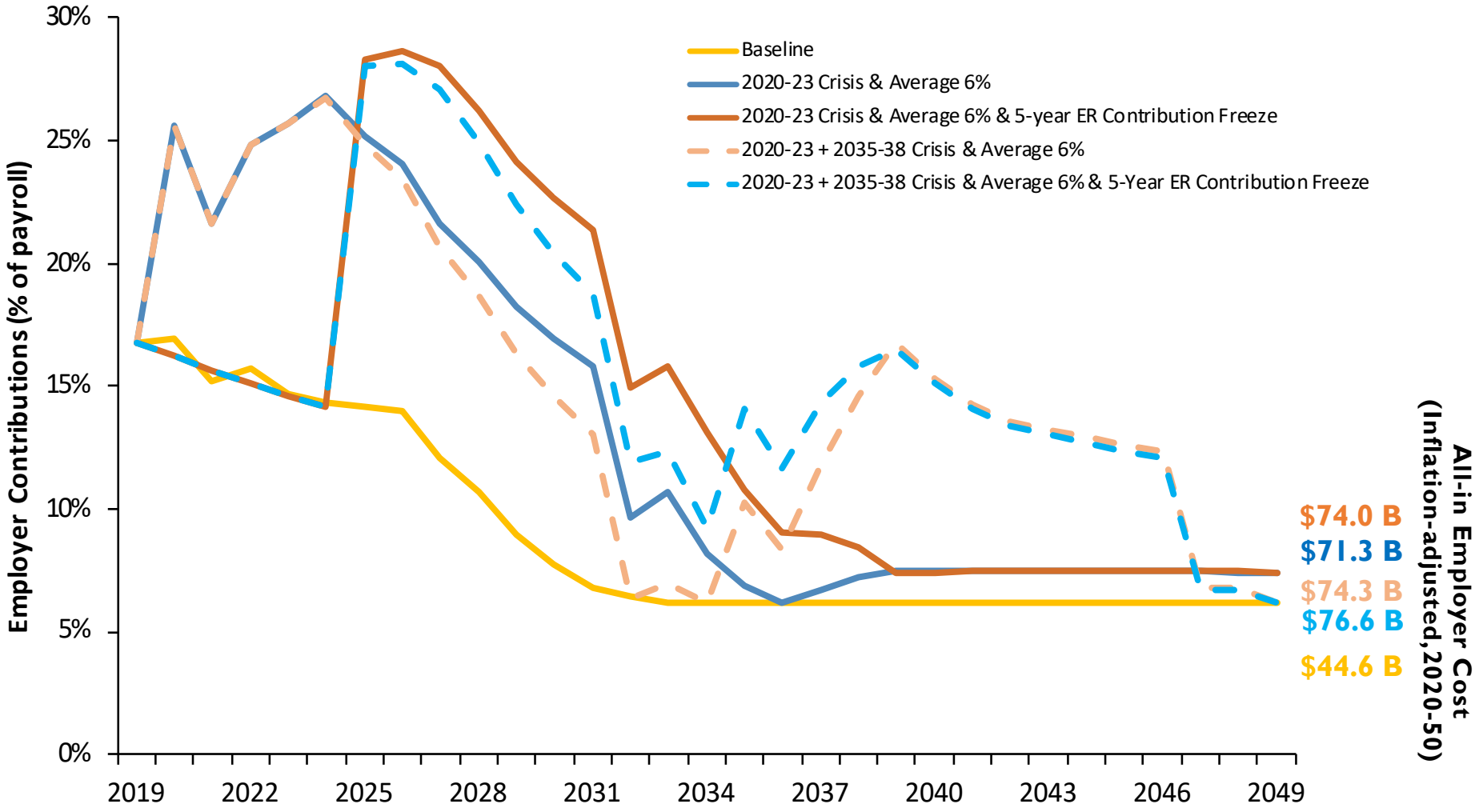
Stress Testing Scenarios:

