Teachers' and State Employees' Retirement System of North Carolina

Stress Testing and Sensitivity Analysis Report

Prepared as of December 31, 2022

July 2024

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Insurance | Risk Management | Consulting

Agenda

I. Executive Summary
II. Stress Testing
III. Stochastic Analysis
IV. Sensitivity Analysis
V. Other Requirements of G.S. 135-6(n1)
VI. Appendix

Executive Summary

Executive Summary

Overview

- In 1941, the Teachers' and State Employees' Retirement System (referred to as "TSERS" or the "State Plan") was established. TSERS provides benefits to all full-time teachers and state employees in all public-school systems, universities, departments, institutions, and agencies of the state
- Every year, an actuarial valuation is performed to determine the funded status of the plan and the actuarially determined contribution
- Every five years, an experience study is performed to recommended demographic and economic assumptions
- North Carolina General Statute 135-6(n1) requires that prior to performing the experience study review, the TSERS Board of Trustees requests their actuary perform a stress testing study on the investment return, meeting the requirements outlined in the statute

Executive Summary

Purpose

- To satisfy North Carolina General Statutes, specifically G.S. 135-6(n1)
- Intended to assist the TSERS Board of Trustees, the General Assembly, the Governor of North Carolina, and other stakeholders to better understand and assess the risks inherent in the funding of the pension system
- To assess the health and financial sustainability of TSERS under a variety of hypothetical economic scenarios
- To provide information to decision makers to help ensure that applicable pension liabilities and funding mechanisms are managed in a manner that promotes sustainability
- Analysis does not consider stress from factors beyond the investment return assumption/experience, such as the impact of future potential future benefit improvements

Executive Summary

Risk

- Investment Risk
  - The potential that investment returns will be different than expected
  - Much of the focus of this report are focused on this risk
- Longevity and Other Demographic Risks – the potential that mortality or other demographic experience will be different than expected
- Interest Rate Risk - to the extent significant changes in capital market assumptions or asset allocations affect the expected return on assets, there is a risk of change to the discount rate that determines the present value of liabilities and actuarial valuation results
- Contribution Risk – the potential that actual contributions are different than the actuarially determined contributions
  - Certain hypothetical scenarios in Section 1 highlight this risk

Executive Summary

Deterministic Stress Testing

- The stress testing analysis highlights the strengths and weaknesses of the funding policy in a variety of different economic environments.
  - If annual asset returns of 6.50% are achieved over a 30-year period, the TSERS plan is expected to be 100% funded by December 31, 2036
  - If annual asset returns are 2% or 4% lower than the assumed rate of return and annual appropriations continue based on current funding policy, the plan's funded percentage is expected to drop
    - However, the plan maintains a fairly level funded percentage
    - Close to 86% if 2% lower over the 30-year projection period
    - Close to 75% if 4% lower over the 30-year projection period
    - The relatively short amortization period helps in maintaining a stronger funded position over time if lower than expected returns are realized.

Executive Summary

Deterministic Stress Testing (continued)

- Under the hypothetical situation described by G.S. 135-6(n1)(4)b:
  - Annual asset returns are assumed to be 2% or 4% lower than the assumed rate of return
  - Further assumes the State would not respond to the market downturn by increasing its contributions to TSERS
  - TSERS funded percentage would be expected to drop substantially and possibly to the point of insolvency, as projected to occur in 2049 based on actual returns 4% lower than assumed
- Current projected baseline projections are sufficient to fund the plan over the projection period if the expected return is achieved
  - However, the projected contribution rates do not include additional amounts to fund for potential adverse deviation
  - If TSERS Board were to adopt a funding policy that did not adjust for actual performance, adverse deviation would lead to poor outcomes

Executive Summary

Deterministic Stress Testing (continued)

- If the plan experiences an asset return 20% lower than expected followed by 20 years of asset returns 2% lower than the assumed rate of return:
  - TSERS funded percentage drops
  - However, TSERS is still able to recover and normalize to a stable funded percentage within the projection period
  - The funded percentage hovers around 87% assuming annual appropriations continue based on current funding policy
- Under the hypothetical situation described by G.S. 135-6(n1)(5)b:
  - TSERS experiences an asset return 20% lower than expected followed by 20 years of asset returns 2% lower than expected
  - Further assumes the State would not respond to the market downturn by increasing its contributions to TSERS
  - TSERS funded percentage would be expected to drop to around 29% in 2044

Executive Summary

Stochastic Analysis

- The stochastic analysis shows a range and likelihood of future actuarially determined employer contributions (ADECs)
- Produces a “likely” range of results with 50% probability of occurring based on:
  - 5,000 simulated trials based on target asset allocation of TSERS, and
  - Buck’s Capital Market Assumptions as of January 2024 (see Appendix)
- Also demonstrates the “tail risk” of TSERS based on unlikely poor conditions expected to occur with 5% probability
- Over a 30-year period, the lowest annual return at the 25th percentile is 1.5% in a given year, and the highest annual return at the 75th percentile is 14.3%
- The mean expected compound return over the 30-year projection period is 6.7%
- The ADEC rate as a percent of payroll is projected to fall within a 14.16% to 19.85% range at the 25th to 75th percentile for FYE 2029, with such range declining over the period of the projection
- By the end of the projection period, the probability that the ADEC has fallen to the 6.0% minimum is 74%

Executive Summary

Sensitivity Analysis – Interest Rate

- This sensitivity analysis shows how adjustments to the expected return would impact the funded status of the plan and the recommended contributions to support the system
  - TSERS is invested in a diversified portfolio and therefore is expected to achieve a return in excess of risk-free rates over the long term
  - However, the statutes require a disclosure of TSERS liabilities and contribution requirements determined using a 10-year average yield of 30-year treasuries as the discount rate.
  - As of December 31, 2022, such rate is 2.75% compared to the 6.50% expected return.
  - Measuring liabilities using a discount rate of 2.75% would increase the ADEC to 65.66% of payroll for fiscal year ending June 30, 2025, compared to 15.90% of payroll using the 6.50% expected return.
  - However, current funding policy would limit the contribution to 53.56% of payroll for fiscal year ending June 30, 2025
  - Note: The contribution rates above are prior to application of direct rate smoothing or the ECRSP.

Executive Summary

Sensitivity Analysis – Amortization

- This sensitivity analysis shows how adjustments to the amortization payments of unfunded actuarial accrued liability, or the paydown period of the pension debt, would impact the funded status of the plan and the recommended contributions to support the system.
  - Shortening the amortization period from 12 years (maintaining current amortization layers) to a single period of nine years, equal to estimated average remaining service period of active member, would increase the ADEC by 0.3% of payroll (from 15.90% of payroll to 16.20%)
  - The contribution rates above are prior to application of direct rate smoothing or the ECRSP
  - Compared to its peers, TSERS' 12-year amortization period pays down the unfunded liability in a shorter period of time.
    - According to an April 2022 NASRA study, the median liability-weighted amortization period for public pension plans that used a closed, layered amortization, was 18 years
    - Reducing the amortization period to the average expected lifetime in this case is therefore not as impactful to the ADEC as it may be for other systems with longer periods

Executive Summary

Key Takeaways

- TSERS has a relatively short amortization period of 12 years
  - Results in pay down of unfunded liability faster than its peers
  - Results in a stronger funded position over time even when the expected return is not achieved
- If continuing to adopt a funding policy tied to the underlying ADEC, it is likely that:
  - TSERS will be able to achieve full funding over the next 20 years, and
  - The employer contribution rate will drop to the 6% minimum employer contribution rate

Executive Summary

Key Takeaways (continued)

- The General Assembly has a history of annually appropriating the actuarially determined employer contributions for TSERS
- The stress testing scenarios required by G.S. 135-6(n1)(4)b and G.S. 135-6(n1)(5)b demonstrate how critical such full appropriations are for the sustainability of TSERS
  - These scenarios assume that, in the event of persistent low returns, the State would not respond by increasing contributions
  - Instead, the hypothetical scenarios assume the State would view its long-term funding commitment (under baseline conditions) as “locked in,” and never adjust for market conditions.
  - In these scenarios, the financial condition of TSERS would not recover, and the cost of providing benefits would escalate out of control

Stress Testing

Stress Testing

Overview

- Stress testing is designed to measure the effect on the plans of various projected, generally adverse, investment and actuarial events. For purposes of this report, we are stress testing one specific element – the return on assets – and its impact to the system
- We have performed stress testing on the asset return using two projection methods: deterministic forecasting and stochastic analysis
- Deterministic forecasting is based on one scenario in the future (as covered in this section)
- Stochastic analysis gathers projected asset return streams covering a wide range of potential future outcomes, simulating the volatility of annual investment returns (as covered in the next section)

Stress Testing

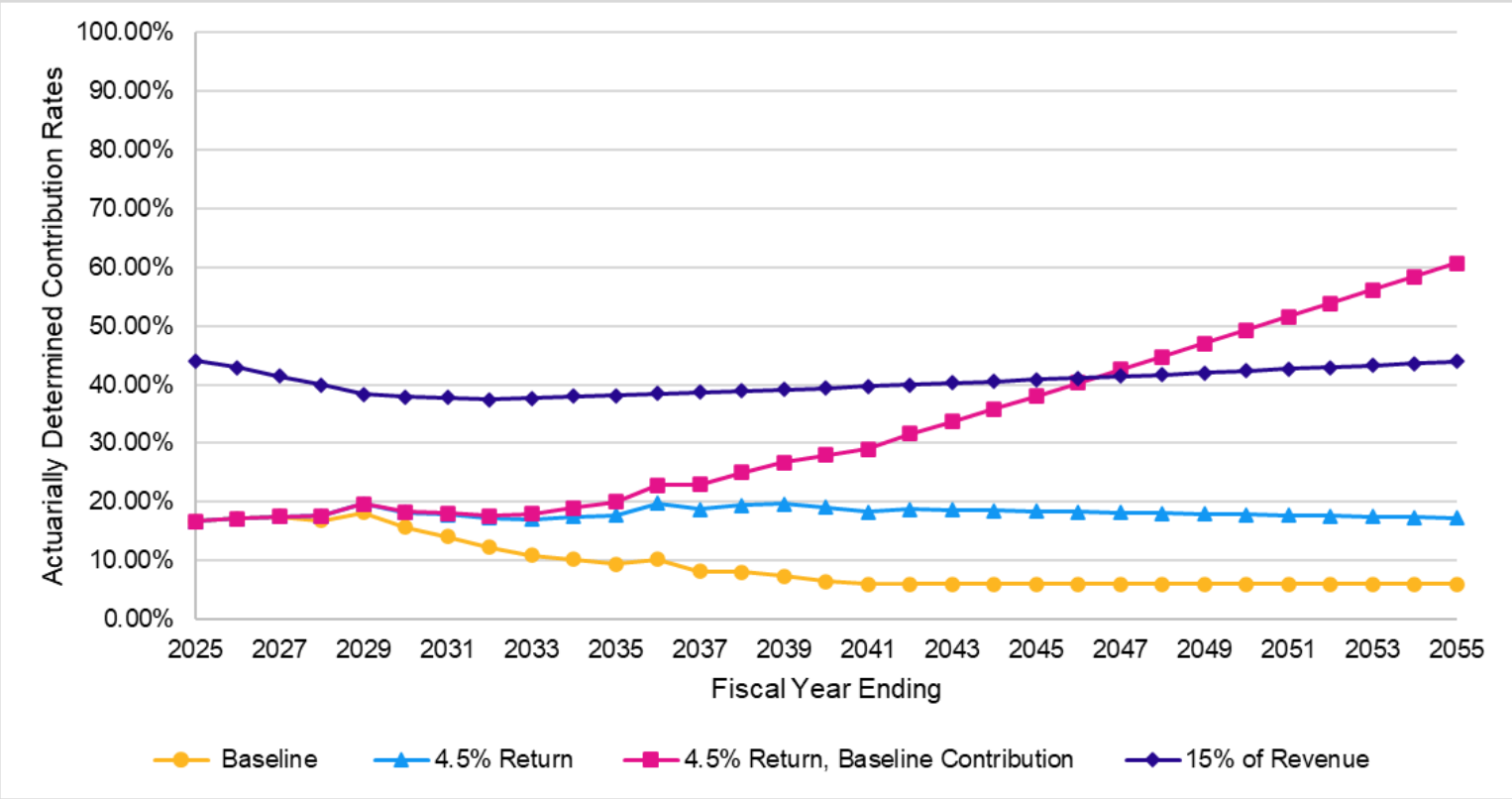
Deterministic Forecasting

There are several specific scenarios outlined within the requirements of G.S.135-6(n1) which cover economic situations where annual returns fall short of what is currently expected and/or create a one-year “shock” to the system. These scenarios are outlined in G.S.135-6(n1)(3), G.S.135-6(n1)(4), and G.S.135-6(n1)(5). At a high level, these scenarios are described as follows:

Scenario	Investment Returns	Employer Contributions
Baseline	6.5%	Current funding policy
4.5% Return	4.5%	Current funding policy
4.5% Return, Baseline Contribution	4.5%	Baseline Contribution Rates
4.5% Return, 15% of Revenue Cap	4.5%	Current funding policy, never exceeds 15% of projected total revenue
2.5% Return	2.5%	Current funding policy
2.5% Return, Baseline Contribution	2.5%	Baseline Contribution Rates
2.5% Return, 15% of Revenue Cap	2.5%	Current funding policy, never exceeds 15% of projected total revenue
(13.5)% Shock, 4.5% Return	1 year return of (13.5)% followed by 20 years of 4.5%	Current funding policy
(13.5%) Shock, 4.5% Return, Baseline Contribution	1 year return of (13.5)% followed by 20 years of 4.5%	Baseline Contribution Rates
(13.5%) Shock, 4.5% Return, 15% of Revenue Cap	1 year return of (13.5)% followed by 20 years of 4.5%	Current funding policy, never exceeds 15% of projected total revenue

Stress Testing

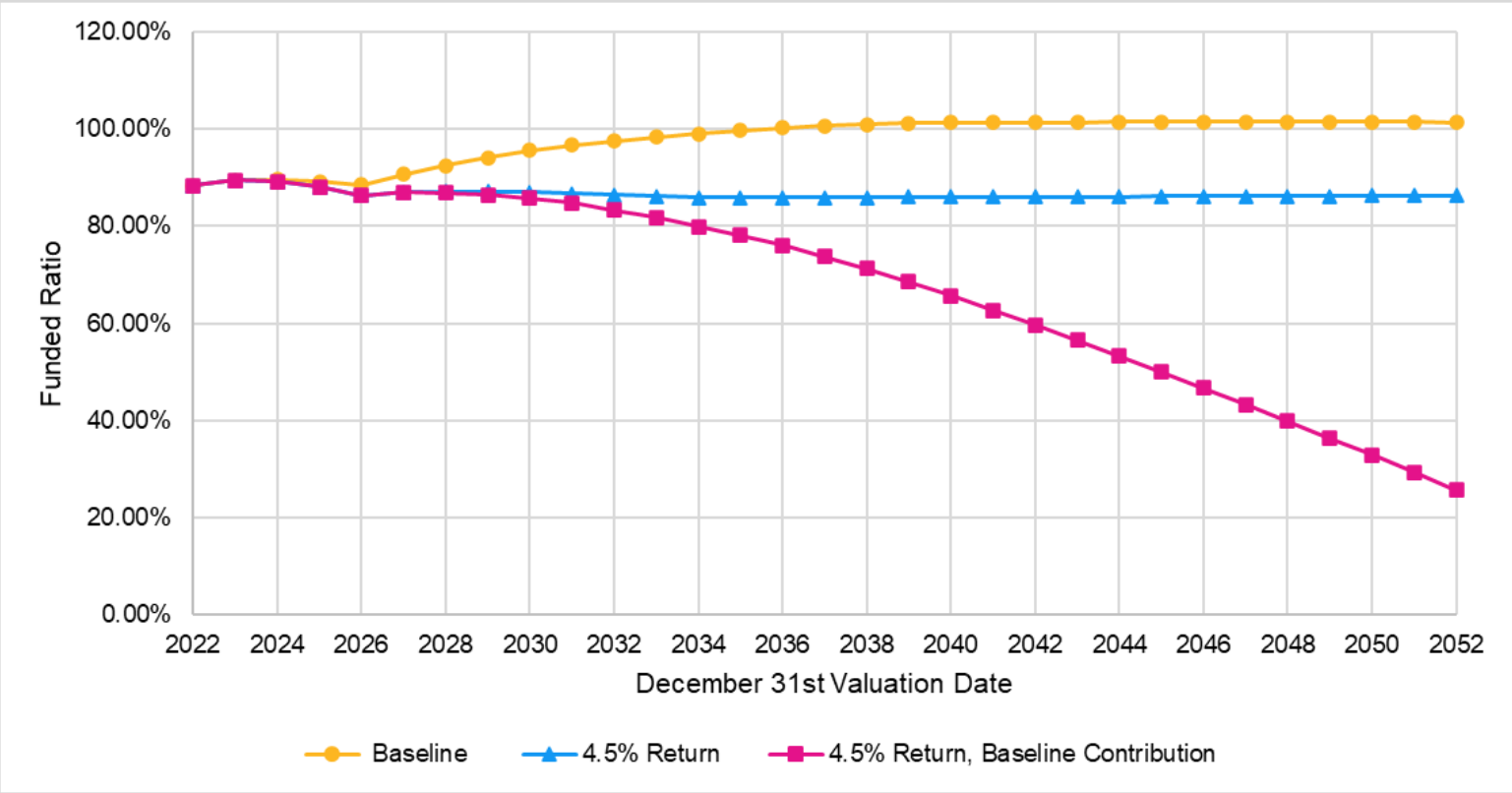
Projected Actuarially Determined Employer Contribution Rates (4.5% Returns)



- Baseline scenario shows ADEC gradually declining to 6% of payroll by FYE 2041
  - Plan is fully funded, and
  - Contributions drop to the minimum employer contribution allowed by statute
- In the 4.5% Return scenario:
  - ADEC exceeds 17.00% of payroll over the entire projection period
  - ADEC climbs to 19.76% of payroll in FYE 2036
- In the 4.5% Return, Baseline Contribution scenario:
  - Hypothetically assumes State does not increase contributions to respond to market conditions
  - ADEC continues to increase over the projection period

Stress Testing

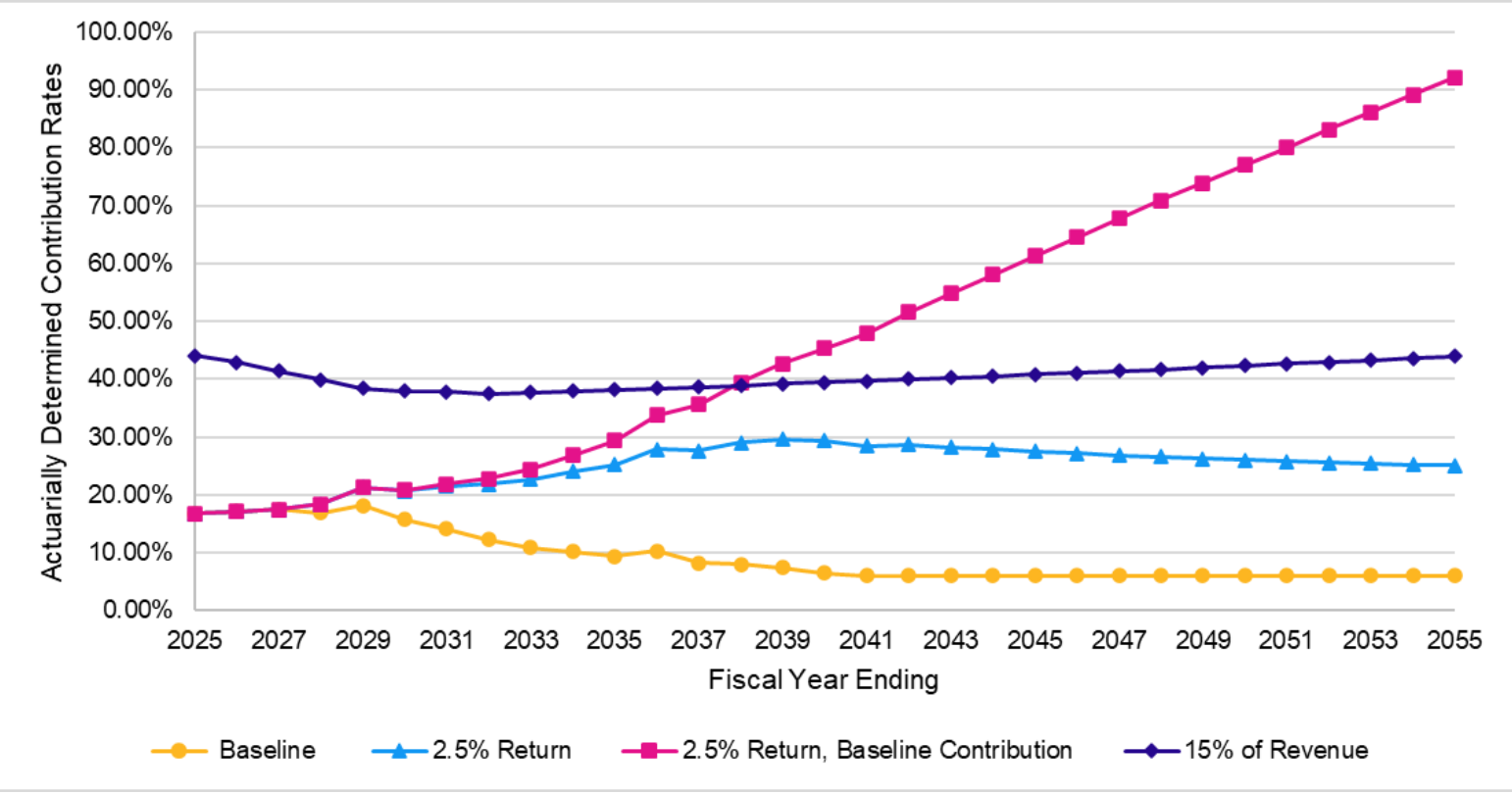
Projected Funded Ratio (4.5% Returns)



- Baseline scenario shows the plan becoming fully funded by 2036
- In the 4.5% Return scenario:
  - Funded ratio remains relatively level close to 86% funded despite poor returns
  - Shows strength of TSERS funding policy
- In the 4.5% Return, Baseline Contribution scenario:
  - Hypothetically assumes State does not increase contributions to respond to market conditions
  - Funded ratio sharply declines as contributions fail to keep pace with asset losses

Stress Testing

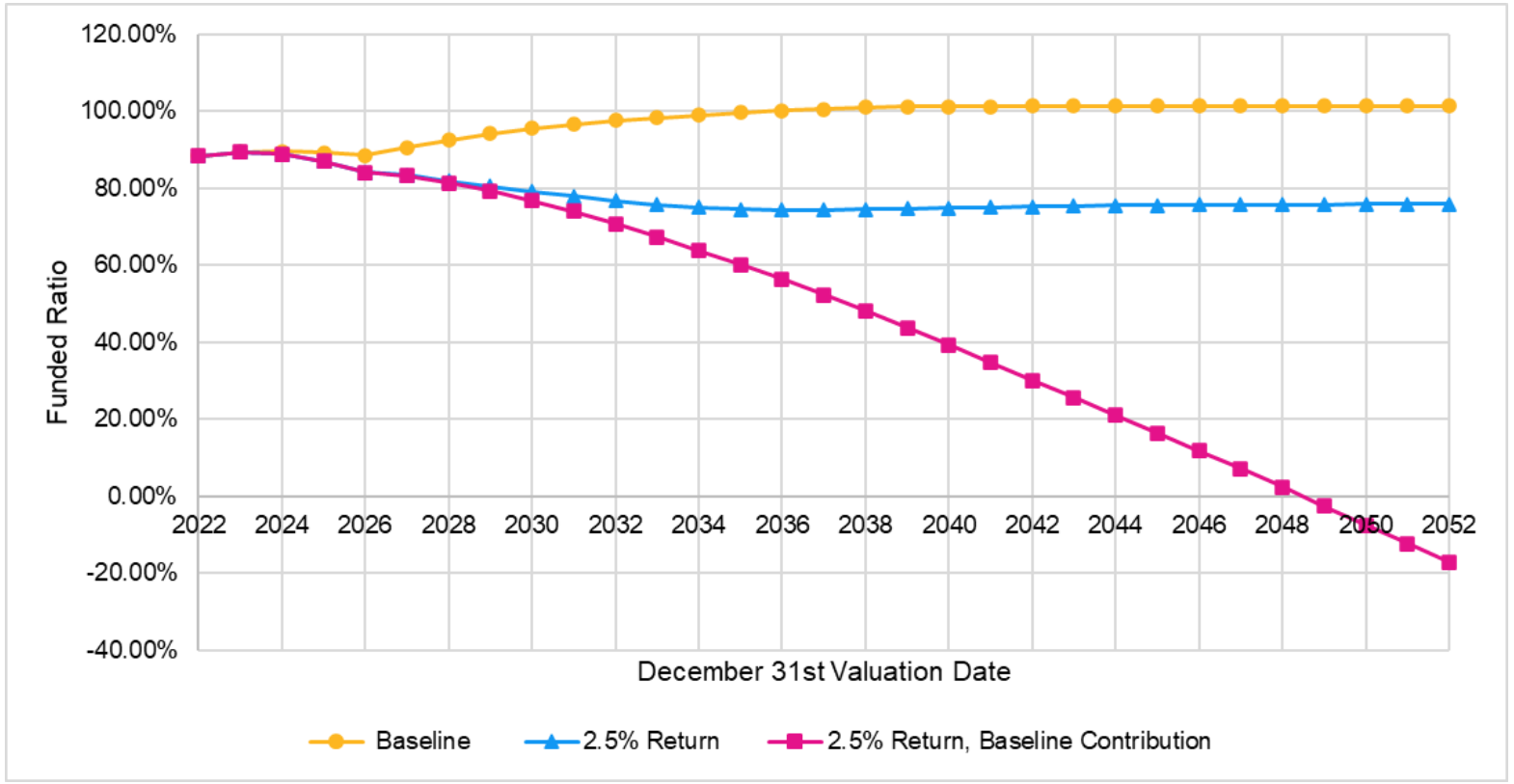
Projected Actuarially Determined Employer Contribution Rates (2.5% Returns)



- Baseline scenario shows ADEC gradually declining to 6% of payroll by FYE 2041
  - Plan is fully funded, and
  - Contributions drop to the minimum employer contribution allowed by statute
- In the 2.5% Return scenario:
  - ADEC climbs to 29.67% of payroll in FYE 2039
  - ADEC then slowly declines to about 25% of payroll
- In the 2.5% Return, Baseline Contribution scenario:
  - Hypothetically assumes State does not increase contributions to respond to market conditions
  - ADEC continues to increase over the projection period

Stress Testing

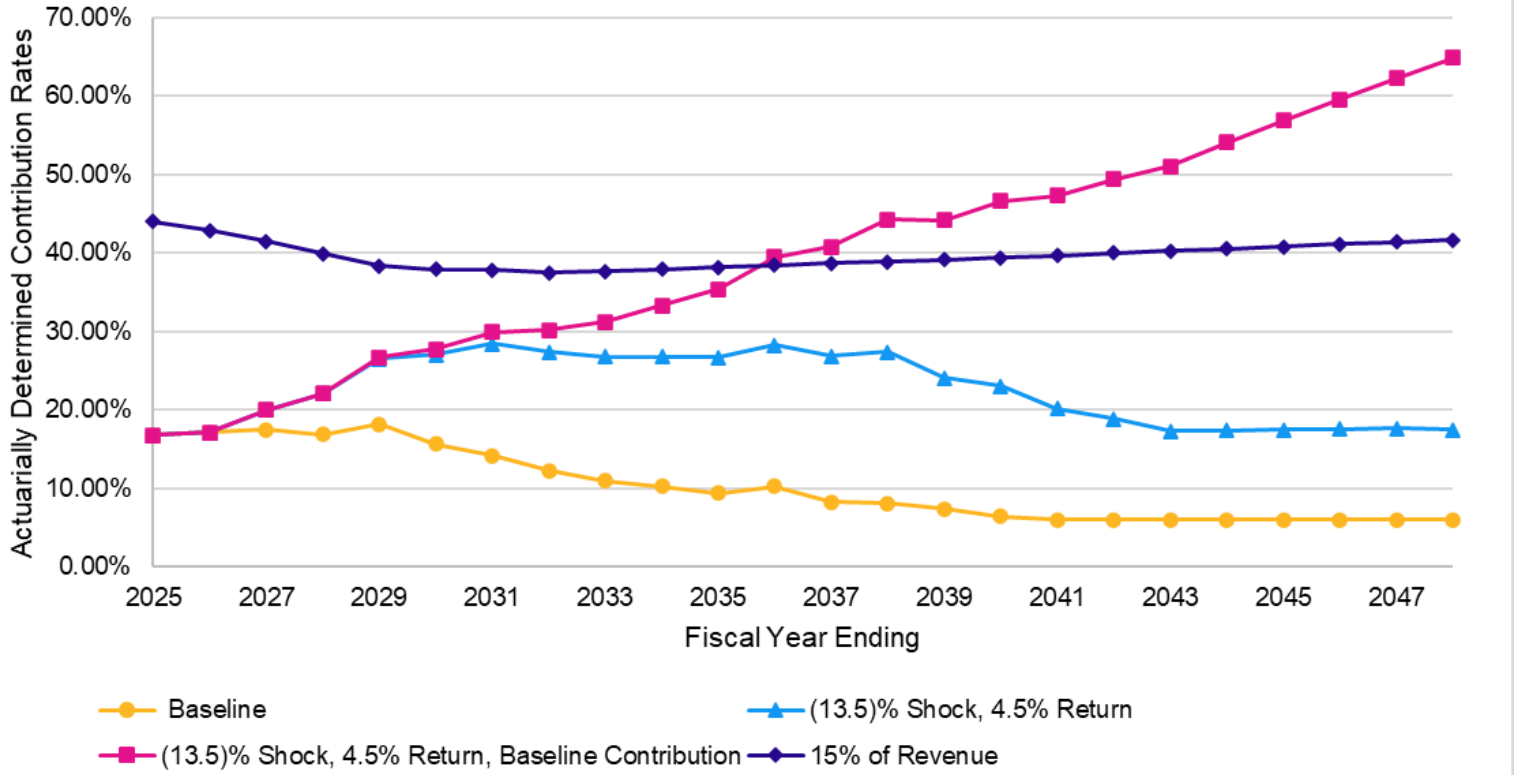
Projected Funded Ratio (2.5% Returns)



- Baseline scenario shows the plan becoming fully funded by 2036
- In the 2.5% Return scenario:
  - Funded ratio remains relatively level close to 75% funded despite poor returns
  - Shows strength of TSERS funding policy
- Under the 2.5% Return, Baseline Contribution scenario
  - Hypothetically assumes State does not increase contributions to respond to market conditions
  - Funded ratio sharply declines as contributions fail to keep pace with asset losses
  - In this hypothetical scenario, TSERS projected to become insolvent in 2049 and would be unable to pay benefits due to members