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

TSERS Stress Testing: All-in Employer Cost Projections

How a Crisis Increases TSERS Costs

Discount Rate: 7.00%, Assumed Return: 7.00%, Actual Return: Varying, Amo. Period: 30-Year, Closed

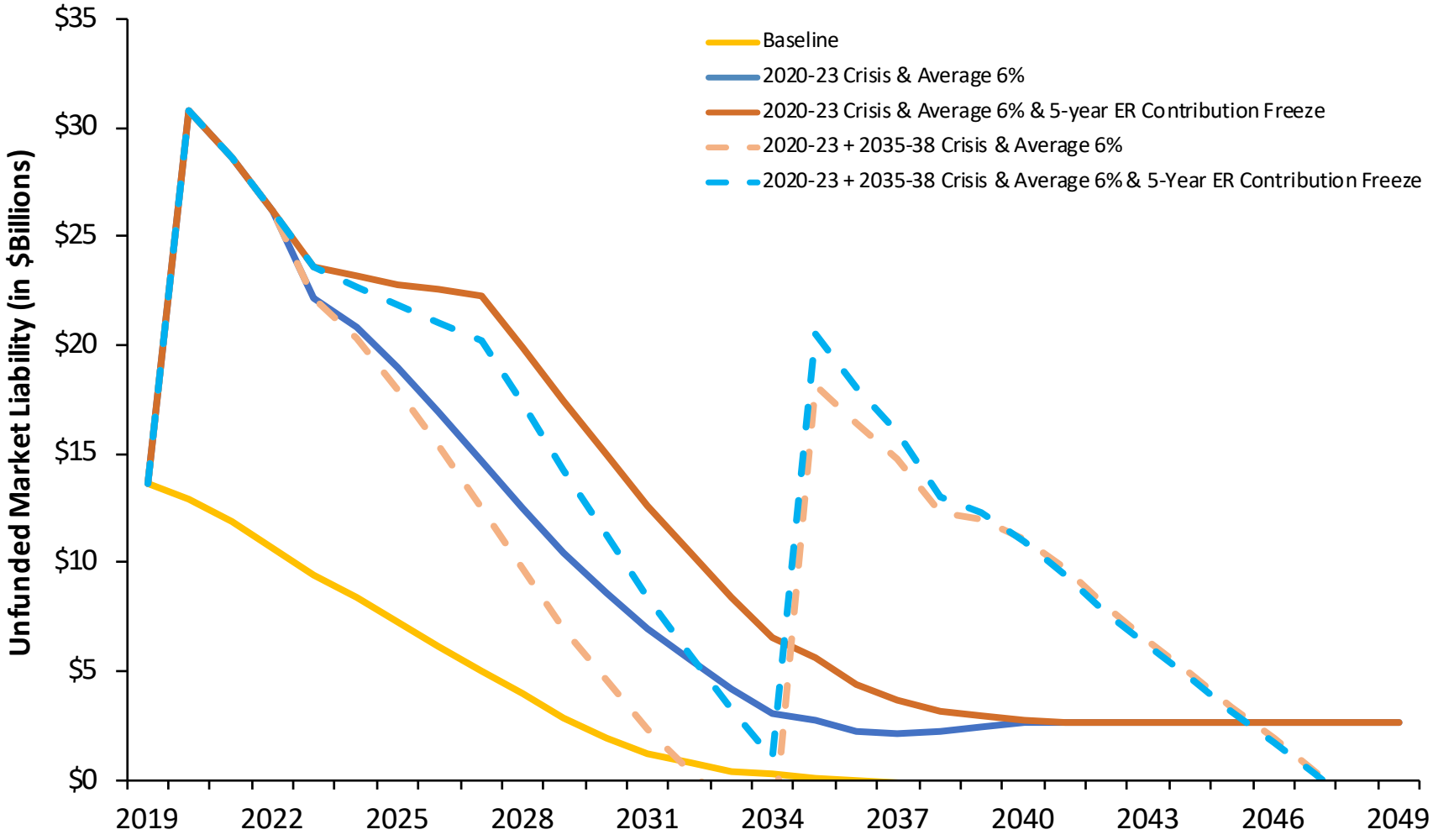


Source: Pension Integrity Project TSERS actuarial forecast. Values are rounded and adjusted for inflation. State assumed to make 100% statutory contributions.

TSERS Stress Testing: Unfunded Liability Projections

Crisis Scenarios Drive Unfunded Liabilities Higher

Discount Rate: 7.00%, Assumed Return: 7.00%, Actual Return: Varying, Amo. Period: 30-Year, Closed

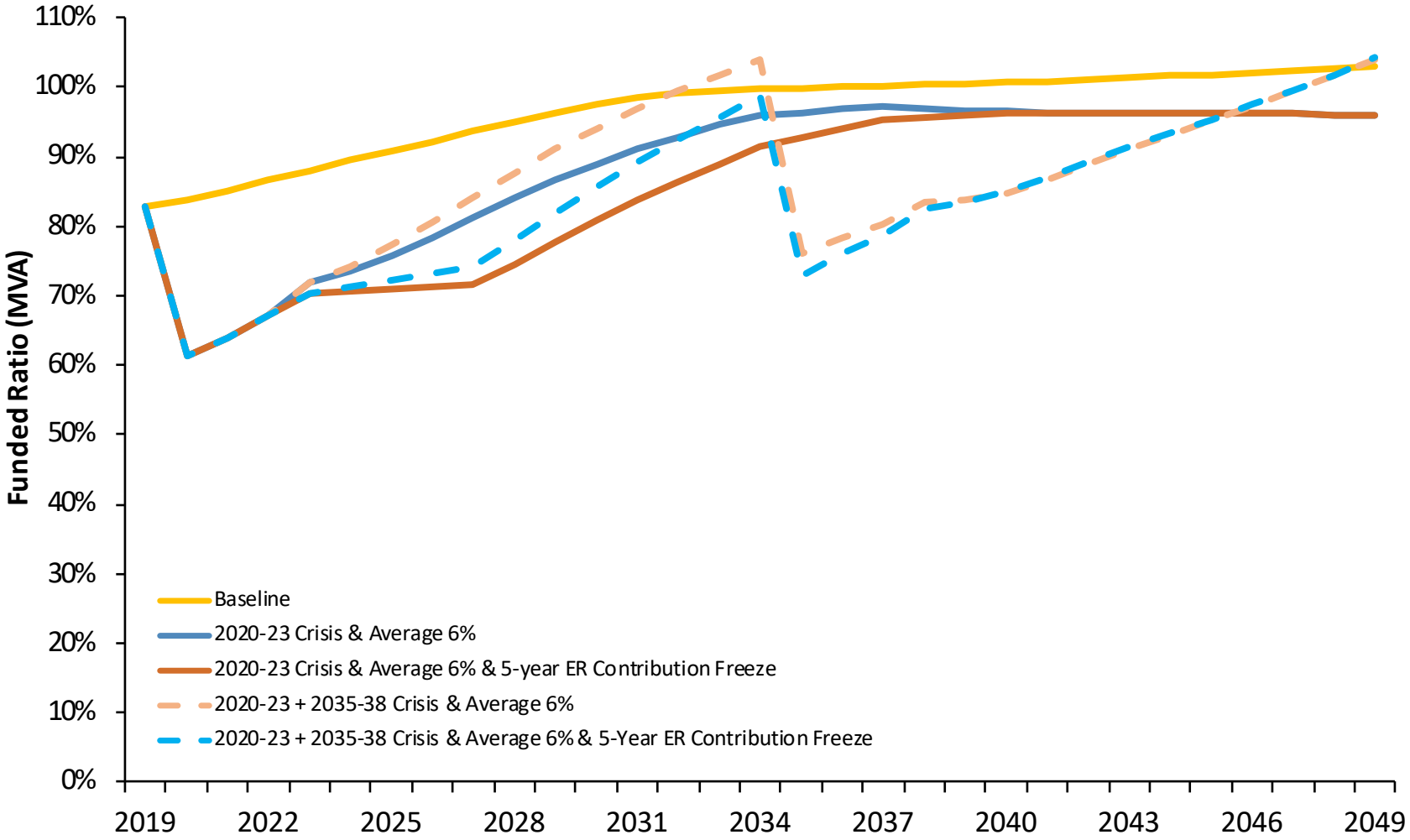


Source: Pension Integrity Project TSERS actuarial forecast. Values are rounded and adjusted for inflation. State is assumed to make statutory contributions