Stress Testing

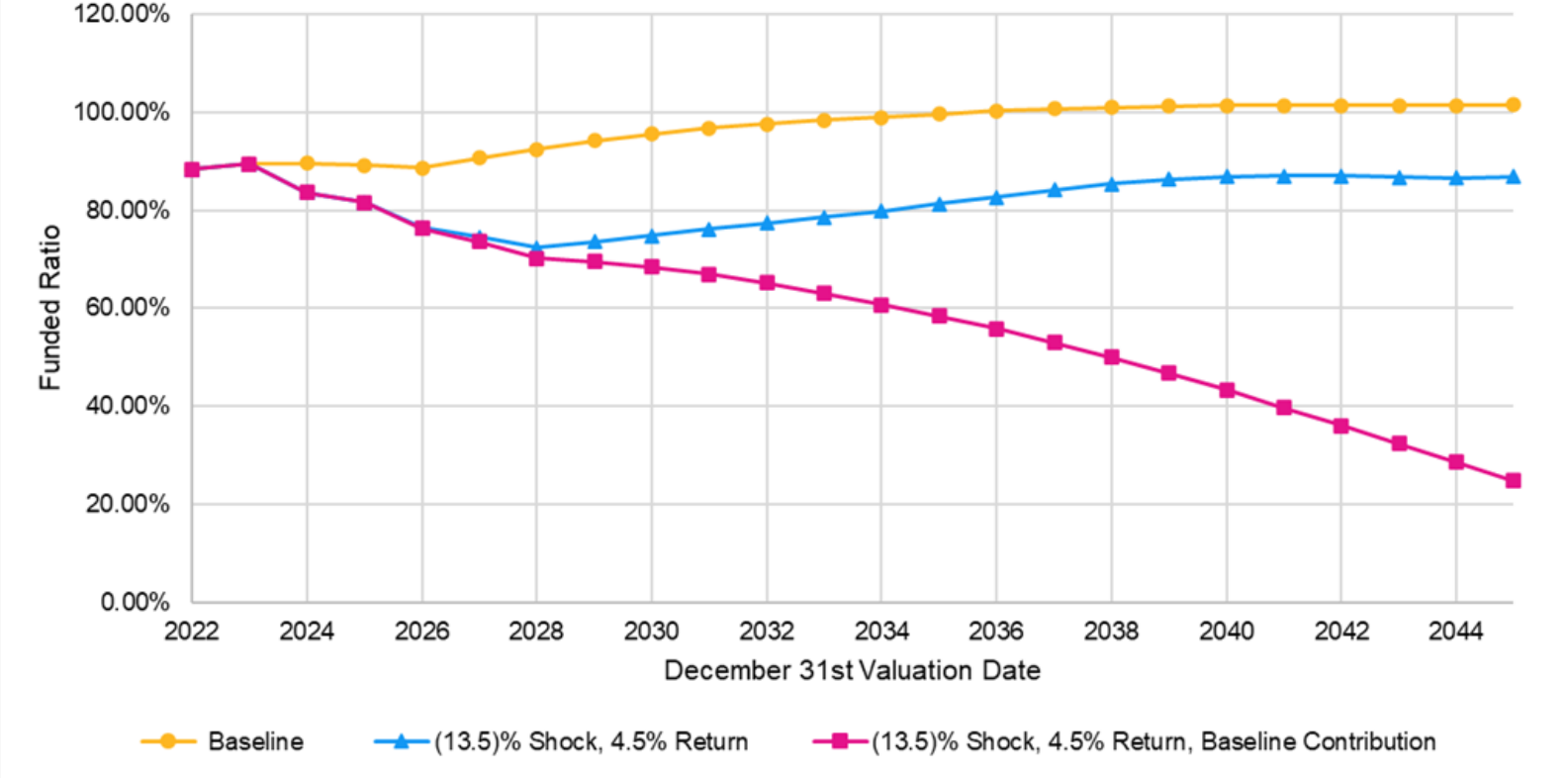
Projected Actuarially Determined Employer Contribution Rates ((13.5)% Shock, 4.5% Returns)



- Baseline scenario shows ADEC gradually declining to 6% of payroll by FYE 2041
  - Plan is fully funded, and
  - Contributions drop to the minimum employer contribution allowed by statute
- Under the (13.5%) Shock, 4.5% Return scenario:
  - ADEC approaches 30% of payroll in FYE 2029
  - ADEC decreases below 20% of payroll in FYE 2042
- Under the (13.5%) Shock, 4.5% Return, Baseline Contribution scenario:
  - Hypothetically assumes State does not increase contributions to respond to market conditions
  - ADEC continues to increase over the projection period

Stress Testing

Projected Funded Ratio ((13.5)% Shock, 4.5% Returns)



- Baseline scenario shows the plan becoming fully funded by 2036
- In the (13.5%) Shock,4.5% Return scenario, the funded ratio:
  - Drops to 72% in 2028
  - Approaches 87% by end of projection period
- Under the (13.5%) Shock, 4.5% Return, Baseline Contribution scenario
  - Hypothetically assumes State does not increase contributions to respond to market conditions
  - Funded ratio sharply declines as contributions fail to keep pace with asset losses

Stochastic Analysis

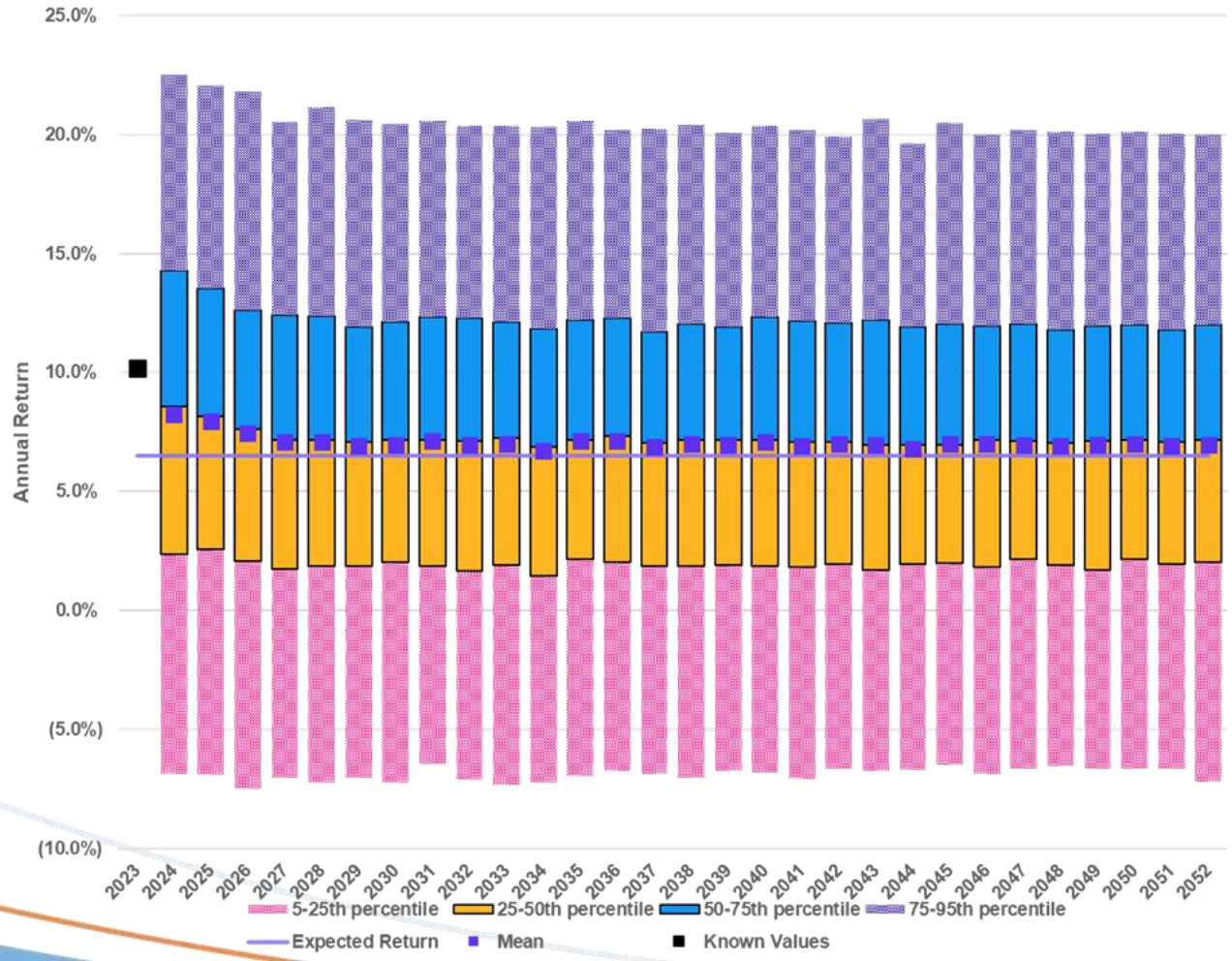
Stochastic Analysis

Overview

- Section 135-6(n1)(2) requires an estimate of the range of “likely” employer contributions over 20 years
  - Based on analysis that simulates the volatility of annual investment returns above and below the expected rate
  - Applying methodology determined by the actuary
- Range of employer contributions modeled by performing a stochastic analysis
  - Analysis produces 5,000 randomized trials of projected 30-year investment return paths
  - Each 30-year path is modeled in the projected asset values and produce hypothetical valuation results including the projected actuarially determined employer contributions (ADECs)

Stochastic Analysis

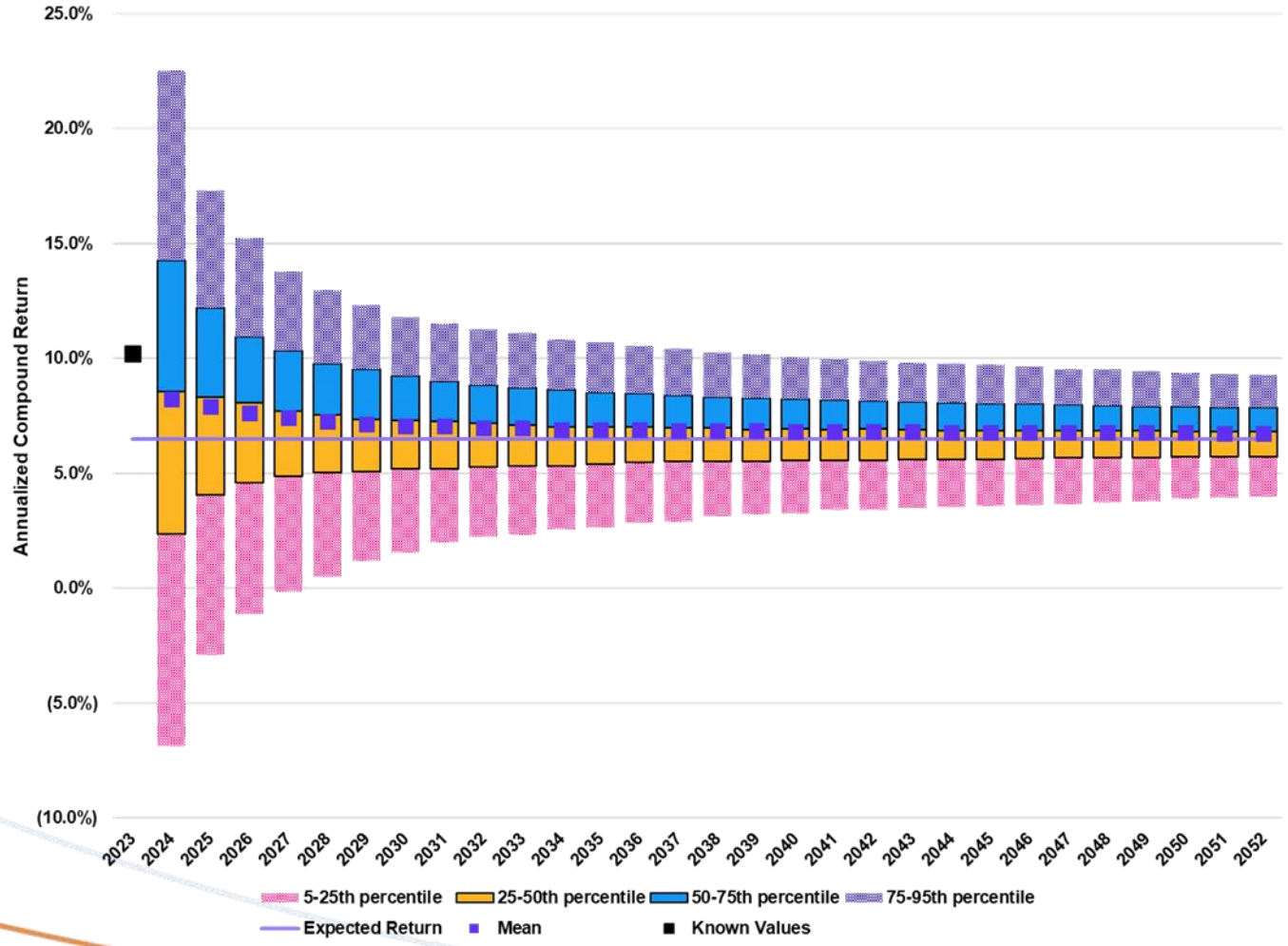
Annual Returns



- The projected annual returns in each year do not vary much from one year to the next, showing the strength of the diversification of the underlying portfolio
- Over a 30-year period, the annual return ranges between 1.5% as the lowest single return at the 25th percentile (2034) and 14.3% as the highest single return at the 75th percentile (2024)

Stochastic Analysis

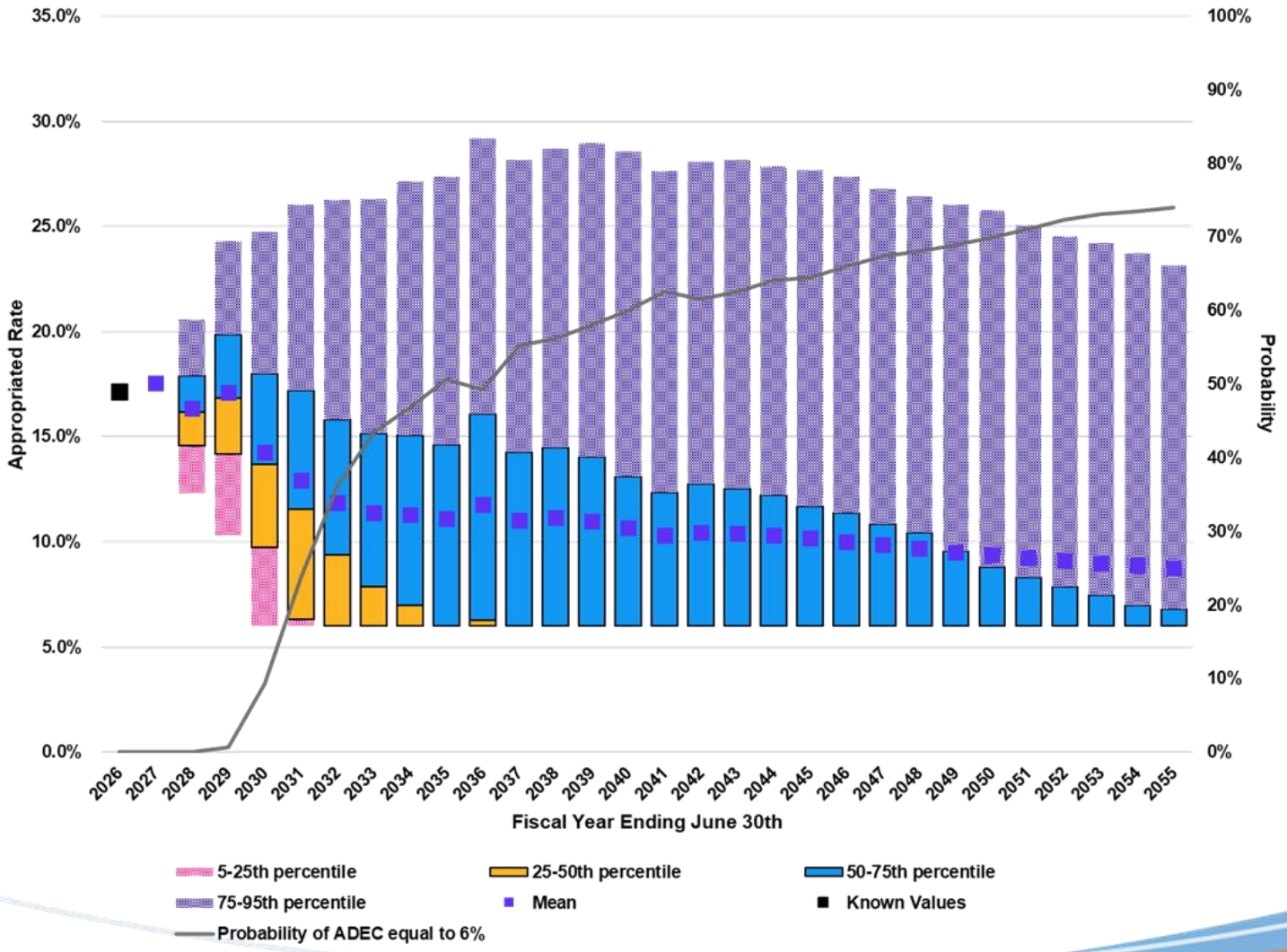
Projected Annualized Compound Returns (Stochastic)



- Over a 20-year period, annualized compound return is:
  - 5.6% at the 25th percentile
  - 8.1% at the 75th percentile
  - 50% chance TSERS would achieve a compound return over 20 years between 5.6% and 8.1%
- The 20-year mean annualized compound return is 6.8%.
- Over a 30-year period, annualized compound return is:
  - 5.7% at the 25th percentile
  - 7.9% at the 75th percentile
  - 50% chance TSERS would achieve a compound return over 30 years between 5.7% and 7.9%
- The 30-year mean annualized compound return is 6.7%.

Stochastic Analysis

Projected Actuarially Determined Employer Contributions (Stochastic)



Stochastic Analysis

Projected Actuarially Determined Employer Contributions (Stochastic)

- Given the ECRSP design, little to no variability in ADECs occur under the simulated returns prior the expiration of the policy at FYE 2027
  - For FYE 2027, the ADEC is anticipated to be 17.49% for all scenarios between the 25th and 75th percentiles
  - For FYE 2028, the ADEC ranges between 14.58% at the 25th percentile and 17.91% at the 75th percentile
  - For FYE 2029, the ADEC further widens ranging between 14.16% at the 25th percentile and 19.85% at the 75th percentile
- Over the next 20 years, the range of likely ADECs between the 25th and 75th percentile is 6.00% (occurring in FYE 2032 and later) and 19.85% (in FYE 2029)
  - Given the strength of the funding policy, the range of likely ADECs over the entire projection period continues to trend closer to the 6% of payroll minimum ADEC

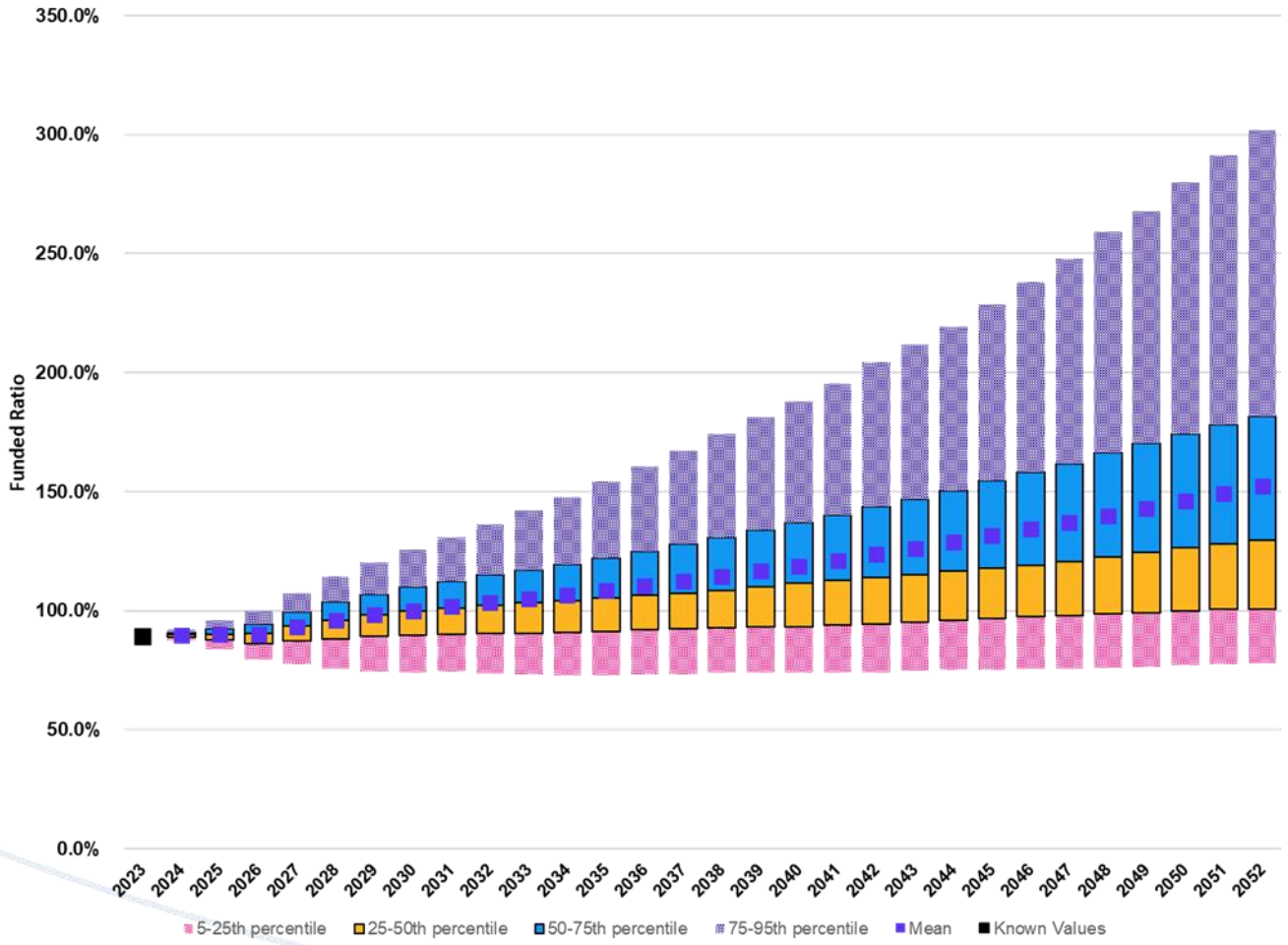
Stochastic Analysis

Projected Actuarially Determined Employer Contributions (Stochastic) (continued)

- The floor of the employer contribution is set to 6% of payroll, which is the minimum employer contribution rate
  - This minimum is based on statute, which requires that the employer contribution rate not be less than the employee contribution rate
  - For FYE 2035 and all years FYE 2037 and later, the minimum employer contribution rate of 6% of payroll occurs in at least 50% of all simulated scenarios
  - We have shown in the graph above the probability of an ADEC reaching the minimum 6% of payroll.
  - By the end of the projection period, the probability of the ADEC being equal to 6% of payroll is 74.0%
- Even if we consider pessimistic scenarios at the 95th percentile, the ADEC is not projected to rise above 30% of payroll
  - At the 95th percentile, the plan's ADEC is 29.16% of payroll for FYE 2036

Stochastic Analysis

Projected Funded Ratio (Stochastic)



- At the 50th percentile for the simulated December 31, 2031, valuations, TSERS is projected to be 100% funded
- At the end of the projection period in 2052, the funded percentage ranges between 100.7% at the 25th percentile and 181.9% at the 75th percentile
- This demonstrates the strength of the funding policy in keeping pace by paying down the unfunded liability over a sufficiently short period

Sensitivity Analysis

Sensitivity Analysis

Overview

- Sensitivity analysis, or sensitivity testing, examines the effect on the plan of different actuarial assumptions and methods
- Section 135-6(n1) requires a sensitivity analysis of a one-year “snapshot” of key valuation results based on varying two key actuarial assumptions and methods: the discount rate and the amortization period
- For this section, we test the potential impact to the liability, funded position, normal cost and actuarially recommended employer contribution (ADEC)
- For purposes of this section, we use all plan provisions, assumptions, and methods in place as of the December 31, 2022 valuation and provide an analysis as of the same date

Sensitivity Analysis

Discount Rate Sensitivity

Table 3a: Discount Rate Sensitivity (Based on a 10-Year Average of the Yield on 30-year Treasury notes)

Valuation Date ADEC for Fiscal Year Ending	Baseline 12/31/2022 6/30/2025	Discount Rate Sensitivity 12/31/2022 6/30/2025
Discount Rate	6.50%	2.75%
Actuarial Accrued Liability	$ 96,675,255,859	$ 157,057,815,830
Employee Normal Cost	$ 971,038,277	$ 988,599,163
Employer Normal Cost	998,717,407	3,866,145,954
Total Normal Cost	$ 1,969,755,684	$ 4,854,745,117
Total ADEC (% of Pay)	15.90%	65.66%

- The first column shows “Baseline” results for the most recent valuation as of December 31, 2022
- The second column shows “Discount Rate Sensitivity" results reflecting a discount rate of 2.75% based on the 10-year average of the yield of 30-year treasury notes as of December 31, 2022

Sensitivity Analysis

Amortization Sensitivity

Table 3b: Amortization Over a Single Period

Valuation Date ADEC for Fiscal Year Ending	Baseline 12/31/2022 6/30/2025	12-Year Amortization 12/31/2022 6/30/2025	9-Year Amortization 12/31/2022 6/30/2025
Amortization Method	12 years layered	12 years full UAAL	9 years full UAAL
Normal Cost Rate Calculation			
(a) Normal Cost Rate	6.17%	6.17%	6.17%
(b) Expense Rate	0.10%	0.10%	0.10%
(c) Total Normal Cost Rate	6.27%	6.27%	6.27%
Accrued Liability Rate Calculation			
(d) Total Annual Amortization Payments	$ 1,747,345,937	$ 1,470,902,143	$ 1,802,953,550
(e) Projected Compensation	18,152,305,049	18,152,305,049	18,152,305,049
(f) Accrued Liability Rate: (d) / (e)	9.63%	8.10%	9.93%
Total ADEC (% of Pay) (c) + (f)	15.90%	14.37%	16.20%

- The first column shows “Baseline” results maintaining 14 separate amortization balances
- The second column shows results based on a single 12-year amortization of the entire UAAL as of December 31, 2022
  - In other words, all UAAL has been re-amortized over a single period
  - This effectively eliminates previous amortization bases
- The last column shows the sensitivity of results if the single amortization period was changed to nine years, which is equal to the estimated average remaining service period of TSERS active employees

Other Requirements of G.S. 135-6(n1)

Other Requirements of G.S. 135-6(n1)

Investment Return and Interest Rate Assumption

- As of the most recent actuarial valuation as of December 31, 2022, the assumed annual investment return is 6.50%. This is also the interest rate used for reporting liabilities and calculating ADEC
- Investment return assumption for TSERS typically set based on forward-looking analyses, which
  - Consider multiple time horizons (10, 20, 30 years)
  - Consider current or target asset allocation of TSERS
  - Consider input from multiple sources, for example:
    - Callan study commissioned by DST Investment Management Division in 2022
    - Buck's internal capital market assumptions used in this study
  - Historical returns or peer comparison of investment return assumptions may provide context but should not be used as a primary basis for setting the assumption

Other Requirements of G.S. 135-6(n1)

Investment Return and Interest Rate Assumption (continued)

- Investment return assumption and valuation interest rate can be changed at any time
  - Typically, formal review and recommendation to change assumptions coincides with five-year experience study cycle
- Valuation interest rate typically set equal to the investment return assumption, but could differ
  - Direct-rate smoothing to mitigate impact on change in assumption
  - Provision for adverse deviation to reduce risk of future returns falling short of the assumed investment return

Other Requirements of G.S. 135-6(n1)

Actuarially Determined Employer Contribution (ADEC)

- The ADEC is calculated as the sum of two items:
  - (a) the normal cost as a percent of payroll. And
  - (b) the amortization of the unfunded or overfunded actuarial accrued liability as a percent of payroll.
- As of the December 31, 2022 valuation, an adjustment to the ADEC to phase in the impact of changes in assumptions and methods from the prior experience study
  - Phase in over five-year period beginning with the ADEC determined for FYE 2023
  - The direct-rate smoothing will be fully phased in for the ADEC determined for FYE 2027

Other Requirements of G.S. 135-6(n1)

Actuarial Value of Assets

- As of December 31, 2022, the market value of assets is $77,445,236,928 and the actuarial value of assets are $85,406,884,383. The actuarial value of assets is used to compare to the accrued liability of the plan and determine the funded ratio and unfunded actuarial accrued liability.
- The actuarial value of assets is based upon a smoothed market value method. Under this method, asset returns in excess of or less than the expected return on market value of assets will be reflected in the actuarial value of assets over a five-year period. The Actuarial Value of Assets was reset to the market value of assets at December 31, 2014. The calculation of the Actuarial Value of Assets is based on the following formula:
  - MV – 80% x G/(L)1 – 60% x G/(L)2 – 40% x G/(L)3 – 20% x G/(L)4
  - MV = the market value of assets as of the valuation date
  - G/(L)i = the asset gain or (loss) for the i-th year preceding the valuation date
- The actuarial value of assets cannot be less than 80% nor more than 120% of the market value of assets as of the valuation date.

Any questions?

Appendix

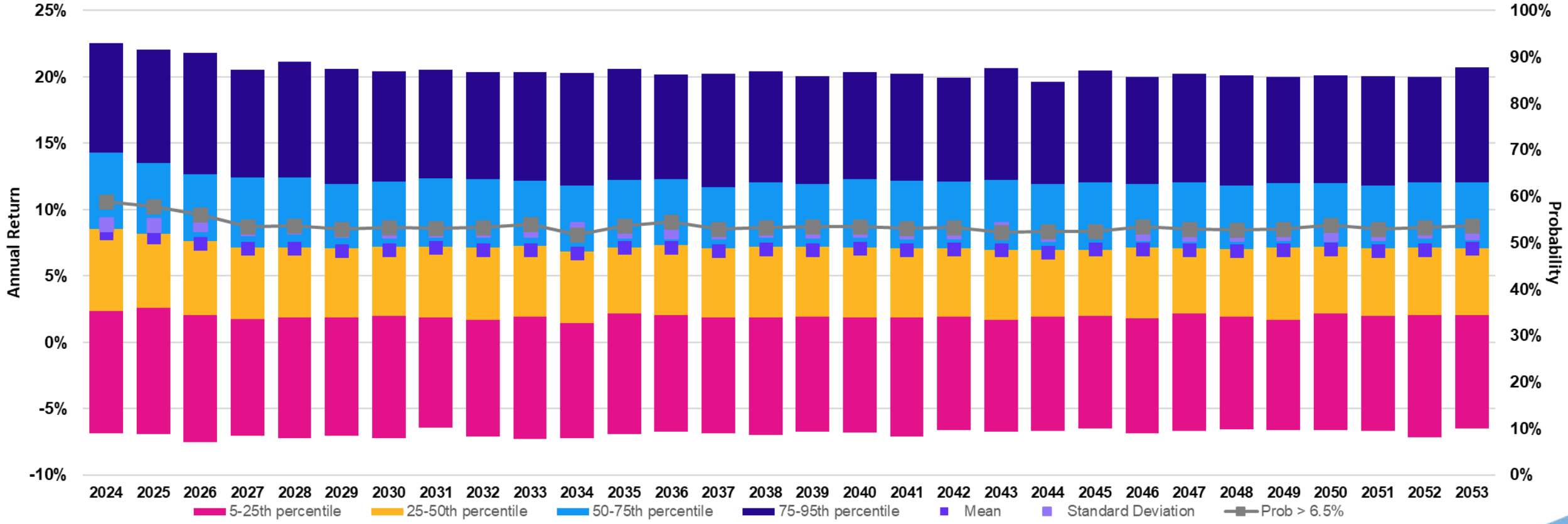
Capital Market Assumptions

Asset Allocation

Asset Class	Target	Buck Asset Class Mapping
Public Equity	38%	Global Equity
Private Equity	7%	Private Equity
Non-Core Real Estate	3%	Direct Real Estate + 200 bps for Return, 150% of Volatility
Opportunistic Fixed Income	7%	75% Private Debt, 25% High Yield
Investment Grade Fixed Income	28%	27% Long Government, 31.50% Long Corporate, 31.50% Mortgage-Backed Securities, 10% Cash
Pension Cash	5%	Cash
Inflation Sensitive	6%	1/3 TIPS, 1/3 Infrastructure, 1/3 Direct Real Estate
Core Real Estate	5%	80% Direct Real Estate, 20% REITs
Multi-Strategy	1%	Hedge Funds
Total	100%	