TSERS Stress Testing: Funded Status Projections

PERS Solvency Varies Under Crisis Scenarios

Discount Rate: 7.00%, Assumed Return: 7.00%, Actual Return: Varying, Amo. Period: 30-Year, Closed



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

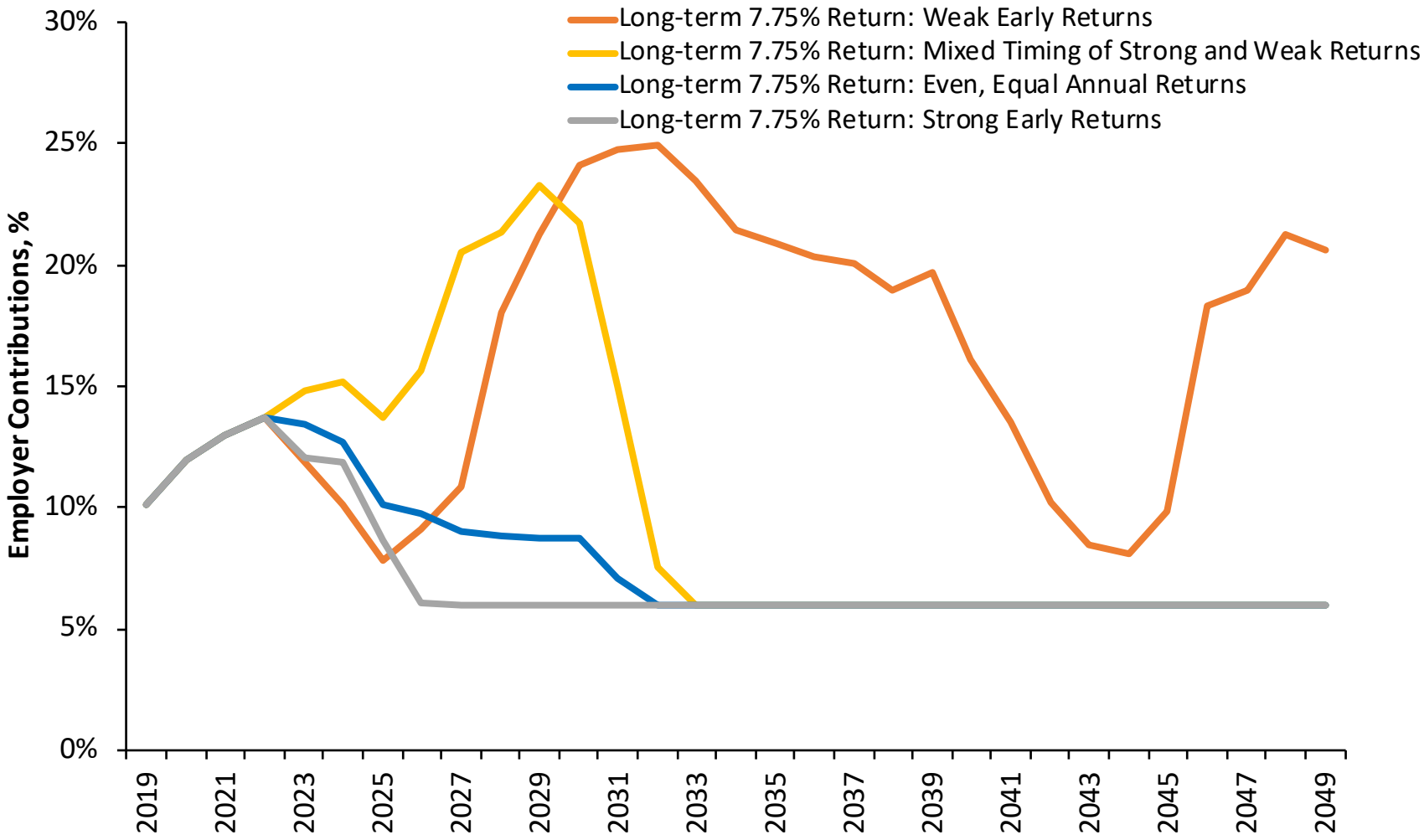
Scenario Comparison of Employer Costs

Scenarios	30-Year Employer Contributions	2050 Unfunded Liability (Market Value)	Total All-in Employer Costs
Pre-Crisis Baseline	$46.7 B	-$2.1 B	$44.6 B
2020-23 Crisis + Average 6%	$68.6 B	$2.7 B	$71.3 B
Two Crises + Average 6%	$77.2 B	-$2.8 B	$74.3 B
2020-23 Crisis + Average 6% + 5-Year Cont. Freeze	$71.2 B	$2.8 B	$74.0 B