Capital Market Assumptions

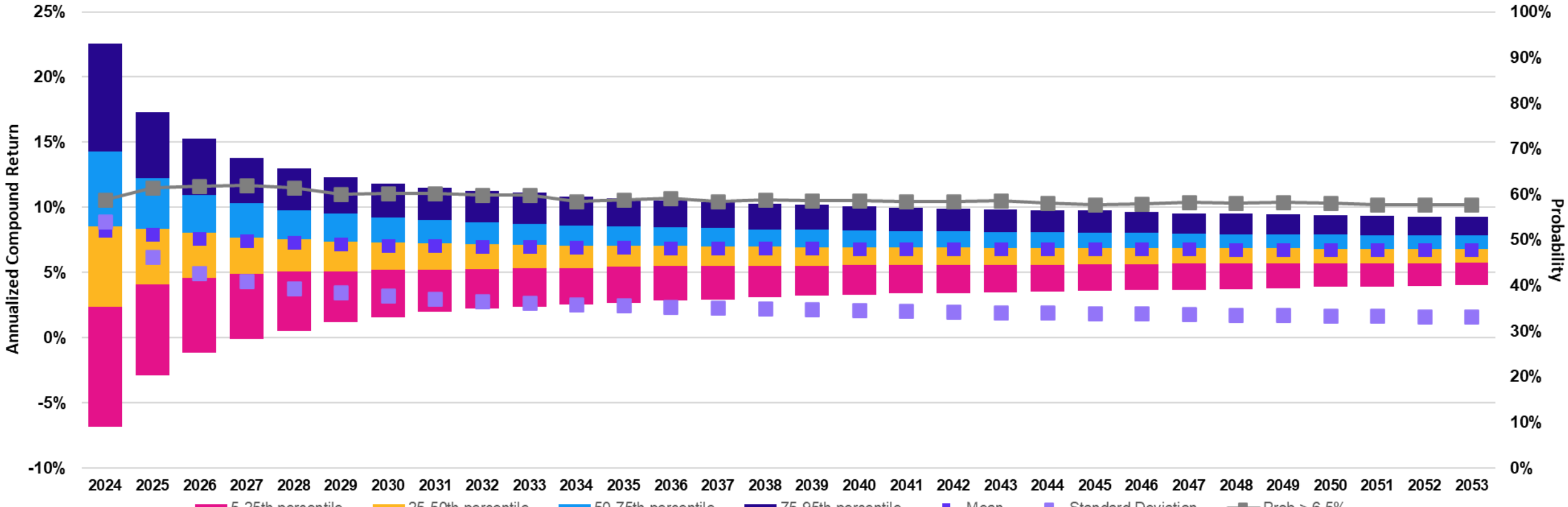
Annual Returns



	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Mean	8.2%	7.9%	7.5%	7.1%	7.1%	6.9%	7.0%	7.1%	7.0%	7.0%	6.7%	7.1%	7.1%	6.9%	7.0%	6.9%	7.1%	6.9%	7.0%	6.9%	6.8%	7.0%	7.0%	7.0%	6.9%	7.0%	7.0%	6.9%	7.0%	7.1%
Standard Dev	8.9%	8.8%	8.9%	8.6%	8.7%	8.5%	8.4%	8.5%	8.5%	8.5%	8.6%	8.4%	8.4%	8.4%	8.5%	8.4%	8.5%	8.4%	8.4%	8.5%	8.1%	8.3%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.4%	8.3%
95th Percentile	22.5%	22.1%	21.8%	20.5%	21.2%	20.6%	20.4%	20.6%	20.4%	20.4%	20.3%	20.6%	20.2%	20.2%	20.4%	20.1%	20.4%	20.2%	19.9%	20.6%	19.6%	20.5%	20.0%	20.2%	20.1%	20.0%	20.1%	20.0%	20.0%	20.7%
75th Percentile	14.3%	13.5%	12.6%	12.4%	12.4%	11.9%	12.1%	12.3%	12.3%	12.1%	11.8%	12.2%	12.3%	11.7%	12.0%	11.9%	12.3%	12.1%	12.1%	12.2%	11.9%	12.1%	11.9%	12.0%	11.8%	12.0%	12.0%	11.8%	12.0%	12.0%
50th Percentile	8.6%	8.1%	7.6%	7.2%	7.1%	7.1%	7.2%	7.2%	7.1%	7.2%	6.9%	7.1%	7.3%	7.1%	7.2%	7.2%	7.2%	7.1%	7.1%	7.0%	7.0%	6.9%	7.1%	7.1%	7.0%	7.1%	7.2%	7.1%	7.1%	7.1%
25th Percentile	2.4%	2.6%	2.1%	1.7%	1.9%	1.9%	2.0%	1.9%	1.7%	1.9%	1.5%	2.1%	2.0%	1.9%	1.9%	1.9%	1.9%	1.8%	1.9%	1.7%	1.9%	2.0%	1.8%	2.1%	1.9%	1.7%	2.2%	2.0%	2.0%	2.1%
5th Percentile	(6.9%)	(6.9%)	(7.5%)	(7.0%)	(7.2%)	(7.0%)	(7.2%)	(6.5%)	(7.1%)	(7.3%)	(7.2%)	(6.9%)	(6.7%)	(6.9%)	(7.0%)	(6.8%)	(6.8%)	(7.1%)	(6.6%)	(6.7%)	(6.7%)	(6.5%)	(6.9%)	(6.7%)	(6.5%)	(6.6%)	(6.6%)	(6.7%)	(7.2%)	(6.5%)
Prob > 6.5%	58.8%	57.8%	56.1%	53.4%	53.7%	52.9%	53.2%	53.2%	53.3%	54.0%	51.7%	53.7%	54.5%	52.9%	53.3%	53.5%	53.5%	53.1%	53.3%	52.3%	52.4%	52.4%	53.5%	53.0%	52.7%	53.0%	53.9%	52.9%	53.3%	53.6%

Capital Market Assumptions

Annualized Compound Return



	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Mean	8.2%	7.9%	7.6%	7.4%	7.3%	7.1%	7.1%	7.0%	7.0%	7.0%	6.9%	6.9%	6.9%	6.9%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.7%	6.7%	6.7%
Standard Dev	8.9%	6.2%	5.0%	4.3%	3.8%	3.5%	3.2%	3.0%	2.8%	2.7%	2.6%	2.5%	2.4%	2.3%	2.2%	2.1%	2.1%	2.0%	2.0%	1.9%	1.9%	1.9%	1.8%	1.8%	1.8%	1.7%	1.7%	1.7%	1.6%	1.6%
95th Percentile	22.5%	17.3%	15.2%	13.8%	13.0%	12.3%	11.8%	11.5%	11.3%	11.1%	10.8%	10.7%	10.5%	10.4%	10.3%	10.2%	10.1%	10.0%	9.9%	9.8%	9.8%	9.7%	9.6%	9.5%	9.5%	9.5%	9.4%	9.3%	9.3%	9.2%
75th Percentile	14.3%	12.2%	10.9%	10.3%	9.8%	9.5%	9.2%	9.0%	8.8%	8.7%	8.6%	8.5%	8.5%	8.4%	8.3%	8.3%	8.2%	8.2%	8.1%	8.1%	8.1%	8.0%	8.0%	8.0%	7.9%	7.9%	7.9%	7.9%	7.9%	7.8%
50th Percentile	8.6%	8.3%	8.1%	7.7%	7.5%	7.3%	7.3%	7.2%	7.2%	7.1%	7.0%	7.0%	7.0%	7.0%	7.0%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.8%	6.8%	6.9%	6.8%	6.9%	6.8%	6.8%	6.8%	6.8%
25th Percentile	2.4%	4.1%	4.6%	4.9%	5.0%	5.1%	5.2%	5.2%	5.3%	5.3%	5.3%	5.4%	5.5%	5.5%	5.5%	5.5%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%
5th Percentile	(6.9%)	(2.9%)	(1.1%)	(0.2%)	0.5%	1.2%	1.5%	2.0%	2.2%	2.3%	2.5%	2.6%	2.8%	2.9%	3.1%	3.2%	3.3%	3.4%	3.4%	3.5%	3.5%	3.6%	3.6%	3.7%	3.7%	3.8%	3.9%	3.9%	4.0%	4.0%
Prob > 6.5%	58.8%	61.5%	61.7%	62.0%	61.3%	60.1%	60.2%	60.3%	59.8%	59.7%	58.5%	58.7%	59.1%	58.4%	58.7%	58.5%	58.7%	58.5%	58.5%	58.5%	58.0%	57.7%	57.8%	58.2%	58.1%	58.2%	58.1%	57.7%	57.7%	57.7%

Capital Market Assumptions

Buck January 2024 Capital Market Assumptions – Summary

Asset Class	1st Year	10th Year	10 Years			20th Year	20 Years			30th Year	30 Years		
	Arithmetic Mean	Arithmetic Mean	Arithmetic Mean	Geometric Mean	Standard Deviation	Arithmetic Mean	Arithmetic Mean	Geometric Mean	Standard Deviation	Arithmetic Mean	Arithmetic Mean	Geometric Mean	Standard Deviation
Global Equity	11.1%	7.9%	8.7%	7.7%	15.1%	7.7%	8.3%	7.3%	14.6%	7.9%	8.1%	7.2%	14.3%
Private Equity	17.0%	10.8%	12.4%	9.6%	25.8%	10.5%	11.5%	8.5%	26.0%	10.8%	11.2%	8.2%	25.9%
Direct Real Estate	4.5%	6.4%	6.3%	5.9%	9.1%	6.4%	6.2%	5.9%	9.1%	6.2%	6.2%	5.8%	9.2%
TSERS Non-Core Real Estate	5.8%	8.4%	8.3%	7.7%	13.6%	8.5%	8.5%	7.7%	13.7%	8.8%	8.5%	7.7%	13.7%
REITs	5.9%	10.6%	8.9%	7.2%	20.4%	10.3%	9.9%	8.1%	20.5%	10.8%	10.1%	8.3%	20.5%
Infrastructure	9.8%	8.8%	8.8%	8.1%	12.8%	8.9%	8.6%	7.9%	12.7%	8.4%	8.6%	7.9%	12.8%
US High Yield	5.1%	9.0%	8.3%	7.5%	13.0%	9.0%	8.6%	7.8%	13.3%	9.3%	8.8%	8.0%	13.3%
Long Government	3.4%	5.2%	4.3%	3.7%	11.0%	5.3%	4.7%	4.1%	11.3%	5.5%	4.9%	4.3%	11.4%
Long Corporate	4.3%	6.0%	5.2%	4.7%	10.4%	6.2%	5.7%	5.1%	10.6%	6.4%	5.9%	5.3%	10.7%
Cash	5.3%	2.8%	3.6%	3.6%	1.8%	2.7%	3.2%	3.1%	1.8%	2.7%	3.0%	3.0%	1.8%
Mortgage-Backed Securities	3.5%	4.5%	4.1%	4.1%	4.0%	4.6%	4.3%	4.3%	4.1%	4.7%	4.5%	4.4%	3.9%
Private Debt	10.2%	8.8%	9.1%	8.8%	8.4%	9.0%	9.0%	8.7%	8.4%	8.8%	8.9%	8.6%	8.4%
TIPS	4.6%	4.6%	4.6%	4.4%	6.4%	4.6%	4.6%	4.4%	6.6%	4.7%	4.6%	4.4%	6.6%
Hedge Funds	7.8%	6.3%	6.8%	6.4%	9.5%	6.4%	6.6%	6.2%	9.5%	6.6%	6.5%	6.1%	9.5%

Capital Market Assumptions

Buck January 2024 Capital Market Assumptions – Correlations

	Global Equity	US All Cap Equity	US Large Cap Equity	US Mid Cap Equity	US Small Cap Equity	Low Volatility Equity	Global Equity ex US	MSCI EAFE Equity	MSCI Emerging Markets Equity	Private Equity	Direct Real Estate	REITs	Infrastructure	Hedge Funds	Commodities	Aggregate Bonds	Global Aggregate Bonds	Short Government	Short Corporate	Short Credit	Short Government/Credit	Intermediate Government	Intermediate Corporate	Intermediate Credit	Intermediate Government/Credit	Core Government	Core Corporate	Core Credit	Core Government/Credit	Long Government	Long Corporate	Long Credit	Long Government/Credit	STRIPS	TIPS	Mortgage-Backed Securities	US High Yield	Emerging Market Debt	Global ex-US Debt	Private Debt	Cash	Inflation	Inflation – Wages	Medical Trend – Professional	Medical Trend – Hospital
Global Equity	1.0																																												
US All Cap Equity	0.9	1.0																																											
US Large Cap Equity	0.9	1.0	1.0																																										
US Mid Cap Equity	0.8	0.9	0.9	1.0																																								
US Small Cap Equity	0.8	0.9	0.8	0.9	1.0																																							
Low Volatility Equity	0.7	0.7	0.7	0.6	0.6	1.0																																							
Global Equity ex US	0.8	0.5	0.5	0.5	0.5	0.3	1.0																																						
MSCI EAFE Equity	0.6	0.3	0.3	0.3	0.3	0.2	0.9	1.0																																					
MSCI Emerging Markets Equity	0.8	0.7	0.7	0.6	0.6	0.5	0.7	0.4	1.0																																				
Private Equity	0.9	1.0	1.0	0.9	0.8	0.7	0.5	0.2	0.7	1.0																																			
Direct Real Estate	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	1.0																																		
REITs	0.5	0.5	0.5	0.5	0.5	0.4	0.3	0.1	0.4	0.5	0.1	1.0																																	
Infrastructure	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.2	0.3	0.1	0.1	1.0																																
Hedge Funds	0.6	0.6	0.6	0.5	0.5	0.4	0.3	0.2	0.4	0.6	0.1	0.3	0.2	1.0																															
Commodities	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	1.0																														
Aggregate Bonds	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.2	1.0																													
Global Aggregate Bonds	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.5	1.0																												
Short Government	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.2	0.9	0.5	1.0																											
Short Corporate	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.2	0.9	0.5	1.0	1.0																										
Short Credit	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.2	0.9	0.5	1.0	1.0	1.0																									
Short Government/Credit	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.2	0.9	0.5	1.0	1.0	1.0	1.0																							
Intermediate Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	1.0	0.5	1.0	0.9	0.9	1.0	1.0																						
Intermediate Corporate	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2	1.0	0.5	0.9	0.9	0.9	0.9	0.9	1.0																					
Intermediate Credit	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.2	1.0	0.5	0.9	0.9	0.9	0.9	0.9	1.0	1.0																				
Intermediate Government/Credit	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.2	1.0	0.5	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0																			
Core Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	1.0	0.5	0.9	0.9	0.9	0.9	1.0	0.9	0.9	1.0	1.0																		
Core Corporate	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.9	0.5	0.8	0.9	0.9	0.8	0.9	1.0	1.0	0.9	0.9	1.0																	
Core Credit	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2	1.0	0.5	0.8	0.9	0.9	0.8	0.9	1.0	1.0	1.0	0.9	1.0	1.0																
Core Government/Credit	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.2	1.0	0.5	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0															
Long Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.9	0.5	0.8	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.0	0.9	0.9	0.9	1.0														
Long Corporate	0.2	0.2	0.2	0.3	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.9	0.5	0.7	0.8	0.8	0.7	0.8	0.9	0.9	0.9	0.9	1.0	1.0	0.9	0.9	1.0													
Long Credit	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.9	0.5	0.7	0.8	0.8	0.7	0.8	0.9	0.9	0.9	0.9	1.0	1.0	0.9	0.9	1.0	1.0												
Long Government/Credit	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.2	1.0	0.5	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0											
STRIPS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.9	0.5	0.7	0.7	0.7	0.7	0.9	0.8	0.8	0.9	0.9	0.8	0.9	0.9	1.0	0.9	0.9	1.0	1.0										
TIPS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.6	0.6	0.3	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.7	1.0									
Mortgage-Backed Securities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.9	0.5	0.9	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.8	0.8	0.9	0.9	0.6	1.0								
US High Yield	0.6	0.7	0.7	0.6	0.6	0.5	0.3	0.2	0.5	0.7	0.2	0.4	0.2	0.4	0.2	0.6	0.4	0.4	0.6	0.6	0.5	0.5	0.7	0.7	0.6	0.5	0.8	0.7	0.6	0.5	0.8	0.8	0.6	0.5	0.3	0.5	1.0							
Emerging Market Debt	0.5	0.5	0.5	0.4	0.4	0.3	0.5	0.2	0.7	0.5	0.1	0.2	0.1	0.3	0.1	0.0	0.4	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.3	1.0									
Global ex-US Debt	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.2	1.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.3	0.5	1.0				
Private Debt	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.1	0.3	0.4	0.1	0.2	0.1	0.2	0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.2	0.2	0.1	1.0			
Cash	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.6	0.6	0.6	0.6	0.4	0.3	0.3	0.4	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.3	0.4	0.1	0.1	0.1	0.0	1.0		
Inflation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.2	-0.7	-0.3	-0.6	-0.6	-0.6	-0.6	-0.7	-0.6	-0.7	-0.7	-0.7	-0.6	-0.7	-0.7	-0.6	-0.5	-0.6	-0.6	-0.5	-0.2	-0.6	-0.3	0.0	-0.2	0.1	0.1	1.0		
Inflation – Wages	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.2	-0.1	-0.1	0.1	0.1	0.1	0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	0.0	0.0	-0.1	0.0	0.0	0.1	0.6	0.5	1.0	
Medical Trend – Professional	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.5	0.1	0.4	1.0
Medical Trend – Hospital	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.5	0.4	0.7	0.7	1.0

Certification

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law. Buck performed a deterministic and stochastic analysis of the potential range of such future differences in investment return; however, this is by no means an exhaustive representation of all potential future investment returns of the system nor a sensitivity analysis of other assumptions key to the measurements.

The purpose of this presentation is to provide a summary of the stress testing to the Board at the July 25, 2024 meeting attended by the actuaries. Use of this report for any other purposes may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of this presentation for that purpose. This presentation should not be provided without a copy of the full valuation report. Because of the risk of misinterpretation of actuarial results, you should ask Buck, A Gallagher Company (Buck) to review any statement you wish to make on the results contained in this presentation. Buck will not accept any liability for any such statement made without prior review."

This presentation is considered part of the annual actuarial valuation report. Please see below for full description of data, actuarial assumptions and methods, plan provisions, and other applicable disclosures.

This report was prepared under our supervision and in accordance with all applicable Actuarial Standards of Practice. We are Fellows of the Society of Actuaries, Enrolled Actuaries, Members of the American Academy of Actuaries, and Fellows of the Conference of Consulting Actuaries. We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. We are available to discuss this report with you at your convenience.

Thank You!

Gallagher

Insurance | Risk Management | Consulting

Teachers' and State Employees' Retirement System of North Carolina

Stress Testing and Sensitivity Analysis Report
Prepared as of December 31, 2022

July 2024

Gallagher

Insurance | Risk Management | Consulting

Gallagher
Insurance | Risk Management | Consulting

110 West Berry Street
Suite 1300
Fort Wayne, IN 46802

July 2024

Board of Trustees
Teachers' and State Employees'
Retirement System of North Carolina
3200 Atlantic Avenue
Raleigh, NC 27604

Members of the Board:

We submit the results of the stress testing report for the Teachers' and State Employees' Retirement System of North Carolina (referred to as "TSERS" or the "State Plan") prepared as of December 31, 2022.

The purpose of this report is to satisfy the requirements of North Carolina General Statutes 135-6(n1). This report is intended to assist the TSERS Board of Trustees, the General Assembly, the Governor of North Carolina, and other stakeholders to better understand and assess the risks inherent in the funding of the retirement system. This report provides a stress analysis of the State Plan's investment return on certain funding targets, including the required employer contribution rates and the projected financial condition of TSERS, and provides a potential range of the changes in the expected full funding dates, which are determined assuming all actuarial assumptions are met in the future. Use of this report for any other purposes or by anyone other than North Carolina Retirement Systems Division (RSD) or Department of State Treasurer staff may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the report for that purpose. The attached pages should not be provided without a copy of this cover letter. Because of the risk of misinterpretation of actuarial results, you should ask Gallagher (formerly known as Buck and referred to as Gallagher or Buck throughout this report) to review any statement you wish to make on the results contained in this report. Gallagher will not accept any liability for any such statement made without prior review.

Where presented, references to "funded ratio" and "unfunded accrued liability" typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratio presented may be appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the plan if the plan were to settle (i.e., purchase annuities) for a portion or all of its liabilities. In various places in the report the results also show funded ratios and unfunded liabilities based upon varying sets of assumptions as required for certain disclosure information by statutes. Where this has been done it has been clearly indicated.

Actuarial Standard of Practice No. 56 ("ASOP 56") provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. Gallagher uses third-party software in the performance of annual actuarial valuations and projections. The model is intended to calculate the liabilities associated with the provisions of the plan using data and assumptions as of the measurement date under the accounting rules specified in this report. The output from the third-party vendor software is used as input to an internally developed model that applies applicable accounting rules to the liabilities derived and other inputs, such as plan assets and contributions, to generate many of the exhibits found in this report. Gallagher has an extensive review process whereby the results of the liability calculations are checked using detailed sample output,

changes from year to year are summarized by source, and significant deviations from expectations are investigated.

Other internal models are similarly reviewed in detail and at a high level for accuracy, reasonability, and consistency with prior results. Gallagher also reviews the third-party model when significant changes are made to the software. The review is performed by experts within the company who are familiar with applicable accounting rules as well as the manner in which the model generates its output. If significant changes are made to the internal model, extra checking and review are completed. Significant changes to the internal model that are applicable to multiple clients are generally developed, checked, and reviewed by multiple experts within the company who are familiar with the details of the required changes.

Future actuarial results may differ significantly from the current results presented in this report due to such factors as the following: fund experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; and changes in plan provisions or applicable law. Such changes in law may include additional costs resulting from future legislated benefit improvements or cost-of-living pension increases or supplements, which are not anticipated in the actuarial valuation. Because of limited scope, Gallagher performed no analysis of the potential range of such future differences, except for some limited analysis in financial projections or required disclosure information.

This report was prepared under our supervision and in accordance with all applicable Actuarial Standards of Practice. We are Fellows of the Society of Actuaries, Enrolled Actuaries, Members of the American Academy of Actuaries, and Fellows of the Conference of Consulting Actuaries. We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. We are available to discuss this report with you at your convenience.

Michael A. Ribble, FSA, EA, MAAA, FCA
Principal, Retirement Actuary
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Executive Summary

Overview

In 1941, the Teachers' and State Employees' Retirement System (referred to as "TSERS" or the "State Plan") was established. TSERS is administered by the North Carolina Retirement Systems Division (RSD) under the management of the Department of the Treasurer. TSERS provides benefits to all full-time teachers and state employees in all public-school systems, universities, departments, institutions, and agencies of the state. With over $77 billion in assets and over 760,000 members as of December 31, 2022, it is the largest pension plan within the NC Retirement Systems.

Every year, actuarial valuations are performed to calculate the amount of contributions needed to fund benefits payable by TSERS. The amount of benefits paid to a member upon retirement, termination, death or disability are defined by law. The contributions needed to fund these benefits fluctuate depending on the demographic experience of the TSERS population and the asset performance of the plan. Actuarial valuations use demographic and economic assumptions to calculate the expected present value of benefits, determine the funded status of the plan, and develop recommended contributions. Every five years, an experience study is performed to evaluate experience under the given assumptions and recommend updates to the Board to best reflect anticipated experience in the actuarially determined contribution. Arguably the most impactful assumption to actuarial valuation results is the investment return.

In accordance with North Carolina General Statutes 135-6(n1), prior to performing the experience study recurring every five years, the TSERS Board of Trustees requests their actuarial service provider perform a stress-testing study on the investment return meeting the requirements outlined within the statute. The study report is then provided to the General Assembly and the Governor by the Board. The next experience study review is to be performed in 2025 based on data from January 1, 2020 through December 31, 2024.

Purpose

The purpose of this report is to satisfy the requirements of North Carolina General Statutes 135-6(n1). This report is intended to assist the TSERS Board of Trustees, the General Assembly, the Governor of North Carolina, and other stakeholders to better understand and assess the risks inherent in the funding of the pension system. This report is a means of assessing the financial health and sustainability of TSERS under a variety of hypothetical economic scenarios. It helps provide information to decision makers to help ensure that the applicable pension liabilities and funding mechanisms are managed in a manner that promotes sustainability.

Actuarial assumptions are a key component of the measurements in the actuarial valuation process and the projection of future valuation results. The investment return is the most significant assumption and the assumption that produces the most volatile changes due to actual results (positive and negative) varying significantly from one year to the next. This report focuses on the variable impact of the investment return volatility. This report also demonstrates the impact to TSERS if annual appropriations are less than the recommended contributions.

The analyses contained herein are useful for anticipating trends and comparing various outcomes, under a given methodology, rather than predicting a future state of events. Future actuarial measurements may differ significantly from what has been modeled due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in analysis in financial projections or required disclosed information.

It is important to clarify that this study is not an assessment of the reasonability of the investment return assumption, nor is it a study to recommend an investment return assumption. The intent is to provide a sensitivity analysis of how a change in the investment return assumption would impact key valuation outputs, and how deviations in the asset return from the expected investment return assumption would impact key valuation outputs.

Note that this report focuses primarily on several adverse projections assuming poor asset performance, as described in statutes, to help identify those areas of risk that generally provide the most challenges to plan sponsors. However, probabilities exist for both positive and negative scenarios as shown in the stochastic analysis.

Executive Summary (continued)

Further, stress on the system can occur in scenarios other than those solely related to the investment return assumption/experience. For example, future changes in benefit provisions, including potential future benefit improvements granted by the General Assembly, could significantly stress the system. Stress on the system based on factors other than future investment returns on assets that differ from the 6.50% assumed annual return are beyond the scope of this analysis.

Risk

Measuring pension obligations and actuarially determined contributions requires the use of assumptions regarding future economic and demographic experience. Whenever assumptions are made about future events, there is risk that actual experience will differ from expected. The sensitivity analysis, deterministic forecasts, and stochastic modeling include the risk that actual future measurements will deviate from expected future measurements due to actual experience that is different than the actuarial assumptions. The most significant risks inherent in TSERS valuations and projections are as follows:

- Investment Risk – the potential that investment returns will be different than expected. Sections 1 and 2 of this report demonstrates the sensitivity of future projected results to asset returns deviating from expected returns. Note that although 5,000 simulated returns are shown in stochastic modeling, there are other possible paths that could occur for TSERS.
- Longevity and Other Demographic Risks – the potential that mortality or other demographic experience will be different than expected.
- Interest Rate Risk – To the extent significant changes in capital market assumptions or asset allocations affect the expected return on assets, there is a risk of change to the discount rate that determines the present value of liabilities and actuarial valuation results. Section 3, Table 3a of this report demonstrates the sensitivity of valuation results to different discount rates.
- Contribution Risk – The potential that actual contributions are different than the actuarially determined contributions. Section 1 shows scenarios that demonstrate the effect on TSERS when actual contributions are lower than the actuarially determined contributions.

Actuary's Comments and Observations

The current assumed long-term rate of return for TSERS is equal to the valuation interest rate of 6.50%. As of the most recent valuation, for calendar year 2022, market value returns were far lower than expected, at a negative return of (10.38%) during calendar year 2022 compared to the 6.50% assumed return. However, recent reporting indicates that for calendar year 2023 the rate of return was close to 10.2%. The assumed rate of return is a long-term assumption, whereby we expect on average for the plan to achieve this return based on its target allocation and anticipate benefits to be paid from the plan. This volatility in the markets is not necessarily unanticipated. However, the volatility must be accounted for in how this impacts the funding of the plan both over the short and long term.

While the testing below includes stress on the system based on specific scenarios described in statute, other stress on the system can occur, specifically scenarios not solely related to the investment return assumption/experience. For example, future changes in benefit provisions, including potential future benefit improvements granted by the General Assembly, could significantly stress the system. Stress on the system based on factors other than future investment returns on assets that differ from the 6.50% assumed annual return are beyond the scope of this analysis.

Executive Summary (continued)

Deterministic Stress Testing

The stress testing analysis highlights the strengths and weaknesses of the funding policy in a variety of different economic environments.

- If annual asset returns of 6.50% are achieved over a 30-year period, TSERS is expected to be 100% funded by December 31, 2036.
- If annual asset returns are 2% or 4% lower than the assumed rate of return and annual appropriations continue based on current funding policy, the plan's funded percentage is expected to drop. However, the plan then maintains a relatively level funded percentage over the 30-year projection period of close to 86% and 75% (respectively). The relatively short amortization period helps in maintaining a stronger funded position over time if lower than expected returns are realized.
- Under the hypothetical situation described by G.S. 135-6(n1)(4)b, in which annual asset returns are 2% or 4% lower than the assumed rate of return, and assuming the State would not respond to the market downturn by increasing its contributions to TSERS, the plan's funded percentage would be expected to drop substantially and possibly to the point of insolvency, as projected to occur in 2049 based on actual returns 4% lower than assumed.
- Current projected baseline projections are sufficient to fund TSERS over the projection period if the expected return is achieved, but the projected contribution rates do not include additional amounts to fund for potential adverse deviation. If the TSERS Board were to adopt a funding policy that did not adjust for actual performance, adverse deviation would lead to poor outcomes.
- If the plan experiences an asset return 20% lower than expected followed by 20 years of asset returns 2% lower than the assumed rate of return, TSERS funded percentage drops but is still able to recover and normalize to a stable funded percentage within the projection period hovering around 87% if contributing the ADEC.
- Under the hypothetical situation described by G.S. 135-6(n1)(5)b, in which the plan experiences an asset return 20% lower than expected followed by 20 years of asset returns 2% lower than expected, and assuming the State would not respond to the market downturn by increasing its contributions to TSERS, the TSERS funded percentage would be expected to drop to around 29% in 2044.

Stochastic Analysis

The stochastic analysis shows the range and likelihood of future actuarially determined employer contributions. This analysis produces a "likely" range of results with 50% probability of occurring. The results also demonstrate the "tail risk" of TSERS based on the unlikely poor conditions expected to occur with 5% probability.

- Based on the simulated 5,000 trials utilizing the plan's target allocation and Buck's Capital Market Assumptions, the likely range of annual returns over a 30-year period does not vary significantly from year to year. The lowest 25th percentile return during the period is 1.5% and the highest 75th percentile return during the period is 14.3%.
- Based on the simulated 5,000 trials utilizing the plan's target allocation and Buck's Capital Market Assumptions, the mean expected compound return over the 30-year projection period is 6.7%.
- The actuarially determined employer contribution rate is projected to fall within a 14.16% to 19.85% range at the 25th to 75th percentile for FYE 2029, with such range declining over the period of the projection.
- By the end of the projection period, there is a 74% likelihood overall that the ADEC has fallen to the 6.00% minimum employer contribution rate.

Executive Summary (continued)

Sensitivity Analysis – Interest Rate

This sensitivity analysis shows how adjustments to the expected return would impact the funded status of the plan and the recommended contributions to support the system.

- TSERS is invested in a diversified portfolio and therefore is expected to achieve a return in excess of risk-free rates over the long term.
- However, the statutes require a disclosure of TSERS liabilities and contribution requirements determined using a 10-year average yield of 30-year treasuries as the discount rate. As of December 31, 2022, the 10-year average yield of 30-year treasuries is 2.75% compared to the 6.50% expected return.
- Measuring liabilities using a discount rate of 2.75% would increase the ADEC to 65.66% of payroll for fiscal year ending June 30, 2025 compared to 15.90% of payroll using the 6.50% expected return. That being said, the current funding policy limits the contribution to 53.56% of payroll for fiscal year ending June 30, 2025.
- The contribution rates above are prior to application of direct rate smoothing or the ECRSP.

Sensitivity Analysis – Amortization

This sensitivity analysis shows how adjustments to the amortization payments of unfunded actuarial accrued liability, or the paydown of the pension debt, would impact the funded status of the plan and the recommended contributions to support the system.

- Shortening the amortization period from 12 years (maintaining current amortization layers) to a single period of nine years, equal to estimated average remaining service period of active member, would increase the ADEC by 0.3% of payroll (from 15.90% of payroll to 16.20%).
- The contribution rates above are prior to application of direct rate smoothing or the ECRSP.
- Compared to its peers, North Carolina's 12-year amortization period pays down the unfunded liability in a shorter period of time. According to an April 2022 NASRA study, the median liability-weighted amortization period for public pension plans that used a closed, layered amortization, was 18 years. Reducing the amortization period to the average expected lifetime in this case is therefore not as impactful to the ADEC as it may be for other systems with longer periods.

Key Takeaways

- TSERS' relatively short amortization period of 12 years to pay down the unfunded liability results in a stronger funded position over time when contributing the ADEC, even when the expected return is not achieved.
- If continuing to adopt a funding policy tied to the underlying ADEC, it is likely that TSERS will be able to achieve full funding over the next 20 years and that the employer contribution rate will likely drop to the 6% minimum employer contribution rate.
- The General Assembly has a history of annually appropriating the actuarially determined employer contributions for TSERS. The stress testing in this report demonstrates how critical that is for the sustainability of TSERS. This is demonstrated in the hypothetical scenarios described by G.S. 135-6(n1)(4)b and G.S. 135-6(n1)(5)b. These scenarios assume that, in the event of persistent low returns, the State would not respond by increasing contributions. Instead, the hypothetical scenarios assume the State would view its long-term funding commitment (under baseline conditions) as "locked in," and never adjust for market conditions. In these scenarios, the financial condition of TSERS would not recover, and the cost of providing benefits would escalate out of control.

As has been done over the past 80 years, continued focus on these measures will be needed to maintain the solid status of TSERS well into the future.

Section 1: Stress Testing

Stress testing is designed to measure the potential effect on the plan of future economic or demographic outcomes that vary significantly from actuarial assumptions. For purposes of this report, we are stress testing future results of TSERS based on one specific element – future investment returns on assets that differ from the 6.50% assumed annual return. Notably, stress on the system can occur in scenarios other than those solely related to the investment return assumption/experience. For example, future changes in benefit provisions, including potential future benefit improvements granted by the General Assembly, could significantly stress the system. Stress on the system based on factors other than future investment returns on assets that differ from the 6.50% assumed annual return are beyond the scope of this analysis.

We have performed stress testing on the asset return using two projection methods: deterministic forecasting and stochastic modeling. Deterministic forecasting is based on one or more specific scenarios in the future. Stochastic modeling gathers projected asset return streams covering a wide range of potential future outcomes, simulating the volatility of annual investment returns. The results of Section 1 are based on deterministic forecasting. Section 2 will utilize stochastic modeling.

Projections of contribution requirements and funded status into the future can be helpful planning tools for stakeholders. This section provides such projections as a means of stress testing the system. The baseline projection of the actuarial valuation is a deterministic projection based on the December 31, 2022 actuarial valuation results and assumptions. We list below other key projection assumptions.

Key Projection Assumptions

- Valuation interest rate of 6.50%
- 10.2% return on assets for calendar year 2023.
- 6.50% investment return on market value of assets for all years after 2023, except where otherwise noted.
- Direct-rate smoothing of the change in the employer contribution rate due to the changes in assumption and methods over a 5-year period beginning July 1, 2022.
- Actuarial assumptions and methods as described in Appendix C. All future demographic experience is assumed to be exactly realized.
- The contribution rate under the Employer Contribution Rate Stabilization Policy (ECRSP) is contributed until fiscal year ending 2027.
- The actuarially determined contribution rate is contributed for fiscal years ending 2028 and beyond.
- The employer contribution shall not be less than the employee contribution, which is currently 6%.
- 0% increase in the total active member population of TSERS and its subgroups: Teachers, Other Education, General Employees, and Law Enforcement Officers, except that effective January 1, 2024, no new hires of UNC Health Care System (UNC HC) will participate in TSERS.
- To replace those assumed to leave active service, the age, gender and salary of future members assumed to be hired into TSERS are based on the demographic information of new TSERS hires over the past three (3) valuations.
- Demographic profiles of new entrants for each subgroup are based on new hires specific to that subgroup over the past three (3) valuations.
- 75% of new entrants are assumed to have rounded service of 0 when first valued, and 25% are assumed to have rounded service of 1 when first valued.
- No cost-of-living adjustments granted.
- Future pay increases based on long-term salary increase assumptions.

The ECRSP contribution rate is the Stable Contribution rate shown in the projections. See Appendix F for more detail on the ECRSP.

Section 1: Stress Testing (continued)

Deterministic Forecasting

Several specific scenarios are outlined within the requirements of G.S. 135-6(n1) and cover economic situations where annual returns fall short of what is currently expected and/or create one-year "shocks" to the system. These scenarios are outlined in G.S. 135-6(n1)(3), G.S. 135-6(n1)(4), and G.S. 135-6(n1)(5). These scenarios are described as follows:

- A **Baseline** scenario, where the expected return assumption of 6.50% is realized over the projection period. This is the standard of comparison to other scenarios modeled.
- A **4.5% Return** scenario, where investment returns are persistently 4.50% (2.00% lower than the current assumed rate of return of 6.50%) and employer contributions are based on the current funding policy.
- A **4.5% Return, Baseline Contribution** scenario, where investment returns are persistently 4.50% (2.00% lower than the current assumed rate of return of 6.50%) but employer contributions are held constant at the contribution rates modeled under the Baseline scenario, i.e., well less than the amount required under the current funding policy.
- A **4.5% Return, 15% of Revenue Cap** scenario, where investment returns are persistently 4.50% (2.00% lower than the current assumed rate of return of 6.50%) and employer contributions are based on the current funding policy, but never exceed 15% of the projected total revenue available for appropriation by the General Assembly.
- A **2.5% Return** scenario, where investment returns are persistently 2.50% (4.00% lower than the current assumed rate of return of 6.50%) and employer contributions are based on the current funding policy.
- A **2.5% Return, Baseline Contribution** scenario, where investment returns are persistently 2.50% (4.00% lower than the current assumed rate of return of 6.50%) but employer contributions are held constant at the contribution rates modeled under the Baseline scenario, i.e., well less than the amount required under the current funding policy.
- A **2.5% Return, 15% of Revenue Cap** scenario, where investment returns are persistently 2.50% (4.00% lower than the current assumed rate of return of 6.50%) and employer contributions are based on the current funding policy, but never exceed 15% of the projected total revenue available for appropriation by the General Assembly.
- A **(13.5%) Shock, 4.5% Return** scenario, where there is a one-year (negative) return of (13.5)% (20.00% lower than the current assumed rate of return of 6.50%) followed by 20 years of 4.50% returns (2.00% lower than the current assumed rate of return of 6.50%) and employer contribution are based on the current funding policy. In this case, the (13.50%) return is assumed for calendar year 2024 with 4.5% returns assumed for calendar years 2025 to 2044.
- A **(13.5%) Shock, 4.5% Return, Baseline Contribution** scenario, where there is a one-year (negative) return of (13.5)% (20.00% lower than the current assumed rate of return of 6.50%) followed by 20 years of 4.50% returns (2.00% lower than the current assumed rate of return of 6.50%) and employer contributions are based on the current funding policy. In this case, the (13.50%) return is assumed for calendar year 2024 with 4.5% returns assumed for calendar years 2025 to 2044.
- A **(13.5%) Shock, 4.5% Return, 15% of Revenue Cap** scenario, where there is a one-year (negative) return of (13.5)% (20.00% lower than the current assumed rate of return of 6.50%) followed by 20 years of 4.50% returns (2.00% lower than the current assumed rate of return of 6.50%) and employer contributions are based on the current funding policy, but never exceed 15% of the projected total revenue available for appropriation by the General Assembly. In this case, the (13.50%) return is assumed for calendar year 2024 with 4.5% returns assumed for calendar years 2025 to 2044.

Section 1: Stress Testing (continued)

Deterministic Forecasting (continued)

Where applicable, we have projected the 15% of projected total revenue available for appropriation by the General Assembly as a rate of pay by projecting revenue based on the 2024 Debt Affordability Advisory Committee study for General Fund and Transportation for each fiscal year through the fiscal year ending 2034. We applied the FYE 2034 assumed growth rate for each year onward (4.3% for General Fund and 1.50% for Transportation). We determined 15% of the total projected revenue of the General Fund and Transportation as a percentage of the total General Fund and Transportation payroll assumed to grow at 3.25% annually. This rate was then applied as a cap in modeled scenarios detailed in this section.

Additional requisite detail for these scenarios can be found in Appendix D of this report.

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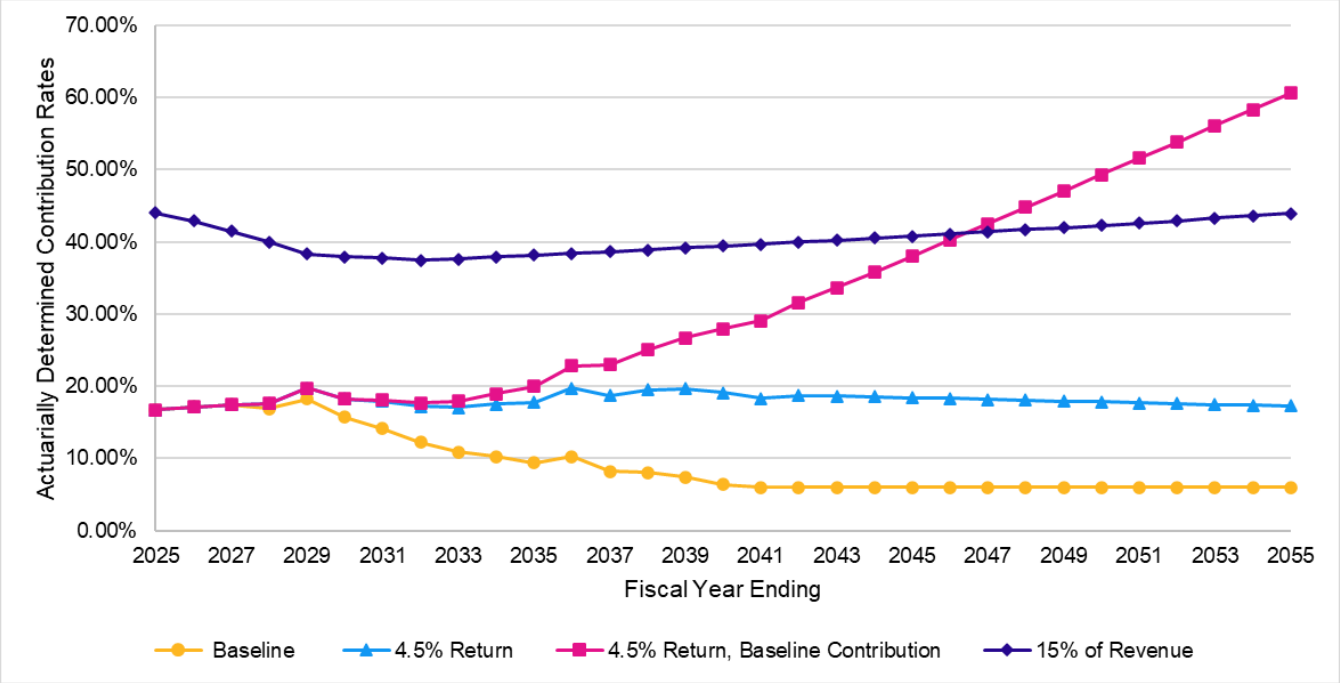
Section 1: Stress Testing (continued)

Projected Actuarially Determined Employer Contribution Rates

Below we model the Actuarially Determined Employer Contribution Rates (ADECs) of scenarios required under G.S. 135-6(n1)(3) and portions of G.S. 135-6(n1)(4); specifically, the Baseline scenario, the 4.5% Return scenario, and the 4.5% Return, Baseline Contribution scenario. The 4.5% Return, 15% of Revenue Cap scenario is not modeled separately in the graphs below, as the results are identical to the 4.5% Return scenario.

Graph 1a: Projected Actuarially Determined Employer Contribution Rates (4.5% Returns)



Projected ADECs are shown over a 30-year projection period, from fiscal year ending June 30, 2025 through June 30, 2055. The Baseline scenario shows the ADEC gradually declining to 6.00% of payroll by FYE 2041, which is the minimum employer contribution rate based on the employee contribution rate of 6.00%.

Under the 4.5% Return scenario, the ADEC exceeds 17.00% of payroll over the entire projection period, climbing to 19.76% of payroll in FYE 2036 before slowly declining, but never dropping to the 6% minimum employer contribution rate. Under the 4.5% Return, Baseline Contribution scenario, the ADEC continues to increase over the projection period, increasing above 60% of payroll by FYE 2055.

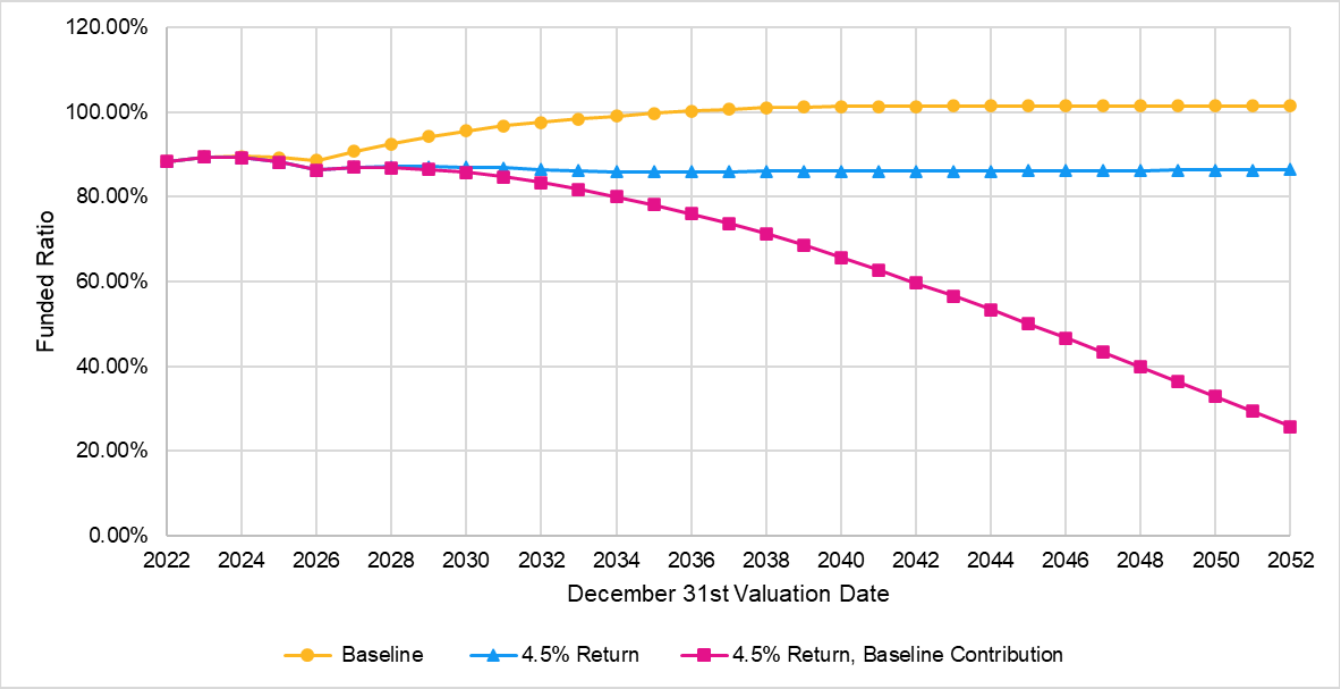
We note that the 4.5% Return, 15% of Revenue Cap scenario is not modeled separately in the graphs as the results are identical to the 4.5% Return scenario. We have included in the graph above, however, a line indicating the projected 15% of Revenue cap, that would have been applied. As shown, the 4.5% Return scenario does not approach the revenue cap. However, the 4.5% Return with only Baseline contributions would exceed 15% of revenue projection beginning in FYE 2047.

Section 1: Stress Testing (continued)

Projected Funded Ratio

Below we model the funded ratio of scenarios required under G.S. 135-6(n1)(3) and portions of G.S. 135-6(n1)(4); specifically, the Baseline scenario, the 4.5% Return scenario, and the 4.5% Return, Baseline Contribution scenario. The 4.5% Return, 15% of Revenue Cap scenario is not modeled separately in the graphs below, as the results are identical to the 4.5% Return scenario.

Graph 1b: Projected Funded Ratio (4.5% Returns)



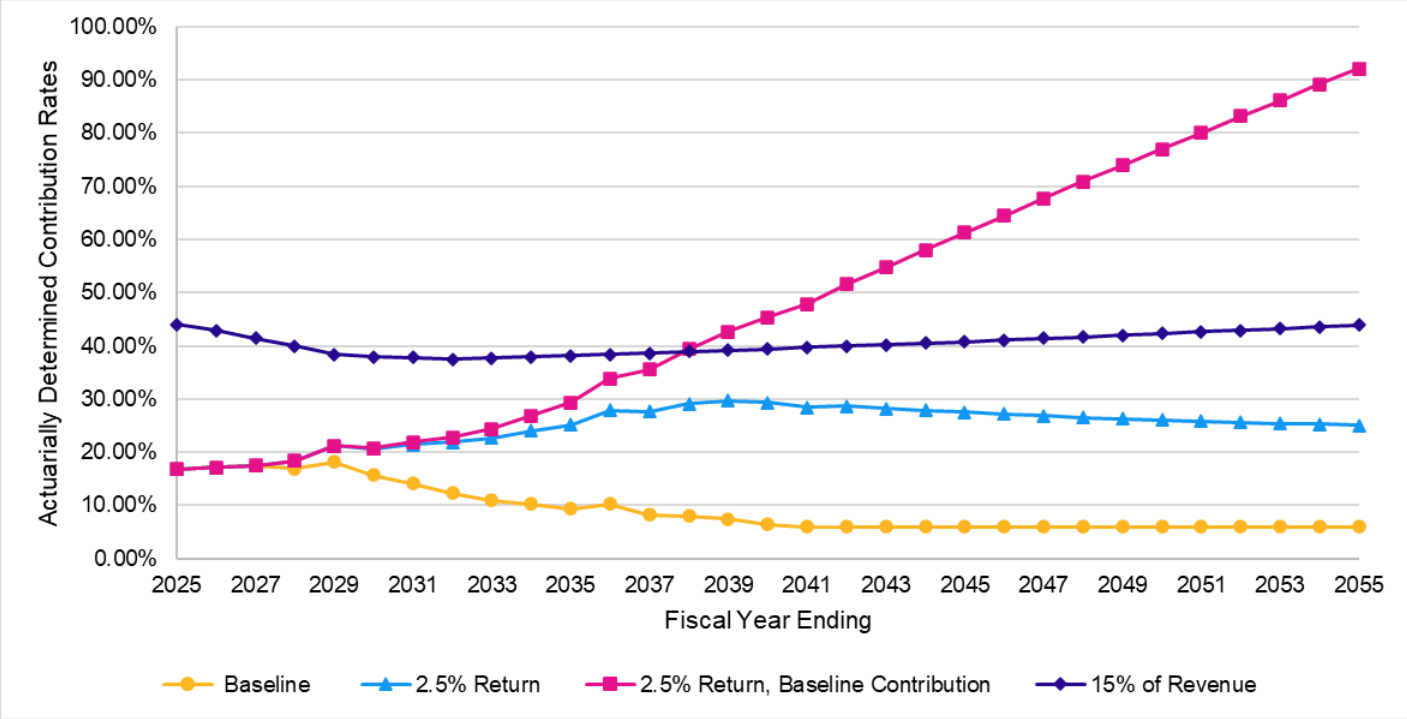
Projected funded ratios are shown over a 30-year projection period, from calendars years ending December 31, 2022 through December 31, 2052. The Baseline scenario shows TSERS becoming fully funded by December 31, 2036. Under the 4.5% Return scenario, the funded percentage remains relatively level close to 86% funded during the projection period. Under the 4.5% Return, Baseline Contribution scenario, the funded ratio sharply declines as contributions fail to keep pace with asset losses. In particular, under this scenario contributions drop to the minimum contribution rate of 6% in FYE 2041 and therefore no contribution is allocated to the pay-down of the unfunded actuarial accrued liability.

Section 1: Stress Testing (continued)

Projected Actuarially Determined Employer Contribution Rates

Below we model the Actuarially Determined Employer Contribution Rates (ADECs) of scenarios required under G.S. 135-6(n1)(3) and portions of G.S. 135-6(n1)(4); specifically, the Baseline scenario, the 2.5% Return scenario, and the 2.5% Return, Baseline Contribution scenario. The 2.5% Return, 15% of Revenue Cap scenario is not modeled separately in the graphs below, as the results are identical to the 2.5% Return scenario.

Graph 1c: Projected Actuarially Determined Employer Contribution Rates (2.5% Returns)



Projected ADECs are shown over a 30-year projection period, from fiscal year ending June 30, 2025, through June 30, 2055. The Baseline scenario shows the ADEC gradually declining to 6.00% of payroll by FYE 2041, which is the minimum employer contribution rate based on the employee contribution rate of 6.00%. Under the 2.5% Return scenario, the ADEC climbs to 29.67% of payroll in FYE 2039 before slowly declining to about 25% of payroll. Under the 2.5% Return, Baseline Contribution scenario, the ADEC continues to increase over the projection period, increasing above 90% of payroll by FYE 2055.

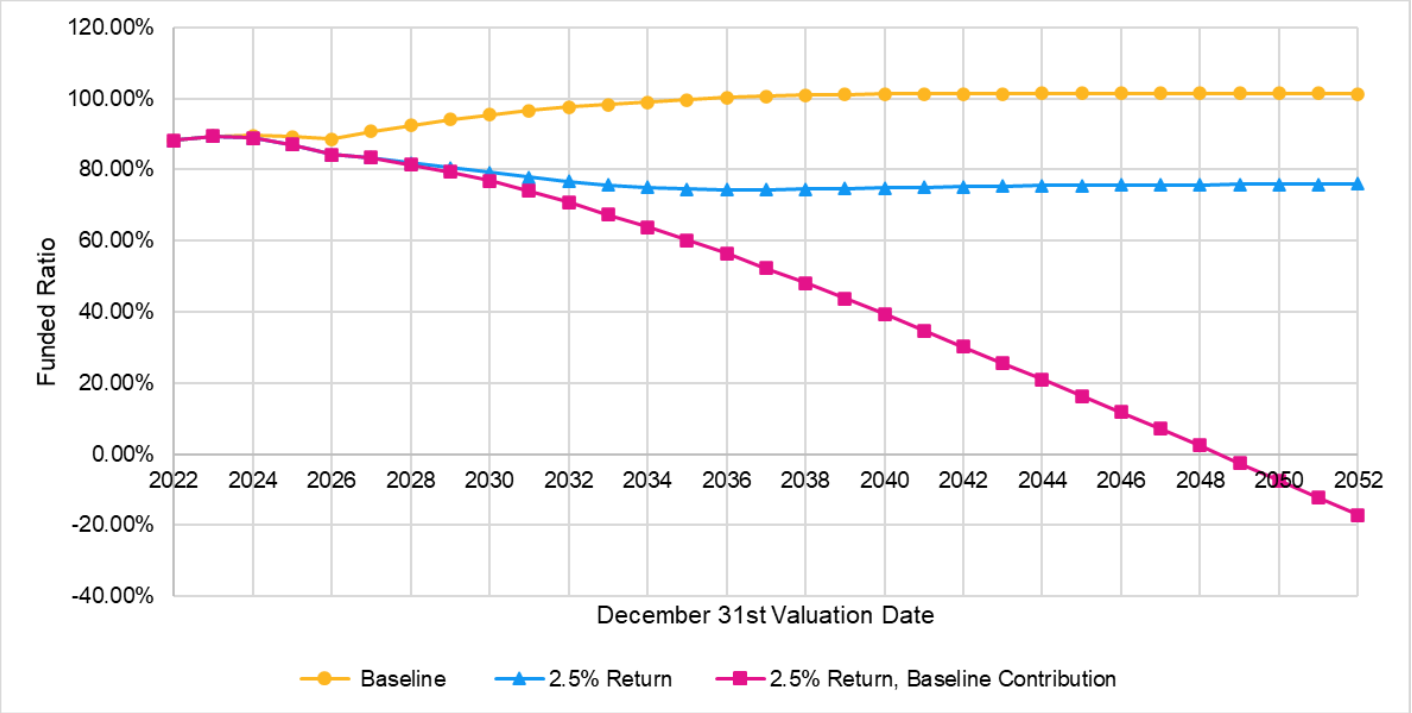
We note that the 2.5% Return, 15% of Revenue Cap scenario is not modeled separately in the graphs as the results are identical to the 2.5% Return scenario. We have included in the above, however, a line indicating the projected 15% of Revenue cap that would have been applied. As shown, the 2.5% Return scenario does not approach the revenue cap. It comes closest in FYE 2039, where the revenue cap is 39.17% of payroll compared to the ADEC of 29.67% of payroll (a difference of 9.50% of payroll). However, the 2.5% Return with only Baseline contributions would exceed 15% of revenue projection beginning in FYE 2038.

Section 1: Stress Testing (continued)

Projected Funded Ratio

Below we model the funded ratio of scenarios required under G.S. 135-6(n1)(3) and portions of G.S. 135-6(n1)(4); specifically, the Baseline scenario, the 2.5% Return scenario, the 2.5% Return, Baseline Contribution scenario. The 2.5% Return, 15% of Revenue Cap scenario is not modeled separately in the graphs below, as the results are identical to the 2.5% Return scenario.

Graph 1d: Projected Funded Ratio (2.5% Returns)



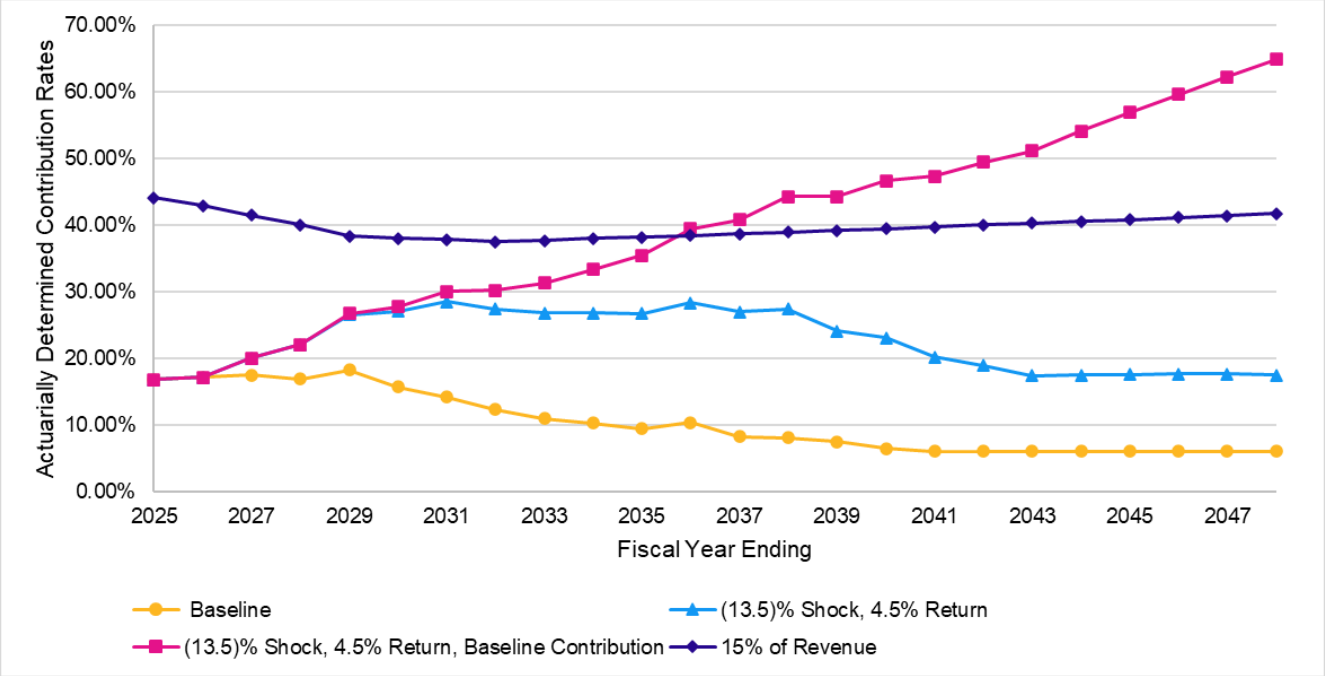
Projected funded ratios are shown over a 30-year projection period, from calendars years ending December 31, 2022 through December 31, 2052. The Baseline scenario shows TSERS becoming fully funded by December 31, 2036. Under the 2.5% Return scenario, the funded percentage remains relatively level close to 75% funded during the projection period. Under the 2.5% Return, Baseline Contribution scenario, the funded ratio sharply declines as contributions fail to keep pace with asset losses. In particular, under this scenario contributions drop to the minimum contribution rate of 6% in FYE 2041 and therefore no contribution is allocated to the pay-down of the unfunded actuarial accrued liability. In fact, under this scenario TSERS is projected to become insolvent as of December 31, 2049, and unable to pay benefits due to members. Hence, the funded ratio drops below 0% for illustrative purposes (indicating a hypothetical scenario in which the fund borrows money to pay promised benefits).

Section 1: Stress Testing (continued)

Projected Actuarially Determined Employer Contribution Rates

Below we model the Actuarially Determined Employer Contribution Rates (ADECs) of scenarios required under G.S. 135-6(n1)(3) and G.S. 135-6(n1)(5); specifically, the Baseline scenario, the (13.5%) Shock, 4.5% Return scenario, and the **(**13.5%) Shock, 4.5% Return, Baseline Contribution scenario. The (13.5%) Shock, 4.5% Return, 15% of Revenue Cap scenario is not modeled separately in the graphs below, as the results are identical to the (13.5%) Shock, 4.5% Return scenario.

Graph 1e: Projected Actuarially Determined Employer Contribution Rates ((13.5)% Shock, 4.5% Returns)



Projected ADECs are shown over a 23-year projection period, from fiscal year ending June 30, 2025 through June 30, 2048. The Baseline scenario shows the ADEC gradually declining to 6.00% of payroll by FYE 2041, which is the minimum employer contribution rate based on the employee contribution rate of 6.00%. Under the (13.5%) Shock, 4.5% Return scenario, the ADEC for fiscal year ending 2027 increases to 20.00% of pay compared to the 17.49% of pay from the baseline, first recognizing the (13.5%) loss in the projected December 31, 2024 actuarial valuation. The ADEC climbs to its maximum of 28.45% of payroll for FYE 2031, as that would be the final year that the asset loss from 2024 is smoothed into the actuarial value of assets. The ADEC remains flat around 27% of pay for the next 7 years before steadily decreasing to about 18% of pay starting in FYE 2043. Under the (13.5%) Shock, 4.5% Return, Baseline Contribution scenario, the ADEC continues to increase over the projection period, increasing above 60% of payroll by FYE 2047.

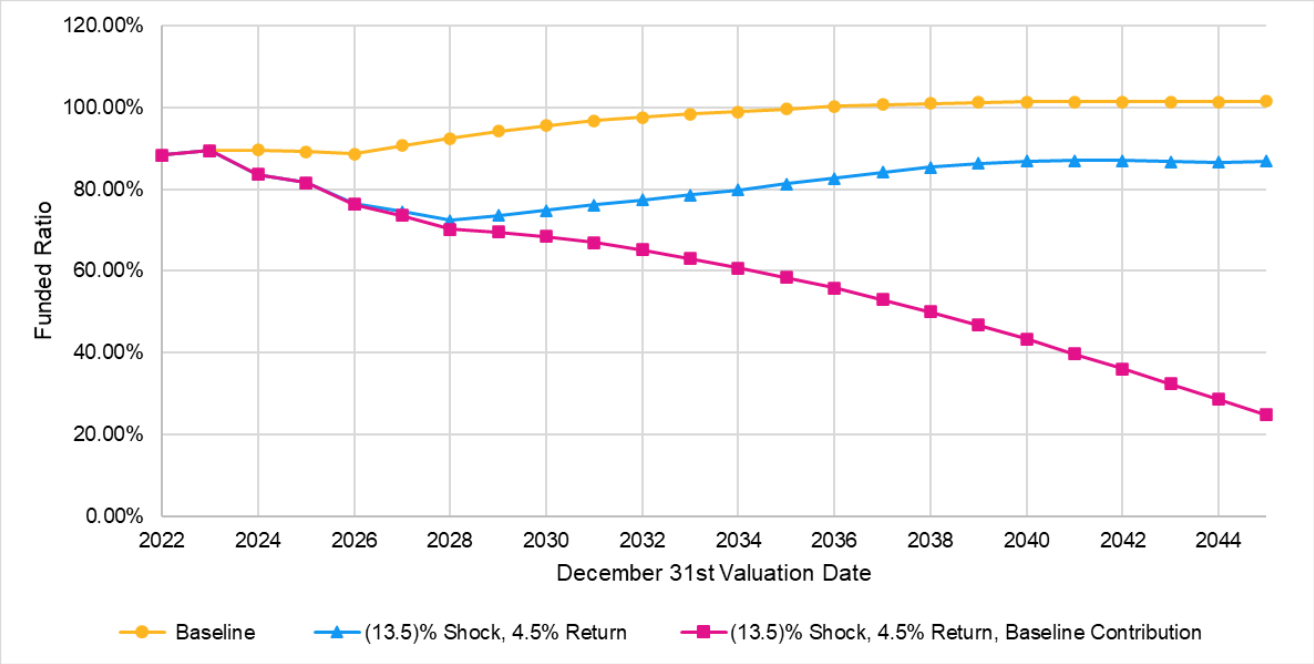
We note that the (13.5)% Shock, 4.5% Return, 15% of Revenue Cap scenario is not modeled separately in the graphs as the results are identical to the (13.5%) Shock, 4.5% Return scenario. We have included in the above, however, a line indicating the projected 15% of Revenue cap which would have been applied. As shown, the (13.5)% Shock, 4.5% Return scenario does not approach the revenue cap. However, the (13.5)% Shock, 4.5% Return with only Baseline contributions would exceed 15% of revenue projection beginning in FYE 2036.

Section 1: Stress Testing (continued)

Projected Funded Ratio

Below we model the funded ratio of scenarios required under G.S. 135-6(n1)(3) and G.S. 135-6(n1)(5); specifically, the Baseline scenario, the (13.5%) Shock, 4.5% Return scenario, and the **(**13.5%) Shock, 4.5% Return, Baseline Contribution scenario. The (13.5%) Shock, 4.5% Return, 15% of Revenue Cap scenario is not modeled separately in the graphs below, as the results are identical to the (13.5%) Shock, 4.5% Return scenario.