Two Crises + Average 6% + 5-Year Cont. Freeze	$79.5 B	-$2.8 B	$76.6 B

Source: Pension Integrity Project actuarial forecast of NCTSERS 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.

Pathways to a 7.0% Average Return not Equal

Long-Term Average Returns of 7.00% for FY2021+



Source: Pension Integrity Project actuarial forecast of TSERS plan. Scenario assumes that TSERS pays ADEC rates each year. Years are plan's fiscal years.

Forecasting the Impact of Market Volatility

Random Variable Analysis

What is it?

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

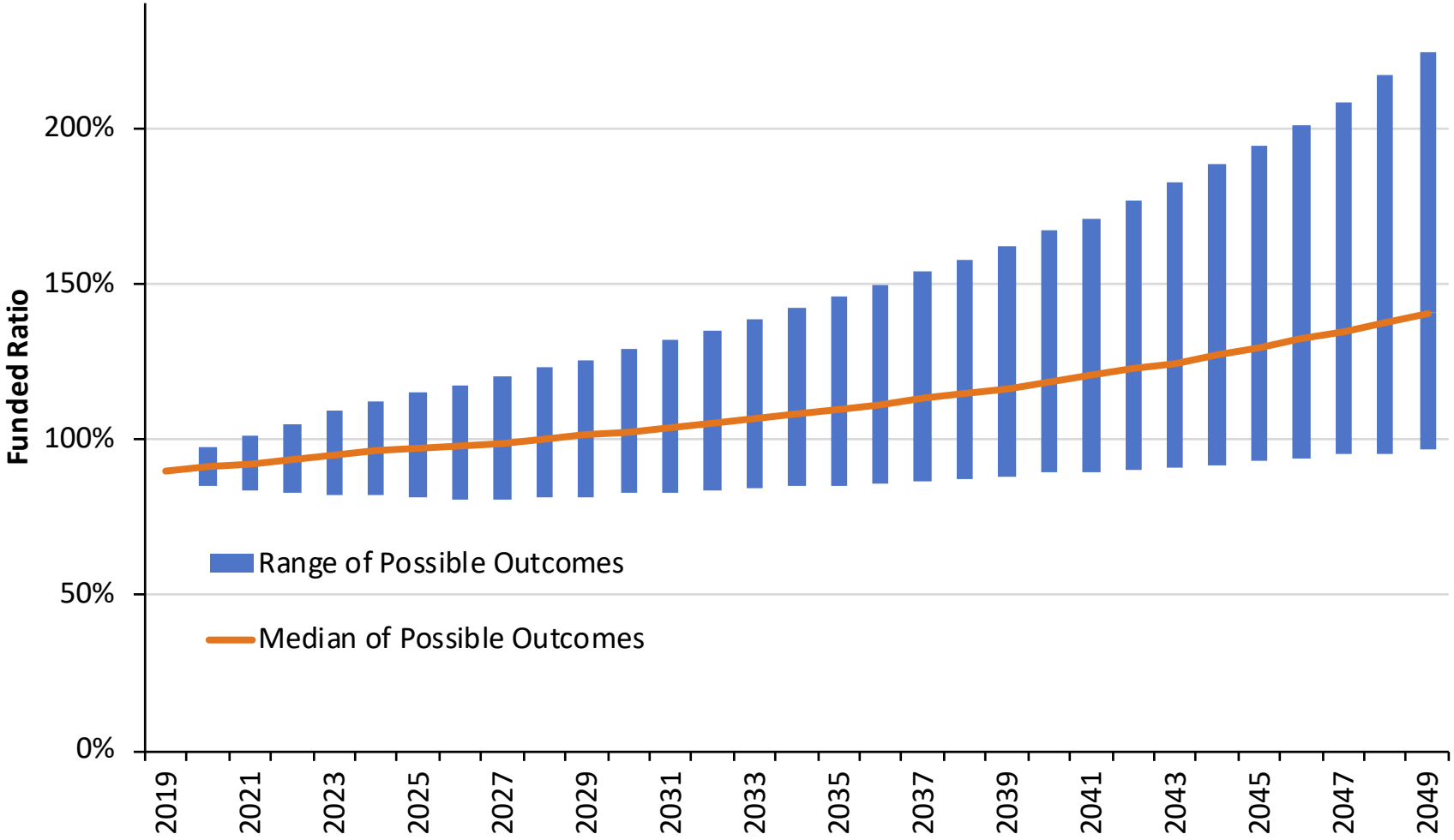
Why use it?