Graph 1f: Projected Funded Ratio ((13.5)% Shock, 4.5% Returns)



Projected funded ratios are shown over a 23-year projection period, from the December 31, 2022 valuation through the projected December 31, 2045 valuation. The Baseline scenario shows TSERS becoming fully funded by December 31, 2036. Under the (13.5%) Shock, 4.5% Return scenario, the funded percentage dips to about 72% funded by December 31, 2028 as the (13.5%) loss is fully recognized in plan assets, then climbs and remains relatively level close to 87% funded over the tail end of the projection period. Under the (13.5%) Shock, 4.5% Return, Baseline Contribution scenario, the funded ratio sharply declines as contributions fail to keep pace with asset losses. In particular, under this scenario contributions drop to the minimum contribution rate of 6% in FYE 2041 and therefore no contribution is allocated to the pay-down of the unfunded actuarial accrued liability.

Section 2: Stochastic Analysis

Stochastic Modeling

G.S. 135-6(n1)(2) requires an estimate of the range of likely employer contributions over 20 years based on analysis that simulates the volatility of annual investment returns above and below the expected rate, applying methodology determined by the actuary.

We have modeled this range of employer contributions by performing a stochastic analysis. The analysis produces 5,000 randomized trials of projected 30-year investment return paths. Each 30-year path is modeled in the projected asset values and compared to the deterministic liability projection using current actuarial assumptions and methods to produce hypothetical valuation results including the projected actuarially determined employer contributions (ADECs). Note that the projection assumptions defined in Section 1, other than the assumed future rates of investment return, also apply to the analysis within this section.

The simulated returns were calculated by Buck's Financial Risk Management (FRM) practice based on Buck's Capital Market Assumptions (CMAs) and the target allocation defined in the TSERS Investment Policy Statement (IPS). We have shown the mapping of asset classes in the IPS compared to Buck's Asset Class mapping in Appendix E.

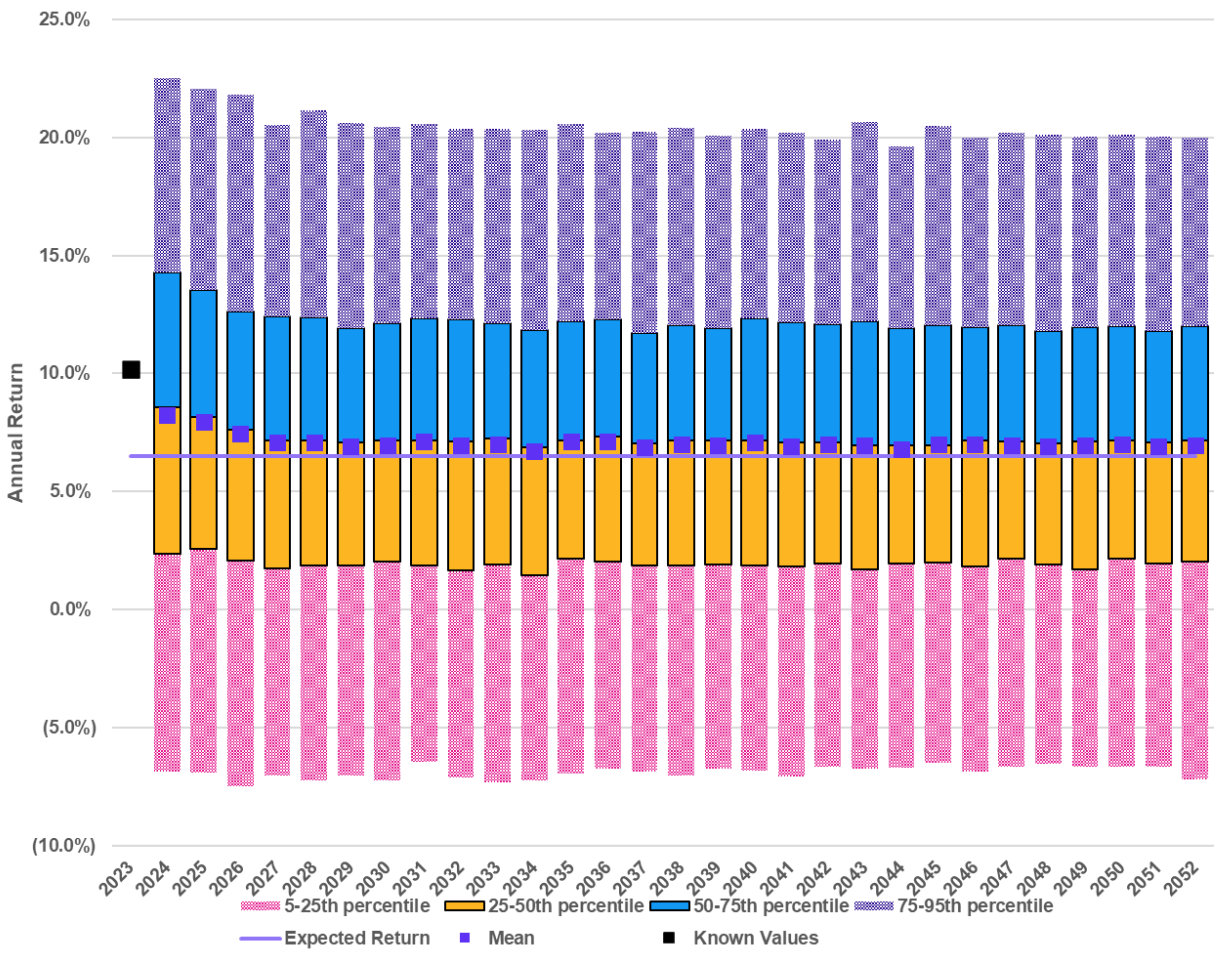
We review the results of the stochastic projection in this report not just for the resulting ADEC, but for the impact to the overall funded status of TSERS. We summarize and rank stochastic results for each metric. For purposes of this analysis, we define the range of likely results to be outcomes between the 25th and 75th percentiles. In effect, this means there is a 50% probability of achieving the results within the range of these percentiles under the 5,000 simulated investment return paths. We show supporting detail in Appendix E. Charts on the following pages show results between the 5th and 95th percentiles. Although not visible on the charts, outcomes below the 5th or above the 95th percentile are possible.

Section 2: Stochastic Analysis (continued)

Annual Returns

We have modeled the range of annual returns by performing a stochastic analysis. The analysis produces 5,000 randomized trials of projected 30-year investment return paths, based on the CMAs from Buck's FRM practice and the asset allocation described in the TSERS IPS. Below we show two graphs: Graph 2a, which shows the percentiles of each individual year's simulated investment return, and Graph 2b, which shows the percentiles of the compounded return of the simulated investment return path in that year.

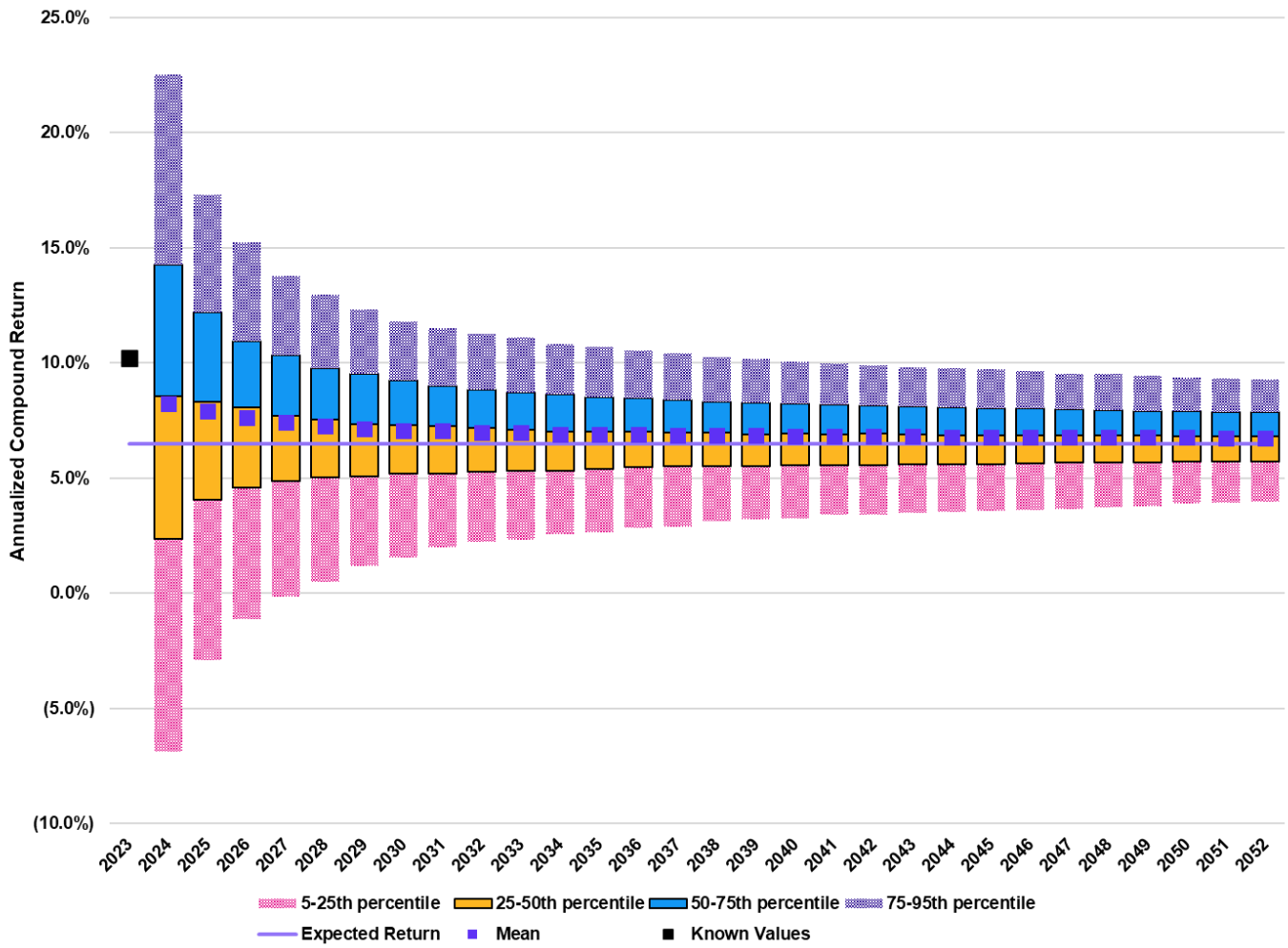
Graph 2a: Projected Annual Returns (Stochastic)



The projected annual returns in each year do not vary much from one year to the next, showing the strength of the diversification of the underlying portfolio. Over a 30-year period, the annual return ranges between 1.5% as the lowest single return at the 25th percentile (2034) and 14.3% as the highest single return at the 75th percentile (2024).

Section 2: Stochastic Analysis (continued)

Graph 2b: Projected Annualized Compound Returns (Stochastic)



At the 25th percentile, the annualized compound return over the 20-year projection period is 5.6% as of December 31, 2043. At the 75th percentile, the annualized compound return over the 20-year projection period is 8.1% as of December 31, 2043. Therefore, based on the range of likelihood we have defined, these projections indicate we expect that 50% of the time TSERS would achieve a compound return over 20 years between 5.6% and 8.1%. The 20-year mean annualized compound return as of December 31, 2043 is 6.8%.

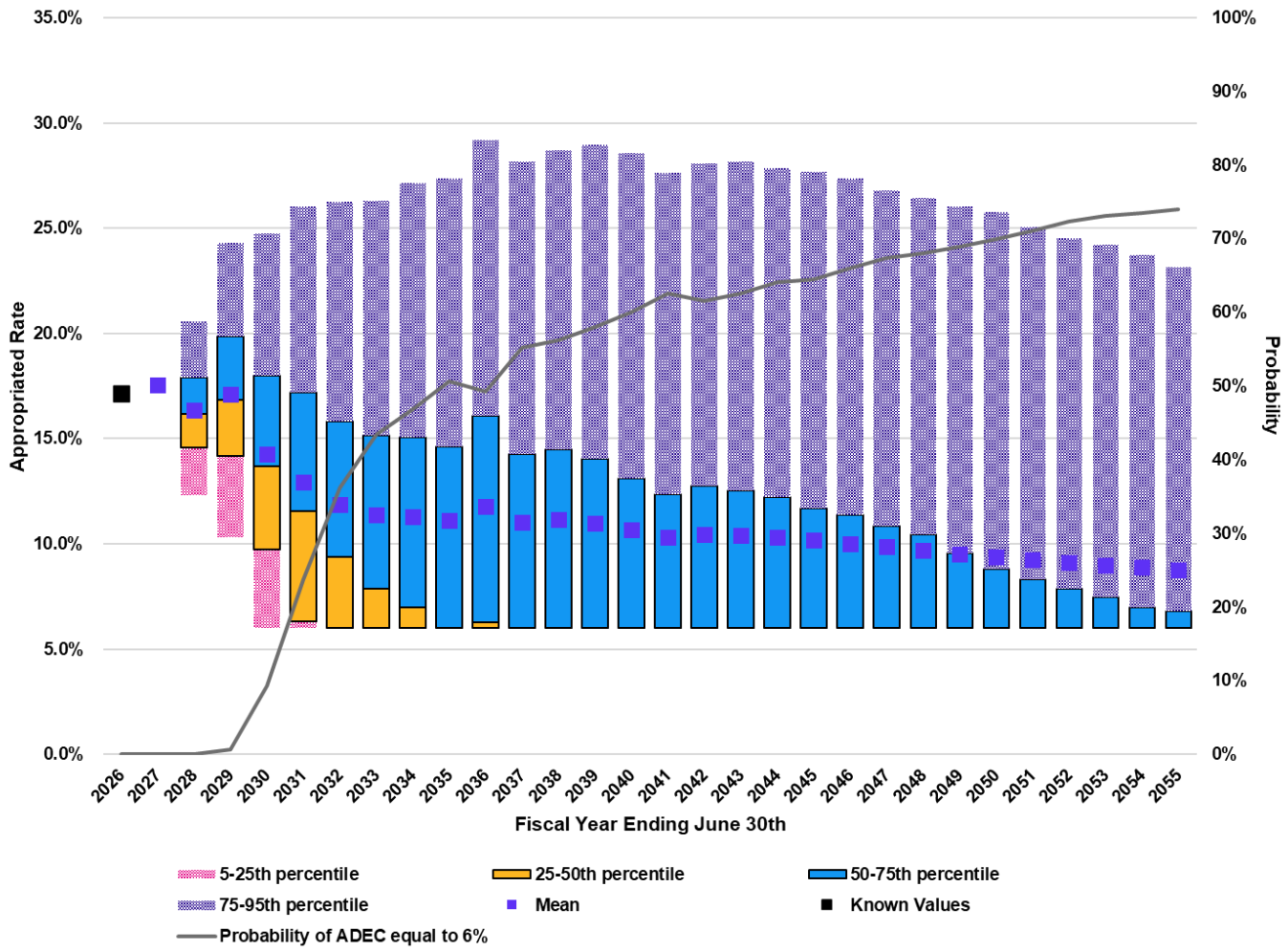
At the 25th percentile, the annualized compound return over the entire projection period is 5.7% as of December 31, 2052. At the 75th percentile, the annualized compound return over the entire projection period is 7.9% as of December 31, 2052. Therefore, based on the range of likelihood we have defined, these projections indicate we expect that 50% of the time TSERS would achieve a compound return between 5.7% and 7.9% as of December 31, 2052.

The mean annualized compound return over the projection period as of December 31, 2052 is 6.7%.

Comparing to Section 1, the 4.5% return scenario contemplated by G.S. 135-6(n1)(4) is between the 5th and 25th percentile of annualized compound returns over both a 20- and 30-year period. The 2.5% return scenario in Section 1 is lower than the 5th percentile of annualized compound returns over both a 20- and 30-year period.

Section 2: Stochastic Analysis (continued)

Graph 2c: Projected Actuarially Determined Employer Contributions (Stochastic)



The ECRSP policy continues through FYE 2027. Given the ECRSP design, little to no variability in ADECs occur under the simulated returns prior the expiration of the policy at FYE 2027. For FYE 2027, the ADEC is anticipated to be 17.49% for all scenarios between the 25th and 75th percentiles. Variability of ADECs based on the simulated returns begins in FYE 2028. For FYE 2028, the ADEC ranges between 14.58% at the 25th percentile and 17.91% at the 75th percentile. For FYE 2029, the ADEC further widens ranging between 14.16% at the 25th percentile and 19.85% at the 75th percentile.

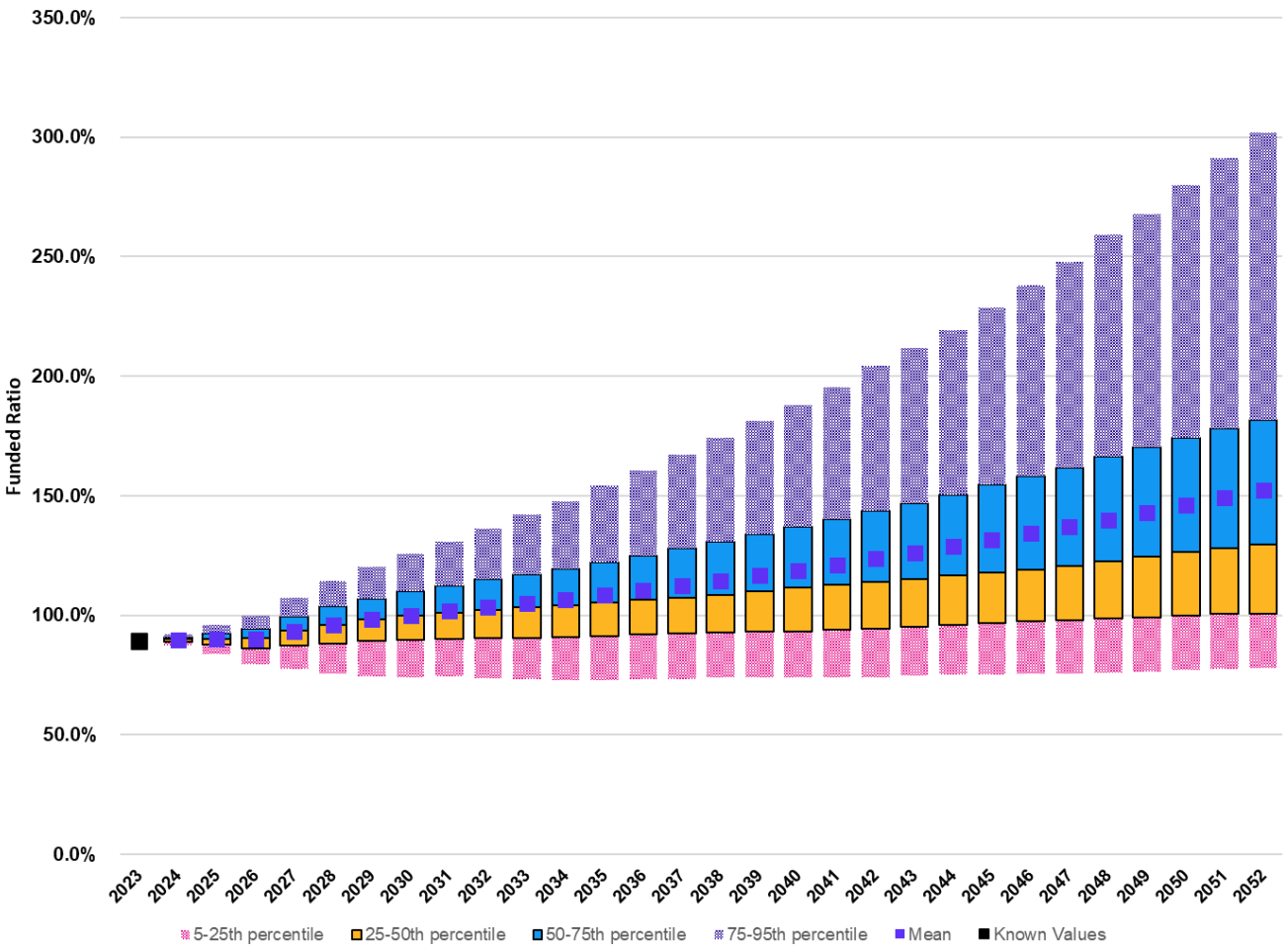
Over the next 20 years, the range of likely ADECs between the 25th and 75th percentile is 6.00% (occurring in FYE 2032 and later) and 19.85% (in FYE 2029). Given the strength of the funding policy, the range of likely ADEC's over the entire projection period continues to trend closer to the 6.00% of payroll minimum ADEC.

The floor of the employer contribution is set to 6.00% of payroll, which is the minimum employer contribution rate. This minimum is based on statute, which requires that the employer contribution rate not be less than the employee contribution rate. For FYE 2035 and all years FYE 2037 and later, the minimum employer contribution rate of 6.00% of payroll occurs in at least 50% of all simulated scenarios. We have shown in the graph above the probability of an ADEC reaching the minimum 6.00% of payroll. By the end of the projection period, the probability of the ADEC being 6.00% of payroll is 74.0%.

Even if we consider pessimistic scenarios at the 95th percentile, the ADEC is not projected to rise above 30% of payroll. At the 95th percentile for FYE 2036, the plan's ADEC is 29.16% of payroll.

Section 2: Stochastic Analysis (continued)

Graph 2d: Projected Funded Ratio (Stochastic)



At the 50th percentile for the simulated December 31, 2031, valuations, TSERS is projected to be 100% funded. At the end of the projection period as of December 31, 2052, the funded percentage ranges between 100.7% at the 25th percentile and 181.9% at the 75th percentile. Even at the 5th percentile as of December 31, 2052, TSERS is 77.9% funded. This demonstrates the strength of the funding policy in keeping pace by paying down the unfunded liability over a sufficiently short period.

Section 3: Sensitivity Analysis

Sensitivity analysis, or sensitivity testing, examines the effect on the plan of using different actuarial assumptions and methods. For purposes of this section, we use the same census data, plan provisions, actuarial assumptions and methods as used for the December 31, 2022 valuation of TSERS. However, we isolate one variable and change it to test the potential impact on the liability, normal cost and actuarially determined employer contribution (ADEC). G.S. 135-6(n1) requires a sensitivity analysis based on a one-year “snapshot” of key valuation results based on varying two key actuarial assumptions and methods: the discount rate and the amortization period.

Please see the following pages for (1) Discount Rate Sensitivity analysis and (2) Amortization Sensitivity analysis.

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Section 3: Sensitivity Analysis (continued)

Discount Rate Sensitivity

G.S. 135-6(n1)(6) requires a calculation of the estimated actuarial accrued liability, total plan normal cost (by tier, if applicable), and employer normal cost (by tier, if applicable) assuming (a) a discount rate equal to the assumed rate of return; and (b) a discount rate equal to the 10-year average of the yield of 30-year treasury notes. If the discount rate is not equal to the assumed rate of return, then the report should also provide a calculation of the actuarially accrued liability based upon a discount rate that is 2% and 4% above and below the long-term rate of return actually used by the Board of Trustees.

As of the most recent actuarial valuation as of December 31, 2022, the assumed annual investment return is 6.50%. The economic assumptions with respect to investment yield and inflation have been based upon a review of the existing portfolio structure as well as recent and anticipated experience. All assumptions represent an estimate of future experience. Since the discount rate is equal to the assumed rate of return of 6.50%, no analysis displaying a discount rate 2% and 4% lower than the long-term rate of return used by the Board of Trustees is required.

For purposes of satisfying this requirement, the first column of Table 3a below shows “Baseline” results for the most recent valuation as of December 31, 2022, as approved by the Board of Trustees in October 2023, including a discount rate of 6.50%. The second column shows “Discount Rate Sensitivity" results reflecting a discount rate of 2.75% based on the 10-year average of the yield of 30-year treasury notes as of December 31, 2022.

Table 3a: Discount Rate Sensitivity (Based on a 10-Year Average of the Yield on 30-year Treasury notes)

	Baseline	Discount Rate Sensitivity
Valuation Date	12/31/2022	12/31/2022
ADEC for Fiscal Year Ending	6/30/2025	6/30/2025
Discount Rate	6.50%	2.75%
Actuarial Accrued Liability	$ 96,675,255,859	$ 157,057,815,830
Employee Normal Cost	$ 971,038,277	$ 988,599,163
Employer Normal Cost	998,717,407	3,866,145,954
Total Normal Cost	$ 1,969,755,684	$ 4,854,745,117
Total ADEC (% of Pay)	15.90%	65.66%

Note that the ADEC shown above is calculated prior to reflection of the direct-rate smoothing of the change in the employer contribution rate due to the changes in assumptions and methods over a five-year period beginning with the December 31, 2020 valuation. Additionally, the ADEC shown is not adjusted for the Employer Contribution Rate Stabilization Policy (ECRSP).

Further note that under the current ECRSP policy adopted by the Board of Trustees on April 29, 2021, the recommended contribution may not be greater than a contribution determined using the same assumption used to calculate the ADEC based on the 30-year treasury bond yield as of the valuation date. As of 12/31/2022, the 30-year treasury bond yield was 3.97%, resulting in a maximum ADEC of 53.56%.

Section 3: Sensitivity Analysis (continued)

Amortization Sensitivity

G.S. 135-6(n1)(8) requires a calculation of the contribution rates based on an amortization period equal to the estimated average remaining service periods of employees covered by the contributions.

The ADEC is calculated as the sum of two items: (a) the normal cost as a percent of payroll and (b) the amortization of the unfunded or overfunded actuarial accrued liability (UAAL) as a percent of payroll. The current amortization method amortizes the unfunded or overfunded actuarial accrued liability on a closed, 12-year layered, level-dollar basis, with the first amortization base established for the contribution payable for the fiscal year ending 2012.

As of the December 31, 2022 valuation, 14 amortization bases have been established, each with a remaining balance as of the December 31, 2022, valuation date. The first column of Table 1b below shows "Baseline" results maintaining these 14 separate amortization balances. For comparison purposes, the second column shows the results based on a single 12-year amortization of the full UAAL established as of the December 31, 2022, valuation date. In other words, we have fully re-amortized the entire UAAL over a single period (effectively eliminating the previous amortization bases). The last column shows the sensitivity of results if the single amortization period was changed to nine years, which is equal to the estimated average remaining service period of TSERS active employees.

Table 3b: Amortization Over a Single Period

	Baseline	12-Year Amortization	9-Year Amortization
Valuation Date	12/31/2022	12/31/2022	12/31/2022
ADEC for Fiscal Year Ending	6/30/2025	6/30/2025	6/30/2025
Amortization Method	12 years layered	12 years full UAAL	9 years full UAAL
Normal Cost Rate Calculation			
(a) Normal Cost Rate	6.17%	6.17%	6.17%
(b) Expense Rate	0.10%	0.10%	0.10%
(c) Total Normal Cost Rate	6.27%	6.27%	6.27%
Accrued Liability Rate Calculation			
(d) Total Annual Amortization Payments	$ 1,747,345,937	$ 1,470,902,143	$ 1,802,953,550
(e) Projected Compensation	18,152,305,049	18,152,305,049	18,152,305,049
(f) Accrued Liability Rate: (d) / (e)	9.63%	8.10%	9.93%
Total ADEC (% of Pay) (c) + (f)	15.90%	14.37%	16.20%

Note that the ADEC shown above is calculated prior to reflection of the direct-rate smoothing of the change in the employer contribution rate due to the changes in assumptions and methods over a five-year period beginning with the December 31, 2020 valuation. Additionally, the ADEC shown is not adjusted for the Employer Contribution Rate Stabilization Policy (ECRSP).

The estimated remaining average future service of nine years is based on the actuarial assumptions for 297,802 active members and 4,491 disabled members included in the December 31, 2022 actuarial valuation of TSERS. The nine-year period is three years shorter than the current amortization period, resulting in an increase to the ADEC due to the accelerated payoff of the UAAL. It is worth noting that the current 12-year amortization period used in the TSERS valuation pays down the unfunded liability in a shorter period of time than the majority of Public Sector Retirement Systems in the United States. According to the April 2022 NASRA paper entitled "Overview of Public Pension Plan Amortization Polices," amongst public sector plans in the study using closed, layered amortization, the median liability-weighted amortization period is 18 years. According to actuarial standards of practice, a 12-year amortization period is reasonable and sufficient.

Section 4: Other Requirements of G.S. 135-6(n1)

We provide additional background information for key actuarial assumptions and valuation outputs used throughout the course of this report below.

Investment Return and Interest Rate Assumption

G.S. 135-6(n1)(1) requires a description of, and the process used to determine, the investment return assumption utilized by the Board of Trustees when determining the contribution rates. G.S. 135-6(n1)(9) requires a description of the interest assumption rate utilized by the Board of Trustees for reporting liabilities and the process used to determine that assumption.

As of the most recent actuarial valuation as of December 31, 2022, the assumed annual investment return is 6.50%. The assumed interest rate used for reporting liabilities as well as the calculation of the Actuarially Determined Employer Contribution (ADEC) is equal to the assumed annual investment return of 6.50%.

The process in selecting an investment return assumption typically focuses on forward-looking analyses. Such studies typically focus on expected returns over the next 10, 20 or 30 years based on capital market assumptions for each asset class in the most recent or current target asset allocation of the retirement system. For example, the DST Investment Management Division commissioned a study presented by Callan to the Investment Advisory Committee on February 23, 2022, which showed a range of likelihoods (ranging from 5% to 95%) over the next 10 or 30 years of achieving certain returns. In that study, the current 6.50% assumption was between 25% and 50% likely to occur over the next 10 and 30 years.

As another example, Section 2 of this study shows cumulative annual returns over the next 30 years based on Buck's Capital Market Assumptions (CMAs) and the current target allocations of TSERS. The results of that stochastic analysis show a 20-year and 30-year mean annualized compound return of 6.8% and 6.7%, respectively. Additionally, results show that achieving the 6.50% assumed annual investment return of 6.50% is more than 50% likely to occur.

Changing the investment return assumption and valuation interest rate can occur at any time. While the actuary reviews assumptions for reasonability at each annual valuation date, the formal review and recommendation to change assumptions is typically included in or coincides with the five-year experience study. Within the experience study, along with other demographic and economic assumptions, the actuary performs an analysis and assessment of the assumed annual investment return for TSERS and reviews other studies performed more recently, such as the types of studies mentioned above. The economic assumptions with respect to investment yield and inflation are based upon a review of the existing portfolio structure as well as recent and anticipated experience. All assumptions represent an estimate of future experience. As part of this assessment, the actuary makes a recommendation for the assumed annual investment return going forward, typically focusing on expected geometric returns over the next 20 or 30 years. The Board then decides whether to accept or modify the recommended investment return assumption.

While the valuation interest rate is typically set equal to the recommended investment return, the Board could consider using a valuation interest rate higher or lower than the assumed investment return. Selection of a higher valuation interest rate may be a short-term decision that coincides with "phasing into" the assumed investment return. This "direct-rate smoothing" approach would typically occur over a period of no longer than five years to help mitigate, or smooth, the impact on additional required funding. Selection of a lower valuation interest rate may be a decision to reduce the risk of not achieving the return by pre-funding to include a provision for adverse deviation in actual experience different than assumed.

Finally, it should be noted that some of the analysis or reports described above in review of the investment return assumption may include additional analysis to provide historical or comparative references. For example, studies often include survey results of the assumptions used by other states or retirement systems or historical investment returns achieved by the retirement system. Such information may provide good context but should not be used as a primary basis for setting the assumption.

The most recent experience study was performed as of December 31, 2019. The 6.50% assumption was recommended by the consulting actuary serving TSERS at the time and the recommendation was supported by RSD staff. The experience study was adopted by the TSERS Board of Trustees on January 28, 2021.

Section 4: Other Requirements of G.S. 135-6(n1) (continued)

The 6.50% assumed annual investment return for TSERS, in the actuaries' professional judgment, is reasonable for purposes of the measurement.

Actuarially Determined Employer Contribution (ADEC)

G.S. 135-6(n1)(7) requires a description of the amortization period for any unfunded liabilities utilized by the Board of Trustees when determining the contribution rates.

The ADEC is calculated as the sum of two items: (a) the normal cost as a percent of payroll and (b) the amortization of the unfunded or overfunded actuarial accrued liability as a percent of payroll. The current amortization method amortizes the unfunded or overfunded actuarial accrued liability on a closed, layered level-dollar basis, with the first amortization base established for the contribution payable for the fiscal year ending 2012.

It is worth noting that as of the December 31, 2022 valuation there is an adjustment to the ADEC to phase in the impact of changes in assumptions and methods over a 5-year period beginning with the fiscal year ending June 30, 2023 ADEC. The direct rate smoothing will be fully phased in upon the fiscal year ending June 30, 2027 ADEC.

Additionally, the funding policy adopted by the Board of Trustees on April 29, 2021 titled the Employer Contribution Rate Stabilization Policy (ECRSP) requires that recommended contributions be 0.35% of payroll greater than the recommended appropriation during the prior year, with the following bounds: (1) contributions may not be less than the actuarially determined employer contribution (ADEC); and (2) contributions may not be greater than a contribution determined using the same assumption used to calculate the ADEC based on the long-term treasury bond yield. A detailed summary of the ECRSP can be found in Appendix F.

In performing the sensitivity tests, we show the ADEC as a standard of comparison before direct-rate smoothing and the reflection of the ECRSP. In the stress tests showing deterministic forecasting and stochastic modeling, the ECRSP and direct rate smoothing is reflected (unless otherwise specified).

Actuarial Value of Assets

G.S. 135-6(n1)(10) requires a disclosure of the market value of the assets controlled by the Board of Trustees and an explanation of how the actuarial value assigned to those assets differs from the market value of those assets.

As of December 31, 2022, the market value of assets is $77,445,236,928 and the actuarial value of assets is $85,406,884,383. The actuarial value of assets is used to compare to the accrued liability of the plan and determine the funded ratio and unfunded actuarial accrued liability.

The actuarial value of assets is based upon a smoothed market value method. Under this method, asset returns in excess of or less than the expected return on market value of assets will be reflected in the actuarial value of assets over a five-year period. The Actuarial Value of Assets was reset to the market value of assets at December 31, 2014. The calculation of the Actuarial Value of Assets is based on the following formula:

$MV - 80\% \times G/(L)_1 - 60\% \times G/(L)_2 - 40\% \times G/(L)_3 - 20\% \times G/(L)_4$

MV = the market value of assets as of the valuation date

$G/(L)_i$ = the asset gain or (loss) for the i-th year preceding the valuation date

The actuarial value of assets cannot be less than 80% nor more than 120% of the market value of assets as of the valuation date.

Section 4: Other Requirements of G.S. 135-6(n1) (continued)

Changes in Assumptions

G.S. 135-6(n1) (11) requires an assessment of how the changes of assumptions adopted by the Board of Trustees in the experience review affect any of the other results in the report.

There are no changes of assumptions adopted by the Board of Trustees that would yet need to be addressed as of the date of this report. The last experience study review was prepared as of December 31, 2019 and adopted by the Board of Trustees on January 28, 2021. The next experience study review is to be performed in 2025 based on data from January 1, 2020 through December 31, 2024. Upon the next experience study, an assessment of the impact of any proposed changes may be needed to satisfy the requirement.

Appendix A: Stress Testing Requirements

Teachers' and State Employees' Retirement System Board of Trustees

G.S. 135-6 Retirement for Teachers, Etc.

(n1) Prior to undertaking each quinquennial actuarial experience review, as required by this section, the Board of Trustees shall provide the General Assembly and the Governor a report that includes all of the following, as these items apply to the Retirement System:

(1) A description of, and the process used to determine, the investment return assumption utilized by the Board of Trustees when determining the contribution rates. ***See Section 4.***

(2) An estimate of the range of likely employer contributions over 20 years based on analysis that simulates the volatility of annual investment returns above and below the expected rate, applying methodology determined by the actuary. ***See Section 2.***

(3) Projections of assets, liabilities, pension debt, service costs, employee contributions, employer contributions, net amortization, benefit payments, payroll, and funded ratio for the Retirement System for each of the next 30 years based upon the then-current actuarial assumptions, including the assumed rate of return. ***See Section 1 and Appendix D.***

(4) Projections of assets, liabilities, pension debt, service costs, employee contributions, employer contributions, net amortization, benefit payments, payroll, and funded ratio for the Retirement System assuming that investment returns are two and four percentage points lower than the assumed rate of return and that the State makes employer contributions meeting all of the following:

a. The contributions are based upon the then-current funding policy for the Retirement System.

b. The contributions are held constant at the levels calculated for subdivision (3) of this subsection.

c. The contributions never exceed fifteen percent (15%) of projected total revenue available for appropriation by the General Assembly.

See Section 1 and Appendix D.

(5) Estimates for assets, liabilities, pension debt, service costs, employee contributions, employer contributions, net amortization, benefit payments, payroll, and funded ratio for the Retirement System, if there is a one-year loss on planned investments of twenty percent (20%) followed by a 20-year period of investment returns two percentage points below plan assumptions, with the following assumptions regarding contributions:

a. The contributions are based upon the then-current funding policy for the Retirement System.

b. The contributions are held constant at the levels calculated for subdivision (3) of this subsection.

c. The contributions never exceed fifteen percent (15%) of projected total revenue available for appropriation by the General Assembly.

See Section 1 and Appendix D.

(6) The estimated actuarially accrued liability, the total plan normal cost for all benefit tiers if multiple tiers exist, and the employer normal cost for all benefit tiers if multiple tiers exist, calculated using all of the following:

a. A discount rate equal to the assumed rate of return. If the discount rate used by the Retirement System is different from the investment return assumption, then the report shall provide a calculation of actuarially accrued liability based upon a discount rate that is two percent (2%) and four percent (4%) above and below the long-term rate of return actually used by the Board of Trustees.

Appendix A: Stress Testing Requirements (continued)

G.S. 135-6 Retirement for Teachers, Etc.

b. The 10-year average of the yield of 30-year treasury notes.

See Section 3.

(7) A description of the amortization period for any unfunded liabilities utilized by the Board of Trustees when determining the contribution rates. ***See Section 4.***

(8) A calculation of the contribution rates based on an amortization period equal to the estimated average remaining service periods of employees covered by the contributions. ***See Section 3.***

(9) A description of the interest assumption rate utilized by the Board of Trustees for reporting liabilities and the process used to determine that assumption. ***See Section 4.***

(10) The market value of the assets controlled by the Board of Trustees and an explanation of how the actuarial value assigned to those assets differs from the market value of those assets. ***See Section 4.***

(11) An assessment of how the changes of assumptions adopted by the Board of Trustees in the experience review affect any of the other results in the report. ***See Section 4.***

(12) Any additional information deemed useful by the Board of Trustees or the Investment Advisory Committee under G.S. 147-69.2 to evaluate or adjust the investment policy statement or to evaluate adherence to or risk associated with statutory constraints on investments. ***Commentary added throughout report.***

(13) Any additional information deemed useful by the Board to evaluate current or prospective funding or contribution policies. ***Commentary added throughout report.***

Appendix B: Summary of Main Benefit and Contribution Provisions

A summary of the main benefit provisions of the Retirement System and of the sources of revenue from which benefits are paid is presented in the following digest. Items in parentheses in the text are the provisions applicable to law enforcement officers.

Average final compensation

The average annual compensation during the four consecutive years of membership service that afford the highest such average.

Membership service

Service represented by regular contributions.

Creditable service

Membership service, which may also include certain noncontributory or purchased service.

Benefits

Unreduced Retirement Allowance

Condition for Allowance

An unreduced retirement allowance is payable to any member who retires from service:

a) after age 65 (55) and completion of five years of creditable service.

b) after age 60 and completion of 25 years of creditable service (not applicable to law enforcement officers); or

c) after completion of 30 years of creditable service.

Amount of Allowance

1.82% of average final compensation multiplied by the number of years of creditable service.

In no event will a member whose creditable service commenced on or before June 30, 1963 receive a smaller retirement allowance than he would have received under the benefit provisions of the system in effect on that date.

Reduced Retirement Allowance

Condition for Allowance

A reduced retirement allowance is payable to any member who retires from service prior to becoming eligible for an unreduced retirement allowance but after age 60 and completion of five years of membership service (age 55 and five years of creditable service).

Appendix B: Summary of Main Benefit and Contribution Provisions (continued)

Amount of Allowance

The member's reduced retirement allowance is equal to 1.82% of average final compensation multiplied by the number of years of creditable service at date of retirement reduced by 1/4 of 1% for each month by which the member's age at retirement is less than age 65.

In no event will a member whose creditable service commenced on or before June 30, 1963 receive a smaller retirement allowance than he would have received under the benefit provisions of the system in effect on that date.

OR

Condition for Allowance

A reduced retirement allowance is payable to any member who retires from service after age 50 and completion of 20 (15) years of creditable service but prior to becoming eligible for a reduced or unreduced retirement allowance.

Amount of Allowance

The member's reduced retirement allowance is equal to 1.82% of average final compensation multiplied by the number of years of creditable service at date of retirement reduced by the lesser of:

(i) 5/12 (1/3) of 1% for each month by which his or her age is less than 60 (55), plus, if the member is not a law enforcement officer, 1/4 of 1% for each month by which his or her age is less than 65.

(ii) 5% times the difference between 30 years and his or her creditable service at retirement.

OR

Condition for Allowance

A reduced retirement allowance is payable to any law enforcement officer who retires from service at any age with 25 years of service (15 years as an officer), but prior to becoming eligible for a reduced or unreduced retirement allowance.

Amount of Allowance

The member's reduced retirement allowance is equal to 1.82% of average final compensation multiplied by the number of years of creditable service at date of retirement reduced by the lesser of:

(i) 1/3 of 1% for each month by which his or her age is less than 55,

(ii) 5% times the difference between 30 years and creditable service at retirement plus 4% times the difference between age 50 and the member's age at retirement.

Deferred Retirement Allowance

Any member who separates from service after completing five or more years of membership service prior to becoming eligible for an unreduced or reduced retirement allowance and who leaves his or her total accumulated contributions in the system may receive a deferred retirement allowance, beginning at age 60 (55), computed in the same way as a reduced retirement allowance, or, if the member has 20 (15) or more years of service, at age 50 computed in the same way as a reduced service retirement allowance, on the basis of creditable service and compensation to the date of separation.

Appendix B: Summary of Main Benefit and Contribution Provisions (continued)

Return of Contributions

Upon the withdrawal of a member without a retirement allowance and upon his or her request, the member's contributions are returned, together with accumulated regular interest.

Upon the death of a member before retirement, his or her contributions, together with the full accumulated regular interest thereon, are paid to his or her estate or to person(s) designated by the member unless the designated beneficiary, if eligible, elects the survivor's alternate benefit described below.

The current interest rate on member contributions is 4%.

Survivor's Alternate Benefit

Upon the death of a member in service who has met conditions (a) or (b) below, his or her designated beneficiary may elect to receive a benefit equal to that which would have been payable under the provisions of Option 2 had the member retired on the first day of the month following his or her death and elected such option, in lieu of the member's accumulated contributions, provided the member had not instructed the Board of Trustees in writing that he or she did not wish the alternate benefit to apply.

age 60 (55) and completion five years of membership (creditable) service; or

completion of 20 years of creditable service.

Members receiving a benefit from the Disability Income Plan are eligible for this benefit.

Death After Retirement

Upon the death of a beneficiary who did not retire under an effective election of Option 2, 3, 5 or 6, an amount equal to the excess if any, of the member's accumulated contributions at retirement over the retirement allowance payments received is paid to a designated person or to the beneficiary's estate.

Upon the death of the survivor of a beneficiary who retired under an effective election of Option 2 or Option 3, an Upon the death of the survivor of a beneficiary who retired under an effective election of Option 2, 3, 5 or 6, an amount equal to the excess, if any, of the beneficiary's accumulated contributions at retirement over the total retirement allowance payments received is paid to such other person designated by the beneficiary or to the beneficiary's estate.

Upon the death of a beneficiary, a benefit may be provided by the Retirees' Contributory Death Benefit Plan.

Other Death Benefits

Upon the death of a member in service, other benefits may be provided by the Death Benefit Plan or Separate Insurance Benefit Plan for Law Enforcement Officers.

Optional Arrangements at Retirement

In lieu of the full retirement allowance, any member may elect to receive a reduced retirement allowance equal in value to the full allowance, with the provision that:

Appendix B: Summary of Main Benefit and Contribution Provisions (continued)

Option 1 A member retiring prior to July 1, 1993, may elect that at his or her or her death within 10 years from his or her retirement date, an amount equal to his or her accumulated contributions at retirement, less 1/120 for each month he has received a retirement allowance, is paid to his or her estate, or to a person(s) designated by the member, or

Option 2 At the death of the member his or her allowance shall be continued throughout the life of such other person as the member shall have designated at the time of his or her retirement, or

Option 3 At the death of the member one-half of his or her allowance shall be continued throughout the life of such other person as the member shall have designated at the time of his or her retirement.

Option 4 A member may elect to receive a retirement allowance in such an amount that, together with his or her Social Security benefit, he or she will receive approximately the same income per annum before and after the earliest age at which he or she becomes eligible to receive the Social Security benefit.

Option 5 A member retiring prior to July 1, 1993 may elect to receive a reduced retirement allowance under the provisions of Option 2 or Option 3 in conjunction with the provisions of Option 1.

Option 6 A member may elect either Option 2 or Option 3 with the added provision that in the event the designated beneficiary predeceases the member, the retirement allowance payable to the member after the designated beneficiary's death shall be equal to the retirement allowance which would have been payable had the member not elected the option.

Post-Retirement Increases in Allowances

Future increases in allowances may be granted at the discretion of the State.

Service Reciprocity

For the purpose of determining eligibility for a deferred, reduced or unreduced service retirement allowance, the membership and creditable service of a member shall include such prior service earned as a member of the Local Governmental Employees' Retirement System (LGERS), the Consolidated Judicial Retirement System (CJRS), or the Legislative Retirement System (LRS). In addition, if the member's accumulated contributions and reserves are transferred from the prior System to this System, the creditable service earned as a member of the prior System may be included for purposes of determining the amount of benefits payable under this System.

Military Service

For periods of active duty in the United States military may be counted as creditable service if the member was an employee upon entering the military and returned to employment within two years of discharge or for a period of 10 additional years.

Appendix B: Summary of Main Benefit and Contribution Provisions (continued)

Service Purchases

Additional creditable service may include service that the member purchased to restore a period of service for which the member:

1) received a refund of contributions,
2) had a leave of absence for educational purposes, extended illness or parental or maternity reasons,
3) had full-time temporary or part-time local or State government employment,
4) was in a probationary or waiting period with a unit of the LGERS,
5) had a leave of absence under Workers' Compensation,
6) performed service with a unit of local government not covered by LGERS,
7) performed service with the federal government or to another state not covered by any other retirement system,
8) performed service with a public community service entity funded entirely with federal funds,
9) performed service as a member of the General Assembly,
10) performed service as a member of a charter school not participating in the system,
11) was employed by The University of North Carolina and participated in the Optional Retirement Program but not eligible to receive any benefits from that program, or
12) performed service which was omitted by reason of error.

Unused Sick Leave

Unused sick leave counts as creditable service at retirement. Sick leave which was converted from unused vacation leave is also creditable. One month of credit is allowed for each 20 days of unused sick leave, plus an additional month for any part of 20 days left over.

Transfer of Defined Contribution Balances (Special Retirement Allowances)

A member may make a one-time election to transfer any portion of their eligible accumulated contributions to this plan on or after retirement. Eligible accumulated contributions are those from the Supplemental Retirement Income Plan or Public Employee Deferred Compensation Plan, not including Roth after-tax contributions. A member who became a member of the Supplemental Retirement Income Plan prior to retirement and who remains a member of the Supplemental Retirement Income Plan may also make a one-time election to transfer eligible balances, not including any Roth after-tax contributions, from any of the following plans to the Supplemental Retirement Income Plan, subject to the applicable requirements of the Supplemental Retirement Income Plan, and then through the Supplemental Retirement Income Plan to this Retirement System:

1) A plan participating in the North Carolina Public School Teachers' and Professional Educators' Investment Plan.
2) A plan described in section 403(b) of the Internal Revenue Code.
3) A plan described in section 457(b) of the Internal Revenue Code that is maintained by a state, political subdivision of a state, or any agency or instrumentality of a state or political subdivision of a state.

Appendix B: Summary of Main Benefit and Contribution Provisions (continued)

4) An individual retirement account or annuity described in Section 408(a) or 408(b) of the Internal Revenue Code that is eligible to be rolled over and would otherwise be includible in gross income.

5) A tax-qualified plan described in section 401(a) or 403(a) of the Internal Revenue Code.

The member may elect to convert the accumulated contributions to a life annuity with or without annual increases equal to the annual increase in the U.S. Consumer Price Index. Any ad-hoc COLA increases granted will not apply to benefits under this section. A member may elect Options 2, 3, or 6 under the Plan and may also elect either a guaranteed number of months of payments or a guarantee of total payments at least equal to the amount of contributions transferred to the Plan. In addition, any transfer may be paid in whole or in part with employer contributions paid directly to the Retirement System at the time of transfer.

Contributions

Member Contributions

Each member contributes 6% of his or her compensation.

Employer Contributions

Employers make annual contributions consisting of a normal contribution and an accrued liability contribution. The normal contribution covers the liability on account of current service and is determined by the actuary after each valuation.

The accrued liability contribution covers the past service liability that exceeds the actuarial value of assets.

The minimum total employer contribution rate is 6.00%.

Appendix C: Actuarial Assumptions and Methods

Assumptions are based on the experience investigation prepared as of December 31, 2019 and adopted by the Board of Trustees on January 28, 2021 for use beginning with the December 31, 2020 annual actuarial valuation.

Interest Rate

6.50% per annum, compounded annually.

Price Inflation

2.50% per annum, compounded annually.

Real Wage Growth

0.75% per annum.

Payroll Growth

3.25% per annum.

Separations From Active Service

Representative values of the assumed rates of separation from active service are as follows:

Rates of Withdrawal

Up to five years of membership								
	General Employees		Teachers, Librarians, and Counselors		Law Enforcement Officers		Other Education	
Service	Male	Female	Male	Female	Male	Female	Male	Female
0	0.0900	0.0900	0.0500	0.0350	0.0350	0.0350	0.0900	0.0700
1	0.1700	0.1750	0.1750	0.1650	0.0925	0.0925	0.1900	0.1750
2	0.1500	0.1575	0.1550	0.1550	0.0925	0.0925	0.1700	0.1550
3	0.1250	0.1400	0.1450	0.1375	0.0950	0.0950	0.1300	0.1250
4	0.1100	0.1150	0.1150	0.1150	0.0800	0.0800	0.1100	0.1075

Appendix C: Actuarial Assumptions and Methods (continued)

After five years of membership								
	General Employees		Teachers, Librarians, and Counselors		Law Enforcement Officers		Other Education	
Service	Male	Female	Male	Female	Male	Female	Male	Female
25	0.2500	0.2500	0.3000	0.3500	0.0750	0.0750	0.2500	0.2500
30	0.1250	0.1200	0.0900	0.1000	0.0750	0.0750	0.1000	0.1500
35	0.0750	0.1000	0.0600	0.0575	0.0350	0.0350	0.0550	0.0750
40	0.0500	0.0575	0.0475	0.0400	0.0250	0.0250	0.0500	0.0650
45	0.0400	0.0400	0.0375	0.0350	0.0200	0.0200	0.0500	0.0475
50	0.0400	0.0400	0.0425	0.0400	0.0200	0.0200	0.0500	0.0450
55	0.0400	0.0400	0.0425	0.0400			0.0400	0.0350
60	0.0400	0.0400	0.0425	0.0400			0.0400	0.0350

Annual Rates of Mortality for Employees

(Base rates using Pub-2010 amount weighted)

	General Employees		Teachers, Librarians, and Counselors		Law Enforcement Officers		Other Education	
Service	Male	Female	Male	Female	Male	Female	Male	Female
25	0.00028	0.00009	0.00016	0.00009	0.00037	0.00020	0.00028	0.00009
30	0.00036	0.00015	0.00022	0.00014	0.00041	0.00027	0.00036	0.00015
35	0.00047	0.00023	0.00030	0.00020	0.00047	0.00036	0.00047	0.00023
40	0.00066	0.00036	0.00042	0.00031	0.00059	0.00049	0.00066	0.00036
45	0.00098	0.00056	0.00067	0.00048	0.00082	0.00067	0.00098	0.00056
50	0.00149	0.00083	0.00111	0.00073	0.00120	0.00091	0.00149	0.00083
55	0.00219	0.00123	0.00172	0.00107	0.00175	0.00123	0.00219	0.00123
60	0.00319	0.00186	0.00264	0.00161	0.00264	0.00168	0.00319	0.00186
65	0.00468	0.00296	0.00435	0.00270	0.00410	0.00228	0.00468	0.00296
70	0.00703	0.00489	0.00709	0.00485	0.00766	0.00454	0.00703	0.00489
74	0.01001	0.00731	0.00993	0.00809	0.01263	0.00787	0.01001	0.00731

Appendix C: Actuarial Assumptions and Methods (continued)

Annual Rates of Disability

Active Members with 5 or more years of service as of January 1, 1988

	General Employees		Teachers, Librarians, and Counselors		Law Enforcement Officers		Other Education	
Service	Male	Female	Male	Female	Male	Female	Male	Female
25	0.00020	0.00024	0.00006	0.00018	0.00330	0.00330	0.00020	0.00024
30	0.00040	0.00040	0.00012	0.00026	0.00430	0.00430	0.00040	0.00040
35	0.00100	0.00100	0.00030	0.00060	0.00600	0.00600	0.00100	0.00100
40	0.00300	0.00180	0.00066	0.00102	0.00790	0.00790	0.00300	0.00180
45	0.00500	0.00320	0.00138	0.00178	0.01100	0.01100	0.00500	0.00320
50	0.00840	0.00500	0.00234	0.00316	0.01760	0.01760	0.00840	0.00500
55	0.01440	0.00880	0.00474	0.00554	0.03070	0.03070	0.01440	0.00880
60	0.02400	0.01380	0.00768	0.01020	0.06010	0.06010	0.02400	0.01380
64	0.03160	0.01780	0.01124	0.01392	0.11210	0.11210	0.03160	0.01780

Retirements

Representative values of the assumed rates of retirement from active service are as follows:

Annual Rates of Retirement

General Employees

Male	Service						
Age	5	10	15	20	25	30	35
50				0.030	0.040	0.600	0.600
55				0.030	0.040	0.350	0.350
60	0.090	0.070	0.070	0.100	0.225	0.270	0.270
65	0.180	0.250	0.250	0.300	0.400	0.300	0.300
70	0.180	0.250	0.225	0.225	0.250	0.300	0.300
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Appendix C: Actuarial Assumptions and Methods (continued)

Female	Service						
Age	5	10	15	20	25	30	35
50				0.035	0.040	0.400	0.400
55				0.040	0.040	0.250	0.250
60	0.070	0.080	0.090	0.095	0.200	0.250	0.250
65	0.200	0.250	0.300	0.300	0.350	0.300	0.300
70	0.150	0.200	0.225	0.250	0.350	0.300	0.300
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Teachers, Librarians, and Counselors

Male	Service						
Age	5	10	15	20	25	30	35
50				0.030	0.030	0.700	0.700
55				0.045	0.030	0.450	0.450
60	0.085	0.080	0.100	0.100	0.300	0.300	0.300
65	0.175	0.225	0.250	0.325	0.400	0.250	0.250
70	0.175	0.225	0.250	0.250	0.250	0.300	0.300
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Female	Service						
Age	5	10	15	20	25	30	35
50				0.050	0.045	0.750	0.750
55				0.050	0.045	0.375	0.375
60	0.080	0.100	0.100	0.130	0.250	0.375	0.375
65	0.250	0.300	0.250	0.350	0.475	0.400	0.400
70	0.225	0.250	0.300	0.300	0.300	0.325	0.325
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Appendix C: Actuarial Assumptions and Methods (continued)

Law Enforcement Officers

	Service						
Age	5	10	15	20	25	30	35
50			0.040	0.050	0.050	0.800	0.800
55	0.200	0.200	0.350	0.350	0.500	0.650	0.650
60	0.100	0.200	0.125	0.250	0.250	0.500	0.500
65	0.150	0.450	0.250	0.250	0.250	0.500	0.500
70	0.250	0.150	0.250	0.250	0.250	0.500	0.500
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Other Education

Male	Service						
Age	5	10	15	20	25	30	35
50				0.035	0.045	0.500	0.500
55				0.040	0.050	0.300	0.300
60	0.080	0.070	0.100	0.090	0.200	0.275	0.275
65	0.100	0.250	0.250	0.300	0.275	0.275	0.275
70	0.100	0.250	0.250	0.225	0.300	0.350	0.350
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Female	Service						
Age	5	10	15	20	25	30	35
50				0.045	0.045	0.500	0.500
55				0.045	0.060	0.300	0.300
60	0.070	0.090	0.100	0.100	0.300	0.300	0.300
65	0.175	0.250	0.250	0.300	0.350	0.350	0.350
70	0.150	0.200	0.225	0.200	0.275	0.350	0.350
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Appendix C: Actuarial Assumptions and Methods (continued)

Salary Merit Increases

Total assumed salary increases are these merit rates combined with the wage inflation assumption of 3.25% (2.50% price inflation plus 0.75% real wage growth). Representative values of the assumed annual rates of salary merit increases are as follows:

Service	General Employees	Teachers, Librarians and Counselors	Law Enforcement Officers	Other Education
0	3.00%	4.05%	4.80%	4.25%
5	1.80%	2.87%	3.10%	2.65%
10	1.10%	2.04%	2.00%	1.85%
15	0.60%	1.13%	0.80%	1.33%
20	0.50%	0.00%	0.80%	0.83%
25	0.40%	0.00%	0.80%	0.33%
30	0.00%	0.00%	0.40%	0.00%
>=35	0.00%	0.00%	0.00%	0.00%

Post-Retirement Mortality

Representative values of the assumed post-retirement mortality rates as of 2010 prior to any mortality improvements are as follows:

Annual Rates of Post-Retirement Mortality (members healthy at retirement)

	General Employees		Teachers, Librarians, and Counselors		Law Enforcement Officers		Other Education	
Service	Male	Female	Male	Female	Male	Female	Male	Female
55	0.00455	0.00272	0.00335	0.00266	0.00327	0.00279	0.00455	0.00272
60	0.00649	0.00365	0.00471	0.00344	0.00549	0.00482	0.00649	0.00365
65	0.00963	0.00582	0.00672	0.00456	0.00957	0.00832	0.00963	0.00582
70	0.01610	0.01010	0.01183	0.00789	0.01711	0.01438	0.01610	0.01010
75	0.02818	0.01789	0.02187	0.01499	0.03085	0.02483	0.02818	0.01789
80	0.05037	0.03360	0.04030	0.02895	0.05571	0.04287	0.05037	0.03360

Appendix C: Actuarial Assumptions and Methods (continued)

Annual Rates of Post-Retirement Mortality (survivor and members disabled at retirement)

	Contingent Survivors of Deceased members		Members Disabled at Retirement			
	All Survivors		Non - Law Enforcement Officers		Law Enforcement Officers	
Age	Male	Female	Male	Female	Male	Female
55	0.01147	0.00742	0.02355	0.01692	0.01818	0.01587
60	0.01450	0.00975	0.02785	0.01914	0.02280	0.01833
65	0.02086	0.01332	0.03524	0.02178	0.02677	0.02051
70	0.03221	0.01931	0.04599	0.02706	0.03353	0.02450
75	0.04971	0.02946	0.06347	0.03718	0.04344	0.03239
80	0.07802	0.04698	0.09259	0.05517	0.05921	0.04678

Mortality Assumption

All mortality rates use Pub-2010 amount-weighted tables.

Mortality Projection

All mortality rates are projected from 2010 using generational improvement with Scale MP-2019.

Appendix C: Actuarial Assumptions and Methods (continued)

Deaths After Retirement (General Employees and Other Education)

Mortality rates are based on the General Mortality Table for Retirees. Rates for male members are multiplied by 105.5% at all ages. Rates for female members are multiplied by 95% for ages under 76, increased by 1% for each age up to age 90 and by 110% for all ages greater than 89. Because the retiree tables have no rates prior to age 50, the General Mortality Table for Employees is used for ages less than 50.

Deaths After Retirement (Teachers)

Mortality rates are based on the Below-median Teachers Mortality Table for Retirees. Rates for male members are multiplied by 96% for ages under 83, increased by 2% for each age up to 87 and by 106% for all ages greater than 86. Rates for female members are multiplied by 101% for age 81, increased by 1% for each age up to 85, and by 105% for all ages greater than 84. Because the retiree tables have no rates prior to age 55, the Below-median Teachers Mortality Table for Employees is used for ages less than 55.

Deaths After Retirement (Law Enforcement Officers)

Mortality rates are based on the Safety Mortality Table for Retirees. Rates for all members are multiplied by 97% and Set Forward by 1 year. Because the retiree tables have no rates prior to age 45, the Safety Mortality Table for Employees is used for ages less than 45.

Deaths After Retirement (Survivors of Deceased Members)

Mortality rates are based on the Below- median Teachers Mortality Table for Contingent Survivors. Rates for male members are Set Forward 3 years. Rate for female members are Set Forward 1 year. Because the contingent survivor tables have no rates prior to age 45, the Below-median Teachers Mortality Table for Employees is used for ages less than 45.

Deaths After Retirement (Disabled Members at Retirement)

Mortality rates are based on the General Mortality Table for Disabled Retirees. Rates for male members not in Law Enforcement are Set Forward 3 years, while male members in Law Enforcement are Set Back 3 years. Rates for female members not in Law Enforcement are Set Back 1 year, while female members in Law Enforcement are Set Back 3 years.

Deaths Prior to Retirement

Mortality rates for the general and other education groups are based on the General Mortality Table for Employees. Mortality rates for teachers are based on the Teachers Mortality Table for Employees. Mortality rates for law enforcement officers are based on the Safety Mortality Table for Employees.

Timing of Assumptions

All withdrawals, deaths, disabilities, retirements and salary increases are assumed to occur July 1 of each year. The timing of retirement changes from mid-year to beginning of year at and after the 100% retirement age.

Appendix C: Actuarial Assumptions and Methods (continued)

Leave Conversions

Sick leave can be converted to increase creditable service and used to meet the eligibility requirements for retirement. Unused vacation leave can be converted to increase creditable service or compensation but does not add to the eligibility service. The assumed impact of these conversions is shown in the table below.

		General Employees		Teachers, Librarians and Counselors		Law Enforcement Officers		Other Education	
		Male	Female	Male	Female	Male	Female	Male	Female
Increase in AFC (percentage) – Unused Vacation Leave		2.50%	2.50%	2.00%	2.00%	1.75%	1.75%	1.75%	1.75%
Increase in Service (yrs) – Unused Sick Leave	Credited	0.85	0.55	0.90	0.70	1.50	1.50	1.05	0.80
	Eligibility	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Liability for Inactive Members

For inactive members with five or more years of service without actual deferred benefit amounts, a deferred benefit amount is estimated based on available data and contribution balances projecting backwards assuming 4% salary growth and 4% interest on contribution balances where necessary. For inactive members with less than five years of service the liability is equal to the member's accumulated contributions.

Administrative Expenses

0.10% of payroll added to the normal cost rate.

Marriage Assumption

100% married with male spouses three years older than female spouses.

Missing Gender Code

For members reported on the data without a gender code, we use the prior year's code where available or assign a code based on inspection.

Reported Compensation

Calendar year compensation as furnished by the system's office.

Valuation Compensation

Reported compensation adjusted to reflect the assumed rate of pay as of the valuation date and the probability of decrement during the year.

Compensation for members receiving DIPNC benefits

Compensation earned as of the disability benefit effective date is increased by inflation to the valuation date.

Compensation Limits

No compensation limits are applied.

Appendix C: Actuarial Assumptions and Methods (continued)

Actuarial Cost Method

Entry age normal cost method. Entry age is established on an individual basis.

Normal Cost

Normal cost rate reflects the impact of new entrants during the year.

Amortization Period

12-year closed, level-dollar amount. The first amortization base was created for the contribution payable for fiscal year ending 2012.

Asset Valuation Method

Actuarial value, as developed in Table 10. The actuarial value of assets is based upon a smoothed market value method. Under this method, asset returns in excess of or less than the expected return on market value of assets will be reflected in the actuarial value of assets over a five-year period. The Actuarial Value of Assets was reset to the market value of assets at December 31, 2014. The calculation of the Actuarial Value of Assets is based on the following formula:

MV – 80% x G/(L)1 – 60% x G/(L)2 – 40% x G/(L)3 – 20% x G/(L)4

MV = the market value of assets as of the valuation date

G/(L)i = the asset gain or (loss) for the i-th year preceding the valuation date

Appendix D: Stress Testing Tables

G.S. 135-6(n1)(3) requires the projection of assets, liabilities, pension debt, service costs, employee contributions, employer contributions, net amortization, benefit payments, payroll, and funded ratio for the Retirement System for each of the next 30 years based upon the then-current actuarial assumptions, including the assumed rate of return. We have displayed this detail in tabular format in Tables D-1 and D-2, beginning with the December 31, 2022 valuation results which calculated the recommended contribution for fiscal year ending June 30, 2025.