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

30-year Employer Contribution Forecast

If TSERS Performs as Expected, Rates Can Still Vary

Based on Long-term Average Expected Returns of 7.0%

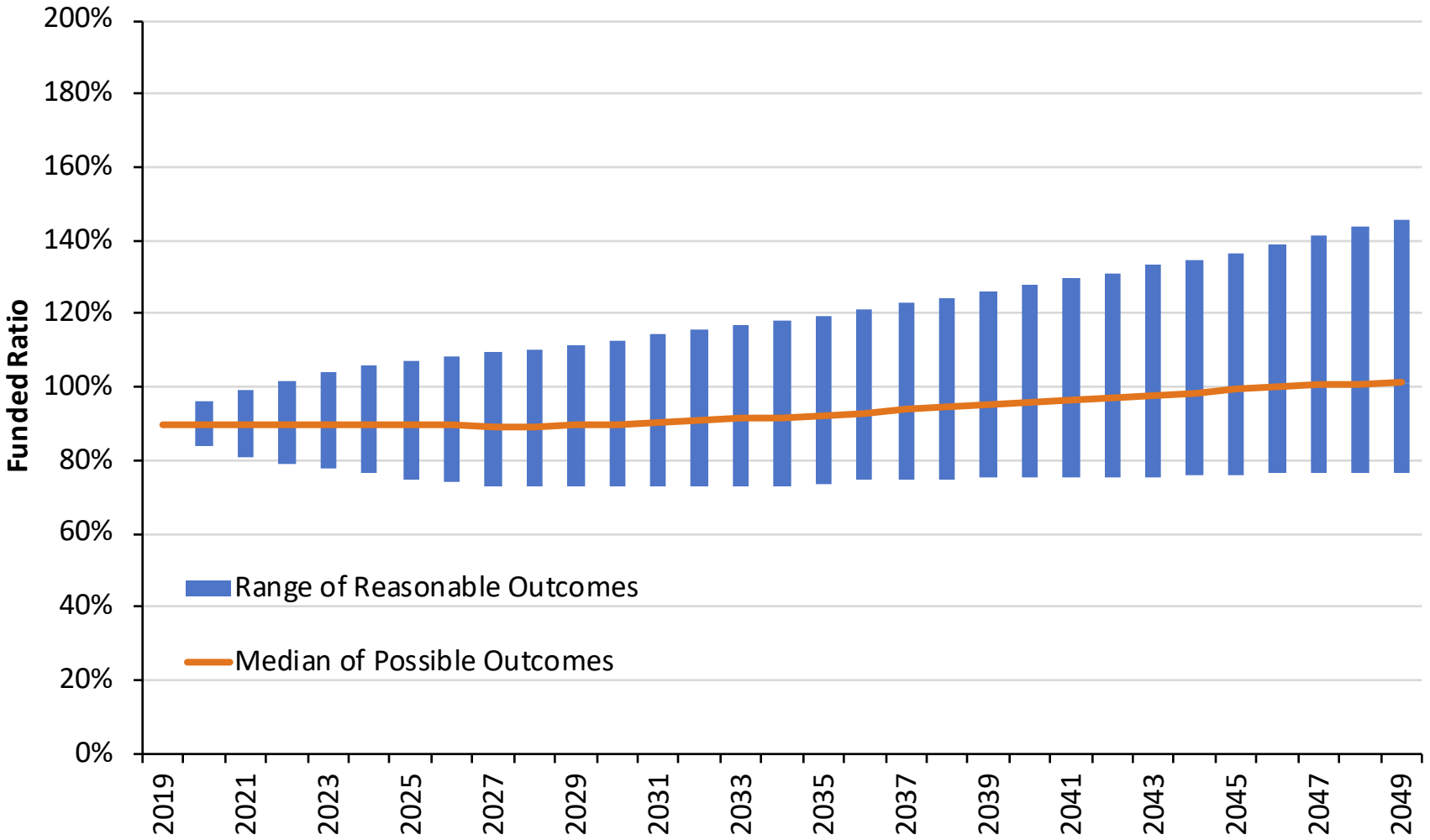


Source: Pension Integrity Project actuarial forecast of TSERS plan based on TSERS return and risk assumptions.
Range of Reasonable Outcomes represents the 50% of possible outcomes closest to the median.

30-year Employer Contribution Forecast

If TSERS Underperforms, Expect Higher Contribution Rates

Based on More Conservative Long-term Average Expected Returns



Source: Pension Integrity Project actuarial forecast of TSERS plan using the return and risk assumptions of the Monte Carlo analysis. Conservative returns are 5.69%, which are the result of combining the long-term capital market assumptions from four prominent financial firms.

FRAMEWORK FOR SOLUTIONS

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

Recommendations to Reduce TSERS Risk & Ensure Fiscal Sustainability

- **Adopt more conservative actuarial assumptions**
  - *Systematically missing a target investment return* leads to higher unfunded liabilities and employer contributions that make running the plan more expensive and can crowd out other public spending.
  - The *timing of returns* alone can impact solvency, and poor performance early on can lead to higher contribution rates and underfunding issues.
  - In order to properly account for all liabilities, TSERS should *lower its discount rate* accordingly. Only then it will know the true value of its unfunded liabilities and will be able to determine appropriate required contributions.

Recommendations to Reduce TSERS Risk & Ensure Fiscal Sustainability

- **Consider Expanding Plan Choice to New Hires and Providing Options to Existing Employees**
  - *Creating a choice-based, multi-tier system* could help address the issue of unanticipated risk and could also offer an attractive benefit design from a human resources perspective.
  - Consider creating a *risk-managed pension plan* for *new hires*—one with the same benefit formula used today, but which uses more conservative assumptions, explicit cost-sharing provisions, and self-correcting mechanisms to prevent severe underfunding.
  - *Cash balance* plans are another way to guarantee a minimum rate of return on investment, but at less risk than the typical pension system because the guaranteed investment return is lower. *Defined contribution* and *hybrid plans* offer other options.

Questions?

Pension Integrity Project at Reason Foundation

Jen Sidorova, Policy Analyst
jen.sidorova@reason.org

Len Gilroy, Vice President & Senior Managing Director
leonard.gilroy@reason.org