Table D-1: Asset and Liability Projection

30-Year Baseline Projection (10.2% Return in 2023, 6.50% Return Thereafter)

Valuation Date	Market Value of Assets ($)	Actuarial Value of Assets ($)	Actuarial Liability ($)	Unfunded Accrued Liability ($)	Funded Ratio
12/31/2022	77,445,237	85,406,884	96,675,256	11,268,372	88.34%
12/31/2023	83,465,865	88,389,692	98,885,868	10,496,176	89.39%
12/31/2024	87,064,962	90,739,984	101,306,594	10,566,610	89.57%
12/31/2025	90,719,280	92,531,264	103,726,360	11,195,096	89.21%
12/31/2026	94,538,766	93,972,033	106,135,681	12,163,648	88.54%
12/31/2027	98,442,584	98,442,584	108,529,663	10,087,079	90.71%
12/31/2028	102,526,026	102,526,026	110,898,989	8,372,963	92.45%
12/31/2029	106,601,775	106,601,775	113,231,946	6,630,171	94.14%
12/31/2030	110,371,876	110,371,876	115,529,674	5,157,798	95.54%
12/31/2031	113,875,368	113,875,368	117,793,573	3,918,205	96.67%
12/31/2032	117,107,478	117,107,478	120,023,691	2,916,213	97.57%
12/31/2033	120,306,659	120,306,659	122,359,776	2,053,117	98.32%
12/31/2034	123,392,098	123,392,098	124,682,080	1,289,982	98.97%
12/31/2035	126,536,344	126,536,344	126,997,156	460,812	99.64%
12/31/2036	129,614,719	129,614,719	129,318,814	(295,905)	100.23%
12/31/2037	132,495,296	132,495,296	131,654,676	(840,620)	100.64%
12/31/2038	135,353,969	135,353,969	134,033,320	(1,320,649)	100.99%
12/31/2039	138,109,437	138,109,437	136,478,333	(1,631,104)	101.20%
12/31/2040	140,774,731	140,774,731	139,000,230	(1,774,501)	101.28%
12/31/2041	143,469,178	143,469,178	141,608,335	(1,860,843)	101.31%
12/31/2042	146,242,324	146,242,324	144,297,273	(1,945,051)	101.35%
12/31/2043	149,100,527	149,100,527	147,075,805	(2,024,722)	101.38%
12/31/2044	152,057,027	152,057,027	149,956,945	(2,100,082)	101.40%
12/31/2045	155,127,172	155,127,172	152,958,037	(2,169,135)	101.42%
12/31/2046	158,329,816	158,329,816	156,098,013	(2,231,803)	101.43%
12/31/2047	161,669,232	161,669,232	159,381,049	(2,288,183)	101.44%
12/31/2048	165,161,815	165,161,815	162,823,697	(2,338,118)	101.44%
12/31/2049	168,822,593	168,822,593	166,441,679	(2,380,914)	101.43%
12/31/2050	172,671,896	172,671,896	170,255,740	(2,416,156)	101.42%
12/31/2051	176,727,890	176,727,890	174,284,077	(2,443,813)	101.40%
12/31/2052	180,980,972	180,980,972	178,516,703	(2,464,269)	101.38%

Appendix D: Stress Testing Tables (continued)

Table D-2: Fiscal Year Contribution Projection

30-Year Baseline Projection (10.2% Return in 2023, 6.50% Return Thereafter)

Fiscal Year End	Employer Contributions (% of pay)	ADEC After Direct Rate Smoothing*	Net Amortization (% of pay)	Normal Cost** (% of pay)	Net Amortization ($)	Normal Cost ($)	Employee Contributions ($ 6% of pay)	Employer Contributions ($)	Benefit Payments	Payroll
6/30/2025	16.79%	14.70%	9.63%	6.27%	1,748,067	1,138,150	1,089,138	3,047,772	5,927,678	18,152,305
6/30/2026	17.14%	14.64%	8.94%	6.30%	1,647,493	1,160,985	1,105,700	3,158,616	5,910,066	18,428,329
6/30/2027	17.49%	15.76%	9.43%	6.33%	1,764,416	1,184,386	1,122,640	3,272,497	6,104,558	18,710,672
6/30/2028	16.88%	16.88%	10.52%	6.36%	2,001,051	1,209,761	1,141,284	3,210,812	6,311,569	19,021,397
6/30/2029	18.22%	18.22%	11.83%	6.39%	2,289,842	1,236,863	1,161,374	3,526,705	6,525,247	19,356,229
6/30/2030	15.69%	15.69%	9.26%	6.43%	1,825,489	1,267,591	1,182,822	3,093,081	6,750,971	19,713,707
6/30/2031	14.14%	14.14%	7.68%	6.46%	1,542,790	1,297,712	1,205,305	2,840,502	6,989,261	20,088,415
6/30/2032	12.28%	12.28%	5.78%	6.50%	1,184,355	1,331,887	1,229,435	2,516,243	7,226,959	20,490,576
6/30/2033	10.94%	10.94%	4.41%	6.53%	922,533	1,366,018	1,255,147	2,288,551	7,463,752	20,919,113
6/30/2034	10.25%	10.25%	3.68%	6.57%	786,058	1,403,370	1,281,616	2,189,428	7,699,993	21,360,273
6/30/2035	9.42%	9.42%	2.82%	6.60%	615,623	1,440,820	1,309,837	2,056,444	7,801,189	21,830,611
6/30/2036	10.30%	10.30%	3.66%	6.64%	817,124	1,482,432	1,339,547	2,299,555	8,028,254	22,325,780
6/30/2037	8.25%	8.25%	1.58%	6.67%	361,040	1,524,137	1,371,038	1,885,177	8,251,868	22,850,630
6/30/2038	8.05%	8.05%	1.35%	6.70%	316,046	1,568,524	1,404,648	1,884,570	8,465,760	23,410,807
6/30/2039	7.42%	7.42%	0.69%	6.73%	165,569	1,614,900	1,439,732	1,780,469	8,675,675	23,995,540
6/30/2040	6.44%	6.44%	-0.32%	6.76%	(78,852)	1,665,754	1,478,480	1,586,902	8,863,827	24,641,331
6/30/2041	6.00%	6.00%	-1.44%	6.78%	(364,527)	1,716,316	1,518,864	1,518,864	9,035,077	25,314,393
6/30/2042	6.00%	6.00%	-1.02%	6.80%	(265,365)	1,769,098	1,560,969	1,560,969	9,204,340	26,016,151
6/30/2043	6.00%	6.00%	-1.05%	6.82%	(280,856)	1,824,227	1,604,892	1,604,892	9,373,022	26,748,197
6/30/2044	6.00%	6.00%	-1.08%	6.83%	(296,958)	1,877,984	1,649,766	1,649,766	9,554,884	27,496,108
6/30/2045	6.00%	6.00%	-1.09%	6.85%	(308,267)	1,937,274	1,696,883	1,696,883	9,738,146	28,281,378
6/30/2046	6.00%	6.00%	-1.10%	6.86%	(320,097)	1,996,240	1,745,982	1,745,982	9,917,858	29,099,704
6/30/2047	6.00%	6.00%	-1.10%	6.88%	(329,559)	2,061,243	1,797,595	1,797,595	10,093,110	29,959,921
6/30/2048	6.00%	6.00%	-1.11%	6.89%	(342,534)	2,126,178	1,851,533	1,851,533	10,262,034	30,858,891

Appendix D: Stress Testing Tables (continued)

Table D-2: Fiscal Year Contribution Projection (Continued)

30-Year Baseline Projection (10.2% Return in 2023, 6.50% Return Thereafter)

Fiscal Year End	Employer Contributions (% of pay)	ADEC After Direct Rate Smoothing*	Net Amortization (% of pay)	Normal Cost** (% of pay)	Net Amortization ($)	Normal Cost ($)	Employee Contributions ($ 6% of pay)	Employer Contributions ($)	Benefit Payments	Payroll
6/30/2049	6.00%	6.00%	-1.11%	6.90%	(352,945)	2,193,984	1,907,812	1,907,812	10,439,749	31,796,868
6/30/2050	6.00%	6.00%	-1.11%	6.92%	(363,799)	2,268,010	1,966,483	1,966,483	10,615,079	32,774,714
6/30/2051	6.00%	6.00%	-1.11%	6.93%	(375,157)	2,342,198	2,027,877	2,027,877	10,790,129	33,797,955
6/30/2052	6.00%	6.00%	-1.11%	6.93%	(387,012)	2,416,207	2,091,954	2,091,954	10,961,150	34,865,903
6/30/2053	6.00%	6.00%	-1.10%	6.94%	(395,672)	2,496,328	2,158,208	2,158,208	11,131,542	35,970,141
6/30/2054	6.00%	6.00%	-1.10%	6.95%	(408,126)	2,578,614	2,226,142	2,226,142	11,329,002	37,102,363
6/30/2055	6.00%	6.00%	-1.07%	6.96%	(409,566)	2,664,094	2,296,633	2,296,633	11,540,704	38,277,210

* Reflects a reduction of 1.20% for FY25 and 0.60% for FY26 for direct rate smoothing of the assumption change impact from the 12/31/2020 valuation

** Includes 0.1% of pay for expenses

Appendix D: Stress Testing Tables (continued)

G.S. 135-6(n1)(4) requires the projection of assets, liabilities, pension debt, service costs, employee contributions, employer contributions, net amortization, benefit payments, payroll, and funded ratio for the Retirement System assuming that investment returns are two and four percentage points lower than the assumed rate of return and that the Sate makes employer contributions meeting all of the following:

a) The contributions are based upon the then-current funding policy for the Retirement System.

b) The contributions are held constant at the levels calculated for subdivision (3) of this subsection.

c) The contributions never exceed fifteen percent (15%) of projected total revenue available for appropriation by the General Assembly.

We have displayed this detail in tabular format over a 30-year period in Tables D-3 through Tables D-10, beginning with the December 31, 2022 valuation results which calculated the recommended contribution for fiscal year ending June 30, 2025.

Table D-3: Asset and Liability Projection

30-Year Projection (10.2% Return in 2023, 4.50% Annual Return Thereafter)

Valuation Date	Market Value of Assets ($)	Actuarial Value of Assets ($)	Actuarial Liability ($)	Unfunded Accrued Liability ($)	Funded Ratio
12/31/2022	77,445,237	85,406,884	96,675,256	11,268,372	88.34%
12/31/2023	83,465,865	88,389,692	98,885,868	10,496,176	89.39%
12/31/2024	85,412,873	90,409,567	101,306,594	10,897,027	89.24%
12/31/2025	87,270,463	91,425,175	103,726,360	12,301,185	88.14%
12/31/2026	89,139,963	91,628,321	106,135,681	14,507,360	86.33%
12/31/2027	91,002,226	94,453,733	108,529,663	14,075,930	87.03%
12/31/2028	93,025,913	96,551,759	110,898,989	14,347,230	87.06%
12/31/2029	95,055,148	98,657,413	113,231,946	14,574,533	87.13%
12/31/2030	96,846,834	100,525,355	115,529,674	15,004,319	87.01%
12/31/2031	98,477,422	102,228,700	117,793,573	15,564,873	86.79%
12/31/2032	99,958,501	103,777,203	120,023,691	16,246,488	86.46%
12/31/2033	101,542,539	105,424,411	122,359,776	16,935,365	86.16%
12/31/2034	103,162,338	107,106,166	124,682,080	17,575,914	85.90%
12/31/2035	105,003,215	109,010,979	126,997,156	17,986,177	85.84%
12/31/2036	106,951,564	111,027,785	129,318,814	18,291,029	85.86%
12/31/2037	108,891,310	113,039,993	131,654,676	18,614,683	85.86%
12/31/2038	110,992,624	115,217,322	134,033,320	18,815,998	85.96%
12/31/2039	113,137,968	117,442,233	136,478,333	19,036,100	86.05%
12/31/2040	115,210,000	119,595,634	139,000,230	19,404,596	86.04%
12/31/2041	117,329,432	121,797,162	141,608,335	19,811,173	86.01%
12/31/2042	119,592,308	124,143,742	144,297,273	20,153,531	86.03%
12/31/2043	121,931,850	126,569,665	147,075,805	20,506,140	86.06%
12/31/2044	124,360,253	129,087,726	149,956,945	20,869,219	86.08%
12/31/2045	126,891,581	131,712,418	152,958,037	21,245,619	86.11%
12/31/2046	129,543,352	134,461,502	156,098,013	21,636,511	86.14%
12/31/2047	132,319,312	137,339,070	159,381,049	22,041,979	86.17%

Appendix D: Stress Testing Tables (continued)

Table D-3: Asset and Liability Projection (continued)

30-Year Projection (10.2% Return in 2023, 4.50% Annual Return Thereafter)

Valuation Date	Market Value of Assets ($)	Actuarial Value of Assets ($)	Actuarial Liability ($)	Unfunded Accrued Liability ($)	Funded Ratio
12/31/2048	135,233,645	140,359,747	162,823,697	22,463,950	86.20%
12/31/2049	138,301,560	143,539,221	166,441,679	22,902,458	86.24%
12/31/2050	141,541,963	146,896,949	170,255,740	23,358,791	86.28%
12/31/2051	144,969,236	150,447,922	174,284,077	23,836,155	86.32%
12/31/2052	148,572,742	154,181,926	178,516,703	24,334,777	86.37%

Appendix D: Stress Testing Tables (continued)

Table D-4: Fiscal Year Contribution Projection

30-Year Baseline Projection (10.2% Return in 2023, 4.50% Return Thereafter)

Fiscal Year End	Employer Contributions (% of pay)	ADEC After Direct Rate Smoothing*	Net Amortization (% of pay)	Normal Cost** (% of pay)	Net Amortization ($)	Normal Cost ($)	Employee Contributions ($ 6% of pay)	Employer Contributions ($)	Benefit Payments	Payroll
6/30/2025	16.79%	14.70%	9.63%	6.27%	1,748,067	1,138,150	1,089,138	3,047,772	5,927,678	18,152,305
6/30/2026	17.14%	14.64%	8.94%	6.30%	1,647,493	1,160,985	1,105,700	3,158,616	5,910,066	18,428,329
6/30/2027	17.49%	15.99%	9.66%	6.33%	1,807,451	1,184,386	1,122,640	3,272,497	6,104,558	18,710,672
6/30/2028	17.62%	17.62%	11.26%	6.36%	2,141,809	1,209,761	1,141,284	3,351,570	6,311,569	19,021,397
6/30/2029	19.75%	19.75%	13.36%	6.39%	2,585,992	1,236,863	1,161,374	3,822,855	6,525,247	19,356,229
6/30/2030	18.24%	18.24%	11.81%	6.43%	2,328,189	1,267,591	1,182,822	3,595,780	6,750,971	19,713,707
6/30/2031	17.91%	17.91%	11.45%	6.46%	2,300,124	1,297,712	1,205,305	3,597,835	6,989,261	20,088,415
6/30/2032	17.25%	17.25%	10.75%	6.50%	2,202,737	1,331,887	1,229,435	3,534,624	7,226,959	20,490,576
6/30/2033	17.08%	17.08%	10.55%	6.53%	2,206,966	1,366,018	1,255,147	3,572,985	7,463,752	20,919,113
6/30/2034	17.53%	17.53%	10.96%	6.57%	2,341,086	1,403,370	1,281,616	3,744,456	7,699,993	21,360,273
6/30/2035	17.81%	17.81%	11.21%	6.60%	2,447,211	1,440,820	1,309,837	3,888,032	7,801,189	21,830,611
6/30/2036	19.76%	19.76%	13.12%	6.64%	2,929,142	1,482,432	1,339,547	4,411,574	8,028,254	22,325,780
6/30/2037	18.73%	18.73%	12.06%	6.67%	2,755,786	1,524,137	1,371,038	4,279,923	8,251,868	22,850,630
6/30/2038	19.52%	19.52%	12.82%	6.70%	3,001,265	1,568,524	1,404,648	4,569,790	8,465,760	23,410,807
6/30/2039	19.65%	19.65%	12.92%	6.73%	3,100,224	1,614,900	1,439,732	4,715,124	8,675,675	23,995,540
6/30/2040	19.16%	19.16%	12.40%	6.76%	3,055,525	1,665,754	1,478,480	4,721,279	8,863,827	24,641,331
6/30/2041	18.31%	18.31%	11.53%	6.78%	2,918,750	1,716,316	1,518,864	4,635,065	9,035,077	25,314,393
6/30/2042	18.77%	18.77%	11.97%	6.80%	3,114,133	1,769,098	1,560,969	4,883,232	9,204,340	26,016,151
6/30/2043	18.67%	18.67%	11.85%	6.82%	3,169,661	1,824,227	1,604,892	4,993,888	9,373,022	26,748,197
6/30/2044	18.56%	18.56%	11.73%	6.83%	3,225,293	1,877,984	1,649,766	5,103,278	9,554,884	27,496,108
6/30/2045	18.45%	18.45%	11.60%	6.85%	3,280,640	1,937,274	1,696,883	5,217,914	9,738,146	28,281,378
6/30/2046	18.33%	18.33%	11.47%	6.86%	3,337,736	1,996,240	1,745,982	5,333,976	9,917,858	29,099,704
6/30/2047	18.21%	18.21%	11.33%	6.88%	3,394,459	2,061,243	1,797,595	5,455,702	10,093,110	29,959,921

Appendix D: Stress Testing Tables (continued)

Table D-4: Fiscal Year Contribution Projection (continued)

30-Year Baseline Projection (10.2% Return in 2023, 4.50% Return Thereafter)

Fiscal Year End	Employer Contributions (% of pay)	ADEC After Direct Rate Smoothing*	Net Amortization (% of pay)	Normal Cost** (% of pay)	Net Amortization ($)	Normal Cost ($)	Employee Contributions ($ 6% of pay)	Employer Contributions ($)	Benefit Payments	Payroll
6/30/2048	18.09%	18.09%	11.20%	6.89%	3,456,196	2,126,178	1,851,533	5,582,373	10,262,034	30,858,891
6/30/2049	17.96%	17.96%	11.06%	6.90%	3,516,734	2,193,984	1,907,812	5,710,717	10,439,749	31,796,868
6/30/2050	17.85%	17.85%	10.93%	6.92%	3,582,276	2,268,010	1,966,483	5,850,286	10,615,079	32,774,714
6/30/2051	17.72%	17.72%	10.79%	6.93%	3,646,799	2,342,198	2,027,877	5,988,998	10,790,129	33,797,955
6/30/2052	17.60%	17.60%	10.67%	6.93%	3,720,192	2,416,207	2,091,954	6,136,399	10,961,150	34,865,903
6/30/2053	17.48%	17.48%	10.54%	6.94%	3,791,253	2,496,328	2,158,208	6,287,581	11,131,542	35,970,141
6/30/2054	17.38%	17.38%	10.43%	6.95%	3,869,776	2,578,614	2,226,142	6,448,391	11,329,002	37,102,363
6/30/2055	17.27%	17.27%	10.31%	6.96%	3,946,380	2,664,094	2,296,633	6,610,474	11,540,704	38,277,210

* Reflects a reduction of 1.20% for FY25 and 0.60% for FY26 for direct rate smoothing of the assumption change impact from the 12/31/2020 valuation

** Includes 0.1% of pay for expenses

Appendix D: Stress Testing Tables (continued)

Table D-5: Asset and Liability Projection

30-Year Projection (10.2% Return in 2023, 4.50% Annual Return Thereafter, Baseline Contributions)

Valuation Date	Market Value of Assets ($)	Actuarial Value of Assets ($)	Actuarial Liability ($)	Unfunded Accrued Liability ($)	Funded Ratio
12/31/2022	77,445,237	85,406,884	96,675,256	11,268,372	88.34%
12/31/2023	83,465,865	88,389,692	98,885,868	10,496,176	89.39%
12/31/2024	85,412,873	90,409,567	101,306,594	10,897,027	89.24%
12/31/2025	87,270,463	91,425,175	103,726,360	12,301,185	88.14%
12/31/2026	89,139,963	91,628,321	106,135,681	14,507,360	86.33%
12/31/2027	90,931,204	94,382,170	108,529,663	14,147,493	86.96%
12/31/2028	92,729,625	96,252,237	110,898,989	14,646,752	86.79%
12/31/2029	94,338,436	97,930,467	113,231,946	15,301,479	86.49%
12/31/2030	95,454,453	99,109,173	115,529,674	16,420,501	85.79%
12/31/2031	96,113,854	99,819,026	117,793,573	17,974,547	84.74%
12/31/2032	96,308,527	100,048,374	120,023,691	19,975,317	83.36%
12/31/2033	96,271,237	100,029,809	122,359,776	22,329,967	81.75%
12/31/2034	95,913,614	99,677,012	124,682,080	25,005,068	79.94%
12/31/2035	95,399,490	99,156,164	126,997,156	27,840,992	78.08%
12/31/2036	94,594,532	98,334,655	129,318,814	30,984,159	76.04%
12/31/2037	93,359,214	97,071,603	131,654,676	34,583,073	73.73%
12/31/2038	91,861,137	95,533,439	134,033,320	38,499,881	71.28%
12/31/2039	90,009,354	93,628,991	136,478,333	42,849,342	68.60%
12/31/2040	87,807,503	91,361,224	139,000,230	47,639,006	65.73%
12/31/2041	85,363,836	88,839,083	141,608,335	52,769,252	62.74%
12/31/2042	82,714,674	86,100,488	144,297,273	58,196,785	59.67%
12/31/2043	79,852,000	83,138,766	147,075,805	63,937,039	56.53%
12/31/2044	76,773,845	79,952,826	149,956,945	70,004,119	53.32%
12/31/2045	73,479,387	76,542,168	152,958,037	76,415,869	50.04%
12/31/2046	69,970,250	72,908,424	156,098,013	83,189,589	46.71%
12/31/2047	66,232,476	69,037,514	159,381,049	90,343,535	43.32%
12/31/2048	62,263,210	64,926,378	162,823,697	97,897,319	39.88%
12/31/2049	58,057,058	60,569,413	166,441,679	105,872,266	36.39%
12/31/2050	53,612,672	55,965,076	170,255,740	114,290,664	32.87%
12/31/2051	48,925,183	51,108,347	174,284,077	123,175,730	29.32%
12/31/2052	43,960,835	45,965,094	178,516,703	132,551,609	25.75%

Appendix D: Stress Testing Tables (continued)

Table D-6: Fiscal Year Contribution Projection

30-Year Projection (10.2% Return in 2023, 4.50% Annual Return Thereafter, Baseline Contributions)

Fiscal Year End	Employer Contributions (% of pay)	ADEC After Direct Rate Smoothing*	Net Amortization (% of pay)	Normal Cost** (% of pay)	Net Amortization ($)	Normal Cost ($)	Employee Contributions ($ 6% of pay)	Employer Contributions ($)	Benefit Payments	Payroll
6/30/2025	16.79%	14.70%	9.63%	6.27%	1,748,067	1,138,150	1,089,138	3,047,772	5,927,678	18,152,305
6/30/2026	17.14%	14.64%	8.94%	6.30%	1,647,493	1,160,985	1,105,700	3,158,616	5,910,066	18,428,329
6/30/2027	17.49%	15.99%	9.66%	6.33%	1,807,451	1,184,386	1,122,640	3,272,497	6,104,558	18,710,672
6/30/2028	16.88%	17.62%	11.26%	6.36%	2,141,809	1,209,761	1,141,284	3,210,812	6,311,569	19,021,397
6/30/2029	18.22%	19.75%	13.36%	6.39%	2,585,992	1,236,863	1,161,374	3,526,705	6,525,247	19,356,229
6/30/2030	15.69%	18.29%	11.86%	6.43%	2,338,046	1,267,591	1,182,822	3,093,081	6,750,971	19,713,707
6/30/2031	14.14%	18.10%	11.64%	6.46%	2,338,292	1,297,712	1,205,305	2,840,502	6,989,261	20,088,415
6/30/2032	12.28%	17.70%	11.20%	6.50%	2,294,945	1,331,887	1,229,435	2,516,243	7,226,959	20,490,576
6/30/2033	10.94%	17.93%	11.40%	6.53%	2,384,779	1,366,018	1,255,147	2,288,551	7,463,752	20,919,113
6/30/2034	10.25%	18.97%	12.40%	6.57%	2,648,674	1,403,370	1,281,616	2,189,428	7,699,993	21,360,273
6/30/2035	9.42%	19.99%	13.39%	6.60%	2,923,119	1,440,820	1,309,837	2,056,444	7,801,189	21,830,611
6/30/2036	10.30%	22.86%	16.22%	6.64%	3,621,242	1,482,432	1,339,547	2,299,555	8,028,254	22,325,780
6/30/2037	8.25%	22.96%	16.29%	6.67%	3,722,368	1,524,137	1,371,038	1,885,177	8,251,868	22,850,630
6/30/2038	8.05%	25.06%	18.36%	6.70%	4,298,224	1,568,524	1,404,648	1,884,570	8,465,760	23,410,807
6/30/2039	7.42%	26.72%	19.99%	6.73%	4,796,708	1,614,900	1,439,732	1,780,469	8,675,675	23,995,540
6/30/2040	6.44%	27.96%	21.20%	6.76%	5,223,962	1,665,754	1,478,480	1,586,902	8,863,827	24,641,331
6/30/2041	6.00%	29.05%	22.27%	6.78%	5,637,515	1,716,316	1,518,864	1,518,864	9,035,077	25,314,393
6/30/2042	6.00%	31.62%	24.82%	6.80%	6,457,209	1,769,098	1,560,969	1,560,969	9,204,340	26,016,151
6/30/2043	6.00%	33.69%	26.87%	6.82%	7,187,241	1,824,227	1,604,892	1,604,892	9,373,022	26,748,197
6/30/2044	6.00%	35.83%	29.00%	6.83%	7,973,871	1,877,984	1,649,766	1,649,766	9,554,884	27,496,108
6/30/2045	6.00%	38.04%	31.19%	6.85%	8,820,962	1,937,274	1,696,883	1,696,883	9,738,146	28,281,378
6/30/2046	6.00%	40.27%	33.41%	6.86%	9,722,211	1,996,240	1,745,982	1,745,982	9,917,858	29,099,704

Appendix D: Stress Testing Tables (continued)

Table D-6: Fiscal Year Contribution Projection (continued)

30-Year Projection (10.2% Return in 2023, 4.50% Annual Return Thereafter, Baseline Contributions)

Fiscal Year End	Employer Contributions (% of pay)	ADEC After Direct Rate Smoothing*	Net Amortization (% of pay)	Normal Cost** (% of pay)	Net Amortization ($)	Normal Cost ($)	Employee Contributions ($ 6% of pay)	Employer Contributions ($)	Benefit Payments	Payroll
6/30/2047	6.00%	42.52%	35.64%	6.88%	10,677,716	2,061,243	1,797,595	1,797,595	10,093,110	29,959,921
6/30/2048	6.00%	44.78%	37.89%	6.89%	11,692,434	2,126,178	1,851,533	1,851,533	10,262,034	30,858,891
6/30/2049	6.00%	47.05%	40.15%	6.90%	12,766,443	2,193,984	1,907,812	1,907,812	10,439,749	31,796,868
6/30/2050	6.00%	49.33%	42.41%	6.92%	13,899,756	2,268,010	1,966,483	1,966,483	10,615,079	32,774,714
6/30/2051	6.00%	51.60%	44.67%	6.93%	15,097,546	2,342,198	2,027,877	2,027,877	10,790,129	33,797,955
6/30/2052	6.00%	53.84%	46.91%	6.93%	16,355,595	2,416,207	2,091,954	2,091,954	10,961,150	34,865,903
6/30/2053	6.00%	56.09%	49.15%	6.94%	17,679,324	2,496,328	2,158,208	2,158,208	11,131,542	35,970,141
6/30/2054	6.00%	58.35%	51.40%	6.95%	19,070,615	2,578,614	2,226,142	2,226,142	11,329,002	37,102,363
6/30/2055	6.00%	60.64%	53.68%	6.96%	20,547,206	2,664,094	2,296,633	2,296,633	11,540,704	38,277,210

* Reflects a reduction of 1.20% for FY25 and 0.60% for FY26 for direct rate smoothing of the assumption change impact from the 12/31/2020 valuation

** Includes 0.1% of pay for expenses

Appendix D: Stress Testing Tables (continued)

Table D-7: Asset and Liability Projection

30-Year Projection (10.2% Return in 2023, 2.50% Annual Return Thereafter)

Valuation Date	Market Value of Assets ($)	Actuarial Value of Assets ($)	Actuarial Liability ($)	Unfunded Accrued Liability ($)	Funded Ratio
12/31/2022	77,445,237	85,406,884	96,675,256	11,268,372	88.34%
12/31/2023	83,465,865	88,389,692	98,885,868	10,496,176	89.39%
12/31/2024	83,760,950	90,079,182	101,306,594	11,227,412	88.92%
12/31/2025	83,888,080	90,332,414	103,726,360	13,393,946	87.09%
12/31/2026	83,947,398	89,342,638	106,135,681	16,793,043	84.18%
12/31/2027	83,988,051	90,618,007	108,529,663	17,911,656	83.50%
12/31/2028	84,252,317	90,891,373	110,898,989	20,007,616	81.96%
12/31/2029	84,612,763	91,266,753	113,231,946	21,965,193	80.60%
12/31/2030	84,875,187	91,549,206	115,529,674	23,980,468	79.24%
12/31/2031	85,141,003	91,836,887	117,793,573	25,956,686	77.96%
12/31/2032	85,424,675	92,142,900	120,023,691	27,880,791	76.77%
12/31/2033	85,979,647	92,724,187	122,359,776	29,635,589	75.78%
12/31/2034	86,737,789	93,519,314	124,682,080	31,162,766	75.01%
12/31/2035	87,882,142	94,717,871	126,997,156	32,279,285	74.58%
12/31/2036	89,298,200	96,210,393	129,318,814	33,108,421	74.40%
12/31/2037	90,868,974	97,878,749	131,654,676	33,775,927	74.35%
12/31/2038	92,743,222	99,870,389	134,033,320	34,162,931	74.51%
12/31/2039	94,758,329	102,021,362	136,478,333	34,456,971	74.75%
12/31/2040	96,744,290	104,155,613	139,000,230	34,844,617	74.93%
12/31/2041	98,774,405	106,340,936	141,608,335	35,267,399	75.10%
12/31/2042	100,902,226	108,629,031	144,297,273	35,668,242	75.28%
12/31/2043	103,043,067	110,934,154	147,075,805	36,141,651	75.43%
12/31/2044	105,216,820	113,275,408	149,956,945	36,681,537	75.54%
12/31/2045	107,444,741	115,674,185	152,958,037	37,283,852	75.62%
12/31/2046	109,751,058	118,155,276	156,098,013	37,942,737	75.69%
12/31/2047	112,143,587	120,727,608	159,381,049	38,653,441	75.75%
12/31/2048	114,642,815	123,413,016	162,823,697	39,410,681	75.80%
12/31/2049	117,268,962	126,233,131	166,441,679	40,208,548	75.84%
12/31/2050	120,044,930	129,212,370	170,255,740	41,043,370	75.89%
12/31/2051	122,985,841	132,367,400	174,284,077	41,916,677	75.95%
12/31/2052	126,081,744	135,689,314	178,516,703	42,827,389	76.01%

Appendix D: Stress Testing Tables (continued)

Table D-8: Fiscal Year Contribution Projection

30-Year Projection (10.2% Return in 2023, 2.50% Annual Return Thereafter)

Fiscal Year End	Employer Contributions (% of pay)	ADEC After Direct Rate Smoothing*	Net Amortization (% of pay)	Normal Cost** (% of pay)	Net Amortization ($)	Normal Cost ($)	Employee Contributions ($ 6% of pay)	Employer Contributions ($)	Benefit Payments	Payroll
6/30/2025	16.79%	14.70%	9.63%	6.27%	1,748,067	1,138,150	1,089,138	3,047,772	5,927,678	18,152,305
6/30/2026	17.14%	14.64%	8.94%	6.30%	1,647,493	1,160,985	1,105,700	3,158,616	5,910,066	18,428,329
6/30/2027	17.49%	16.22%	9.89%	6.33%	1,850,485	1,184,386	1,122,640	3,272,497	6,104,558	18,710,672
6/30/2028	18.36%	18.36%	12.00%	6.36%	2,282,568	1,209,761	1,141,284	3,492,328	6,311,569	19,021,397
6/30/2029	21.24%	21.24%	14.85%	6.39%	2,874,400	1,236,863	1,161,374	4,111,263	6,525,247	19,356,229
6/30/2030	20.70%	20.70%	14.27%	6.43%	2,813,146	1,267,591	1,182,822	4,080,737	6,750,971	19,713,707
6/30/2031	21.49%	21.49%	15.03%	6.46%	3,019,289	1,297,712	1,205,305	4,317,000	6,989,261	20,088,415
6/30/2032	21.88%	21.88%	15.38%	6.50%	3,151,451	1,331,887	1,229,435	4,483,338	7,226,959	20,490,576
6/30/2033	22.69%	22.69%	16.16%	6.53%	3,380,529	1,366,018	1,255,147	4,746,547	7,463,752	20,919,113
6/30/2034	24.06%	24.06%	17.49%	6.57%	3,735,912	1,403,370	1,281,616	5,139,282	7,699,993	21,360,273
6/30/2035	25.19%	25.19%	18.59%	6.60%	4,058,311	1,440,820	1,309,837	5,499,131	7,801,189	21,830,611
6/30/2036	27.93%	27.93%	21.29%	6.64%	4,753,159	1,482,432	1,339,547	6,235,590	8,028,254	22,325,780
6/30/2037	27.64%	27.64%	20.97%	6.67%	4,791,777	1,524,137	1,371,038	6,315,914	8,251,868	22,850,630
6/30/2038	29.09%	29.09%	22.39%	6.70%	5,241,680	1,568,524	1,404,648	6,810,204	8,465,760	23,410,807
6/30/2039	29.67%	29.67%	22.94%	6.73%	5,504,577	1,614,900	1,439,732	7,119,477	8,675,675	23,995,540
6/30/2040	29.37%	29.37%	22.61%	6.76%	5,571,405	1,665,754	1,478,480	7,237,159	8,863,827	24,641,331
6/30/2041	28.48%	28.48%	21.70%	6.78%	5,493,223	1,716,316	1,518,864	7,209,539	9,035,077	25,314,393
6/30/2042	28.73%	28.73%	21.93%	6.80%	5,705,342	1,769,098	1,560,969	7,474,440	9,204,340	26,016,151
6/30/2043	28.28%	28.28%	21.46%	6.82%	5,740,163	1,824,227	1,604,892	7,564,390	9,373,022	26,748,197
6/30/2044	27.87%	27.87%	21.04%	6.83%	5,785,181	1,877,984	1,649,766	7,663,165	9,554,884	27,496,108
6/30/2045	27.50%	27.50%	20.65%	6.85%	5,840,105	1,937,274	1,696,883	7,777,379	9,738,146	28,281,378
6/30/2046	27.16%	27.16%	20.30%	6.86%	5,907,240	1,996,240	1,745,982	7,903,480	9,917,858	29,099,704

Appendix D: Stress Testing Tables (continued)

Table D-8: Fiscal Year Contribution Projection (continued)

30-Year Projection (10.2% Return in 2023, 2.50% Annual Return Thereafter)

Fiscal Year End	Employer Contributions (% of pay)	ADEC After Direct Rate Smoothing*	Net Amortization (% of pay)	Normal Cost** (% of pay)	Net Amortization ($)	Normal Cost ($)	Employee Contributions ($ 6% of pay)	Employer Contributions ($)	Benefit Payments	Payroll
6/30/2047	26.85%	26.85%	19.97%	6.88%	5,982,996	2,061,243	1,797,595	8,044,239	10,093,110	29,959,921
6/30/2048	26.56%	26.56%	19.67%	6.89%	6,069,944	2,126,178	1,851,533	8,196,121	10,262,034	30,858,891
6/30/2049	26.30%	26.30%	19.40%	6.90%	6,168,592	2,193,984	1,907,812	8,362,576	10,439,749	31,796,868
6/30/2050	26.07%	26.07%	19.15%	6.92%	6,276,358	2,268,010	1,966,483	8,544,368	10,615,079	32,774,714
6/30/2051	25.85%	25.85%	18.92%	6.93%	6,394,573	2,342,198	2,027,877	8,736,771	10,790,129	33,797,955
6/30/2052	25.63%	25.63%	18.70%	6.93%	6,519,924	2,416,207	2,091,954	8,936,131	10,961,150	34,865,903
6/30/2053	25.44%	25.44%	18.50%	6.94%	6,654,476	2,496,328	2,158,208	9,150,804	11,131,542	35,970,141
6/30/2054	25.26%	25.26%	18.31%	6.95%	6,793,443	2,578,614	2,226,142	9,372,057	11,329,002	37,102,363
6/30/2055	25.09%	25.09%	18.13%	6.96%	6,939,658	2,664,094	2,296,633	9,603,752	11,540,704	38,277,210

* Reflects a reduction of 1.20% for FY25 and 0.60% for FY26 for direct rate smoothing of the assumption change impact from the 12/31/2020 valuation

** Includes 0.1% of pay for expenses

Appendix D: Stress Testing Tables (continued)

Table D-9: Asset and Liability Projection

30-Year Projection (10.2% Return in 2023, 2.50% Annual Return Thereafter, Baseline Contributions)

Valuation Date	Market Value of Assets ($)	Actuarial Value of Assets ($)	Actuarial Liability ($)	Unfunded Accrued Liability ($)	Funded Ratio
12/31/2022	77,445,237	85,406,884	96,675,256	11,268,372	88.34%
12/31/2023	83,465,865	88,389,692	98,885,868	10,496,176	89.39%
12/31/2024	83,760,950	90,079,182	101,306,594	11,227,412	88.92%
12/31/2025	83,888,080	90,332,414	103,726,360	13,393,946	87.09%
12/31/2026	83,947,398	89,342,638	106,135,681	16,793,043	84.18%
12/31/2027	83,847,373	90,475,154	108,529,663	18,054,509	83.36%
12/31/2028	83,672,127	90,298,310	110,898,989	20,600,679	81.42%
12/31/2029	83,224,563	89,838,200	113,231,946	23,393,746	79.34%
12/31/2030	82,206,054	88,787,093	115,529,674	26,742,581	76.85%
12/31/2031	80,660,118	87,177,616	117,793,573	30,615,957	74.01%
12/31/2032	78,585,887	85,002,155	120,023,691	35,021,536	70.82%
12/31/2033	76,221,392	82,498,898	122,359,776	39,860,878	67.42%
12/31/2034	73,482,194	79,588,003	124,682,080	45,094,077	63.83%
12/31/2035	70,535,458	76,441,765	126,997,156	50,555,391	60.19%
12/31/2036	67,249,929	72,932,702	129,318,814	56,386,112	56.40%
12/31/2037	63,491,915	68,924,681	131,654,676	62,729,995	52.35%
12/31/2038	59,434,773	64,589,084	134,033,320	69,444,236	48.19%
12/31/2039	54,992,663	59,840,006	136,478,333	76,638,327	43.85%
12/31/2040	50,175,327	54,686,271	139,000,230	84,313,959	39.34%
12/31/2041	45,096,197	49,243,165	141,608,335	92,365,170	34.77%
12/31/2042	39,795,478	43,554,526	144,297,273	100,742,747	30.18%
12/31/2043	34,268,848	37,619,105	147,075,805	109,456,700	25.58%
12/31/2044	28,518,224	31,440,920	149,956,945	118,516,025	20.97%
12/31/2045	22,546,797	25,024,115	152,958,037	127,933,922	16.36%
12/31/2046	16,360,295	18,374,746	156,098,013	137,723,267	11.77%
12/31/2047	9,949,084	11,483,256	159,381,049	147,897,793	7.20%
12/31/2048	3,314,910	3,977,892	162,823,697	158,845,805	2.44%
12/31/2049	(3,542,827)	(4,251,393)	166,441,679	170,693,072	-2.55%
12/31/2050	(10,620,495)	(12,744,594)	170,255,740	183,000,334	-7.49%
12/31/2051	(17,917,795)	(21,501,354)	174,284,077	195,785,431	-12.34%
12/31/2052	(25,462,816)	(30,555,380)	178,516,703	209,072,083	-17.12%

The negative asset values starting 12/31/2049 are indicative of a hypothetical scenario in which the fund borrows money to pay promised benefits.

Appendix D: Stress Testing Tables (continued)

Table D-10: Fiscal Year Contribution Projection

30-Year Projection (10.2% Return in 2023, 2.50% Annual Return Thereafter, Baseline Contributions)

Fiscal Year End	Employer Contributions (% of pay)	ADEC After Direct Rate Smoothing*	Net Amortization (% of pay)	Normal Cost** (% of pay)	Net Amortization ($)	Normal Cost ($)	Employee Contributions ($ 6% of pay)	Employer Contributions ($)	Benefit Payments	Payroll
6/30/2025	16.79%	14.70%	9.63%	6.27%	1,748,067	1,138,150	1,089,138	3,047,772	5,927,678	18,152,305
6/30/2026	17.14%	14.64%	8.94%	6.30%	1,647,493	1,160,985	1,105,700	3,158,616	5,910,066	18,428,329
6/30/2027	17.49%	16.22%	9.89%	6.33%	1,850,485	1,184,386	1,122,640	3,272,497	6,104,558	18,710,672
6/30/2028	16.88%	18.36%	12.00%	6.36%	2,282,568	1,209,761	1,141,284	3,210,812	6,311,569	19,021,397
6/30/2029	18.22%	21.24%	14.85%	6.39%	2,874,400	1,236,863	1,161,374	3,526,705	6,525,247	19,356,229
6/30/2030	15.69%	20.80%	14.37%	6.43%	2,832,860	1,267,591	1,182,822	3,093,081	6,750,971	19,713,707
6/30/2031	14.14%	21.87%	15.41%	6.46%	3,095,625	1,297,712	1,205,305	2,840,502	6,989,261	20,088,415
6/30/2032	12.28%	22.77%	16.27%	6.50%	3,333,817	1,331,887	1,229,435	2,516,243	7,226,959	20,490,576
6/30/2033	10.94%	24.36%	17.83%	6.53%	3,729,878	1,366,018	1,255,147	2,288,551	7,463,752	20,919,113
6/30/2034	10.25%	26.83%	20.26%	6.57%	4,327,591	1,403,370	1,281,616	2,189,428	7,699,993	21,360,273
6/30/2035	9.42%	29.36%	22.76%	6.60%	4,968,647	1,440,820	1,309,837	2,056,444	7,801,189	21,830,611
6/30/2036	10.30%	33.82%	27.18%	6.64%	6,068,147	1,482,432	1,339,547	2,299,555	8,028,254	22,325,780
6/30/2037	8.25%	35.58%	28.91%	6.67%	6,606,117	1,524,137	1,371,038	1,885,177	8,251,868	22,850,630
6/30/2038	8.05%	39.40%	32.70%	6.70%	7,655,334	1,568,524	1,404,648	1,884,570	8,465,760	23,410,807
6/30/2039	7.42%	42.68%	35.95%	6.73%	8,626,397	1,614,900	1,439,732	1,780,469	8,675,675	23,995,540
6/30/2040	6.44%	45.39%	38.63%	6.76%	9,518,946	1,665,754	1,478,480	1,586,902	8,863,827	24,641,331
6/30/2041	6.00%	47.84%	41.06%	6.78%	10,394,090	1,716,316	1,518,864	1,518,864	9,035,077	25,314,393
6/30/2042	6.00%	51.64%	44.84%	6.80%	11,665,642	1,769,098	1,560,969	1,560,969	9,204,340	26,016,151
6/30/2043	6.00%	54.79%	47.97%	6.82%	12,831,110	1,824,227	1,604,892	1,604,892	9,373,022	26,748,197
6/30/2044	6.00%	58.02%	51.19%	6.83%	14,075,258	1,877,984	1,649,766	1,649,766	9,554,884	27,496,108
6/30/2045	6.00%	61.29%	54.44%	6.85%	15,396,382	1,937,274	1,696,883	1,696,883	9,738,146	28,281,378
6/30/2046	6.00%	64.52%	57.66%	6.86%	16,778,889	1,996,240	1,745,982	1,745,982	9,917,858	29,099,704

Appendix D: Stress Testing Tables (continued)

Table D-10: Fiscal Year Contribution Projection (continued)

30-Year Projection (10.2% Return in 2023, 2.50% Annual Return Thereafter, Baseline Contributions)

Fiscal Year End	Employer Contributions (% of pay)	ADEC After Direct Rate Smoothing*	Net Amortization (% of pay)	Normal Cost** (% of pay)	Net Amortization ($)	Normal Cost ($)	Employee Contributions ($ 6% of pay)	Employer Contributions ($)	Benefit Payments	Payroll
6/30/2047	6.00%	67.72%	60.84%	6.88%	18,227,616	2,061,243	1,797,595	1,797,595	10,093,110	29,959,921
6/30/2048	6.00%	70.86%	63.97%	6.89%	19,740,433	2,126,178	1,851,533	1,851,533	10,262,034	30,858,891
6/30/2049	6.00%	73.94%	67.04%	6.90%	21,316,620	2,193,984	1,907,812	1,907,812	10,439,749	31,796,868
6/30/2050	6.00%	76.98%	70.06%	6.92%	22,961,965	2,268,010	1,966,483	1,966,483	10,615,079	32,774,714
6/30/2051	6.00%	80.05%	73.12%	6.93%	24,713,065	2,342,198	2,027,877	2,027,877	10,790,129	33,797,955
6/30/2052	6.00%	83.18%	76.25%	6.93%	26,585,251	2,416,207	2,091,954	2,091,954	10,961,150	34,865,903
6/30/2053	6.00%	86.20%	79.26%	6.94%	28,509,934	2,496,328	2,158,208	2,158,208	11,131,542	35,970,141
6/30/2054	6.00%	89.18%	82.23%	6.95%	30,509,273	2,578,614	2,226,142	2,226,142	11,329,002	37,102,363
6/30/2055	6.00%	92.13%	85.17%	6.96%	32,600,700	2,664,094	2,296,633	2,296,633	11,540,704	38,277,210

* Reflects a reduction of 1.20% for FY25 and 0.60% for FY26 for direct rate smoothing of the assumption change impact from the 12/31/2020 valuation

** Includes 0.1% of pay for expenses

Appendix D: Stress Testing Tables (continued)

G.S. 135-6(n1)(5) requires the projection of assets, liabilities, pension debt, service costs, employee contributions, employer contributions, net amortization, benefit payments, payroll, and funded ratio for the Retirement System, if there is a one-year loss on planned investments of twenty percent (20%) followed by a 20-year period of investment returns two percentage points below plan assumptions, with the following assumptions regarding contributions:

a) The contributions are based upon the then-current funding policy for the Retirement System.

b) The contributions are held constant at the levels calculated for subdivision (3) of this subsection.

c) The contributions never exceed fifteen percent (15%) of projected total revenue available for appropriation by the General Assembly.

We have displayed this detail in tabular format over a 23-year period in Tables D-11 through Tables D-14, beginning with the December 31, 2022 valuation results which calculated the recommended contribution for fiscal year ending June 30, 2025.

Table D-11: Asset and Liability Projection

23-Year Projection (10.2% Return in 2023, (13.5)% Shock, 4.50% Annual Return Thereafter)

Valuation Date	Market Value of Assets ($)	Actuarial Value of Assets ($)	Actuarial Liability ($)	Unfunded Accrued Liability ($)	Funded Ratio
12/31/2022	77,445,237	85,406,884	96,675,256	11,268,372	88.34%
12/31/2023	83,465,865	88,389,692	98,885,868	10,496,176	89.39%
12/31/2024	70,552,170	84,662,604	101,306,594	16,643,990	83.57%
12/31/2025	71,741,028	84,574,391	103,726,360	19,151,969	81.54%
12/31/2026	73,148,243	81,155,885	106,135,681	24,979,796	76.46%
12/31/2027	74,958,869	80,827,852	108,529,663	27,701,811	74.48%
12/31/2028	77,358,239	80,264,893	110,898,989	30,634,096	72.38%
12/31/2029	80,238,951	83,229,089	113,231,946	30,002,857	73.50%
12/31/2030	83,335,899	86,426,409	115,529,674	29,103,265	74.81%
12/31/2031	86,505,078	89,708,517	117,793,573	28,085,056	76.16%
12/31/2032	89,549,393	92,871,965	120,023,691	27,151,726	77.38%
12/31/2033	92,724,693	96,168,637	122,359,776	26,191,139	78.59%
12/31/2034	95,966,647	99,533,906	124,682,080	25,148,174	79.83%
12/31/2035	99,462,516	103,156,637	126,997,156	23,840,519	81.23%
12/31/2036	103,106,680	106,933,465	129,318,814	22,385,349	82.69%
12/31/2037	106,788,436	110,753,367	131,654,676	20,901,309	84.12%
12/31/2038	110,300,418	114,405,814	134,033,320	19,627,506	85.36%
12/31/2039	113,456,662	117,699,238	136,478,333	18,779,095	86.24%
12/31/2040	116,279,298	120,650,470	139,000,230	18,349,760	86.80%
12/31/2041	118,707,087	123,194,828	141,608,335	18,413,507	87.00%
12/31/2042	120,866,744	125,457,851	144,297,273	18,839,422	86.94%
12/31/2043	122,919,613	127,603,010	147,075,805	19,472,795	86.76%
12/31/2044	125,094,876	129,864,379	149,956,945	20,092,566	86.60%

Appendix D: Stress Testing Tables (continued)

Table D-12: Fiscal Year Contribution Projection

23-Year Projection (10.2% Return in 2023, (13.5)% Shock, 4.50% Annual Return Thereafter)

Fiscal Year End	Employer Contributions (% of pay)	ADEC After Direct Rate Smoothing*	Net Amortization (% of pay)	Normal Cost** (% of pay)	Net Amortization ($)	Normal Cost ($)	Employee Contributions ($ 6% of pay)	Employer Contributions ($)	Benefit Payments	Payroll
6/30/2025	16.79%	14.70%	9.63%	6.27%	1,748,067	1,138,150	1,089,138	3,047,772	5,927,678	18,152,305
6/30/2026	17.14%	14.64%	8.94%	6.30%	1,647,493	1,160,985	1,105,700	3,158,616	5,910,066	18,428,329
6/30/2027	20.00%	20.00%	13.67%	6.33%	2,557,749	1,184,386	1,122,640	3,742,134	6,104,558	18,710,672
6/30/2028	22.07%	22.07%	15.71%	6.36%	2,988,261	1,209,761	1,141,284	4,198,022	6,311,569	19,021,397
6/30/2029	26.52%	26.52%	20.13%	6.39%	3,896,409	1,236,863	1,161,374	5,133,272	6,525,247	19,356,229
6/30/2030	27.07%	27.07%	20.64%	6.43%	4,068,909	1,267,591	1,182,822	5,336,500	6,750,971	19,713,707
6/30/2031	28.45%	28.45%	21.99%	6.46%	4,417,442	1,297,712	1,205,305	5,715,154	6,989,261	20,088,415
6/30/2032	27.36%	27.36%	20.86%	6.50%	4,274,334	1,331,887	1,229,435	5,606,222	7,226,959	20,490,576
6/30/2033	26.76%	26.76%	20.23%	6.53%	4,231,937	1,366,018	1,255,147	5,597,955	7,463,752	20,919,113
6/30/2034	26.82%	26.82%	20.25%	6.57%	4,325,455	1,403,370	1,281,616	5,728,825	7,699,993	21,360,273
6/30/2035	26.70%	26.70%	20.10%	6.60%	4,387,953	1,440,820	1,309,837	5,828,773	7,801,189	21,830,611
6/30/2036	28.28%	28.28%	21.64%	6.64%	4,831,299	1,482,432	1,339,547	6,313,731	8,028,254	22,325,780
6/30/2037	26.92%	26.92%	20.25%	6.67%	4,627,253	1,524,137	1,371,038	6,151,390	8,251,868	22,850,630
6/30/2038	27.38%	27.38%	20.68%	6.70%	4,841,355	1,568,524	1,404,648	6,409,879	8,465,760	23,410,807
6/30/2039	24.09%	24.09%	17.36%	6.73%	4,165,626	1,614,900	1,439,732	5,780,526	8,675,675	23,995,540
6/30/2040	23.01%	23.01%	16.25%	6.76%	4,004,216	1,665,754	1,478,480	5,669,970	8,863,827	24,641,331
6/30/2041	20.16%	20.16%	13.38%	6.78%	3,387,066	1,716,316	1,518,864	5,103,382	9,035,077	25,314,393
6/30/2042	18.88%	18.88%	12.08%	6.80%	3,142,751	1,769,098	1,560,969	4,911,849	9,204,340	26,016,151
6/30/2043	17.35%	17.35%	10.53%	6.82%	2,816,585	1,824,227	1,604,892	4,640,812	9,373,022	26,748,197
6/30/2044	17.43%	17.43%	10.60%	6.83%	2,914,587	1,877,984	1,649,766	4,792,572	9,554,884	27,496,108
6/30/2045	17.52%	17.52%	10.67%	6.85%	3,017,623	1,937,274	1,696,883	4,954,897	9,738,146	28,281,378
6/30/2046	17.58%	17.58%	10.72%	6.86%	3,119,488	1,996,240	1,745,982	5,115,728	9,917,858	29,099,704
6/30/2047	17.63%	17.63%	10.75%	6.88%	3,220,692	2,061,243	1,797,595	5,281,934	10,093,110	29,959,921

* Reflects a reduction of 1.20% for FY25 and 0.60% for FY26 for direct rate smoothing of the assumption change impact from the 12/31/2020 valuation

** Includes 0.1% of pay for expenses

Appendix D: Stress Testing Tables (continued)

Table D-13: Asset and Liability Projection

23-Year Projection (10.2% Return in 2023, (13.5)% Shock, 4.50% Annual Return Thereafter ,Baseline Contributions)

Valuation Date	Market Value of Assets ($)	Actuarial Value of Assets ($)	Actuarial Liability ($)	Unfunded Accrued Liability ($)	Funded Ratio
12/31/2022	77,445,237	85,406,884	96,675,256	11,268,372	88.34%
12/31/2023	83,465,865	88,389,692	98,885,868	10,496,176	89.39%
12/31/2024	70,552,170	84,662,604	101,306,594	16,643,990	83.57%
12/31/2025	71,741,028	84,574,391	103,726,360	19,151,969	81.54%
12/31/2026	72,911,704	80,917,544	106,135,681	25,218,137	76.24%
12/31/2027	73,972,673	79,830,889	108,529,663	28,698,774	73.56%
12/31/2028	75,007,961	77,880,818	110,898,989	33,018,171	70.23%
12/31/2029	75,819,296	78,732,335	113,231,946	34,499,611	69.53%
12/31/2030	76,101,953	79,047,125	115,529,674	36,482,549	68.42%
12/31/2031	75,890,491	78,854,186	117,793,573	38,939,387	66.94%
12/31/2032	75,175,112	78,140,116	120,023,691	41,883,575	65.10%
12/31/2033	74,186,819	77,135,679	122,359,776	45,224,097	63.04%
12/31/2034	72,835,397	75,752,646	124,682,080	48,929,434	60.76%
12/31/2035	71,282,753	74,155,202	126,997,156	52,841,954	58.39%
12/31/2036	69,392,542	72,208,649	129,318,814	57,110,165	55.84%
12/31/2037	67,023,134	69,769,927	131,654,676	61,884,749	52.99%
12/31/2038	64,339,933	67,003,188	134,033,320	67,030,132	49.99%
12/31/2039	61,249,697	63,814,879	136,478,333	72,663,454	46.76%
12/31/2040	57,753,661	60,205,476	139,000,230	78,794,754	43.31%
12/31/2041	53,957,571	56,281,327	141,608,335	85,327,008	39.74%
12/31/2042	49,895,127	52,077,633	144,297,273	92,219,640	36.09%
12/31/2043	45,555,574	47,584,882	147,075,805	99,490,923	32.35%
12/31/2044	40,934,079	42,799,018	149,956,945	107,157,927	28.54%

Appendix D: Stress Testing Tables (continued)

Table D-14: Fiscal Year Contribution Projection

23-Year Projection (10.2% Return in 2023, (13.5)% Shock, 4.50% Annual Return Thereafter, Baseline Contributions)

Fiscal Year End	Employer Contributions (% of pay)	ADEC After Direct Rate Smoothing*	Net Amortization (% of pay)	Normal Cost** (% of pay)	Net Amortization ($)	Normal Cost ($)	Employee Contributions ($ 6% of pay)	Employer Contributions ($)	Benefit Payments	Payroll
6/30/2025	16.79%	14.70%	9.63%	6.27%	1,748,067	1,138,150	1,089,138	3,047,772	5,927,678	18,152,305
6/30/2026	17.14%	14.64%	8.94%	6.30%	1,647,493	1,160,985	1,105,700	3,158,616	5,910,066	18,428,329
6/30/2027	17.49%	20.00%	13.67%	6.33%	2,557,749	1,184,386	1,122,640	3,272,497	6,104,558	18,710,672
6/30/2028	16.88%	22.07%	15.71%	6.36%	2,988,261	1,209,761	1,141,284	3,210,812	6,311,569	19,021,397
6/30/2029	18.22%	26.68%	20.29%	6.39%	3,927,379	1,236,863	1,161,374	3,526,705	6,525,247	19,356,229
6/30/2030	15.69%	27.72%	21.29%	6.43%	4,197,048	1,267,591	1,182,822	3,093,081	6,750,971	19,713,707
6/30/2031	14.14%	29.96%	23.50%	6.46%	4,720,778	1,297,712	1,205,305	2,840,502	6,989,261	20,088,415
6/30/2032	12.28%	30.14%	23.64%	6.50%	4,843,972	1,331,887	1,229,435	2,516,243	7,226,959	20,490,576
6/30/2033	10.94%	31.24%	24.71%	6.53%	5,169,113	1,366,018	1,255,147	2,288,551	7,463,752	20,919,113
6/30/2034	10.25%	33.30%	26.73%	6.57%	5,709,601	1,403,370	1,281,616	2,189,428	7,699,993	21,360,273
6/30/2035	9.42%	35.41%	28.81%	6.60%	6,289,399	1,440,820	1,309,837	2,056,444	7,801,189	21,830,611
6/30/2036	10.30%	39.45%	32.81%	6.64%	7,325,088	1,482,432	1,339,547	2,299,555	8,028,254	22,325,780
6/30/2037	8.25%	40.80%	34.13%	6.67%	7,798,920	1,524,137	1,371,038	1,885,177	8,251,868	22,850,630
6/30/2038	8.05%	44.24%	37.54%	6.70%	8,788,417	1,568,524	1,404,648	1,884,570	8,465,760	23,410,807
6/30/2039	7.42%	44.21%	37.48%	6.73%	8,993,528	1,614,900	1,439,732	1,780,469	8,675,675	23,995,540
6/30/2040	6.44%	46.66%	39.90%	6.76%	9,831,891	1,665,754	1,478,480	1,586,902	8,863,827	24,641,331
6/30/2041	6.00%	47.33%	40.55%	6.78%	10,264,986	1,716,316	1,518,864	1,518,864	9,035,077	25,314,393
6/30/2042	6.00%	49.41%	42.61%	6.80%	11,085,482	1,769,098	1,560,969	1,560,969	9,204,340	26,016,151
6/30/2043	6.00%	51.08%	44.26%	6.82%	11,838,752	1,824,227	1,604,892	1,604,892	9,373,022	26,748,197
6/30/2044	6.00%	54.11%	47.28%	6.83%	13,000,160	1,877,984	1,649,766	1,649,766	9,554,884	27,496,108
6/30/2045	6.00%	56.89%	50.04%	6.85%	14,152,002	1,937,274	1,696,883	1,696,883	9,738,146	28,281,378
6/30/2046	6.00%	59.56%	52.70%	6.86%	15,335,544	1,996,240	1,745,982	1,745,982	9,917,858	29,099,704
6/30/2047	6.00%	62.26%	55.38%	6.88%	16,591,804	2,061,243	1,797,595	1,797,595	10,093,110	29,959,921

* Reflects a reduction of 1.20% for FY25 and 0.60% for FY26 for direct rate smoothing of the assumption change impact from the 12/31/2020 valuation

** Includes 0.1% of pay for expenses

Appendix E: Stochastic Analysis Support

Annualized Return

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Mean	8.2%	7.9%	7.5%	7.1%	7.1%	6.9%	7.0%	7.1%	7.0%	7.0%	6.7%	7.1%	7.1%	6.9%	7.0%
Standard Dev	8.9%	8.8%	8.9%	8.6%	8.7%	8.5%	8.4%	8.5%	8.5%	8.5%	8.6%	8.4%	8.4%	8.4%	8.5%
95th Percentile	22.5%	22.1%	21.8%	20.5%	21.2%	20.6%	20.4%	20.6%	20.4%	20.4%	20.3%	20.6%	20.2%	20.2%	20.4%
75th Percentile	14.3%	13.5%	12.6%	12.4%	12.4%	11.9%	12.1%	12.3%	12.3%	12.1%	11.8%	12.2%	12.3%	11.7%	12.0%
50th Percentile	8.6%	8.1%	7.6%	7.2%	7.1%	7.1%	7.2%	7.2%	7.1%	7.2%	6.9%	7.1%	7.3%	7.1%	7.2%
25th Percentile	2.4%	2.6%	2.1%	1.7%	1.9%	1.9%	2.0%	1.9%	1.7%	1.9%	1.5%	2.1%	2.0%	1.9%	1.9%
5th Percentile	(6.9%)	(6.9%)	(7.5%)	(7.0%)	(7.2%)	(7.0%)	(7.2%)	(6.5%)	(7.1%)	(7.3%)	(7.2%)	(6.9%)	(6.7%)	(6.9%)	(7.0%)
Prob > 6.5%	58.8%	57.8%	56.1%	53.4%	53.7%	52.9%	53.2%	53.2%	53.3%	54.0%	51.7%	53.7%	54.5%	52.9%	53.3%

	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Mean	6.9%	7.1%	6.9%	7.0%	6.9%	6.8%	7.0%	7.0%	7.0%	6.9%	7.0%	7.0%	6.9%	7.0%	7.1%
Standard Dev	8.4%	8.5%	8.4%	8.4%	8.5%	8.1%	8.3%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.4%	8.3%
95th Percentile	20.1%	20.4%	20.2%	19.9%	20.6%	19.6%	20.5%	20.0%	20.2%	20.1%	20.0%	20.1%	20.0%	20.0%	20.7%
75th Percentile	11.9%	12.3%	12.1%	12.1%	12.2%	11.9%	12.1%	11.9%	12.0%	11.8%	12.0%	12.0%	11.8%	12.0%	12.0%
50th Percentile	7.2%	7.2%	7.1%	7.1%	7.0%	7.0%	6.9%	7.1%	7.1%	7.0%	7.1%	7.2%	7.1%	7.1%	7.1%
25th Percentile	1.9%	1.9%	1.8%	1.9%	1.7%	1.9%	2.0%	1.8%	2.1%	1.9%	1.7%	2.2%	2.0%	2.0%	2.1%
5th Percentile	(6.8%)	(6.8%)	(7.1%)	(6.6%)	(6.7%)	(6.7%)	(6.5%)	(6.9%)	(6.7%)	(6.5%)	(6.6%)	(6.6%)	(6.7%)	(7.2%)	(6.5%)
Prob > 6.5%	53.5%	53.5%	53.1%	53.3%	52.3%	52.4%	52.4%	53.5%	53.0%	52.7%	53.0%	53.9%	52.9%	53.3%	53.6%

Appendix E: Stochastic Analysis Support (continued)

Annualized Compound Return

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Mean	8.2%	7.9%	7.6%	7.4%	7.3%	7.1%	7.1%	7.0%	7.0%	7.0%	6.9%	6.9%	6.9%	6.9%	6.8%
Standard Dev	8.9%	6.2%	5.0%	4.3%	3.8%	3.5%	3.2%	3.0%	2.8%	2.7%	2.6%	2.5%	2.4%	2.3%	2.2%
95th Percentile	22.5%	17.3%	15.2%	13.8%	13.0%	12.3%	11.8%	11.5%	11.3%	11.1%	10.8%	10.7%	10.5%	10.4%	10.3%
75th Percentile	14.3%	12.2%	10.9%	10.3%	9.8%	9.5%	9.2%	9.0%	8.8%	8.7%	8.6%	8.5%	8.5%	8.4%	8.3%
50th Percentile	8.6%	8.3%	8.1%	7.7%	7.5%	7.3%	7.3%	7.2%	7.2%	7.1%	7.0%	7.0%	7.0%	7.0%	7.0%
25th Percentile	2.4%	4.1%	4.6%	4.9%	5.0%	5.1%	5.2%	5.2%	5.3%	5.3%	5.3%	5.4%	5.5%	5.5%	5.5%
5th Percentile	(6.9%)	(2.9%)	(1.1%)	(0.2%)	0.5%	1.2%	1.5%	2.0%	2.2%	2.3%	2.5%	2.6%	2.8%	2.9%	3.1%
Prob > 6.5%	58.8%	61.5%	61.7%	62.0%	61.3%	60.1%	60.2%	60.3%	59.8%	59.7%	58.5%	58.7%	59.1%	58.4%	58.7%

	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Mean	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.7%	6.7%	6.7%
Standard Dev	2.1%	2.1%	2.0%	2.0%	1.9%	1.9%	1.9%	1.8%	1.8%	1.8%	1.7%	1.7%	1.7%	1.6%	1.6%
95th Percentile	10.2%	10.1%	10.0%	9.9%	9.8%	9.8%	9.7%	9.6%	9.5%	9.5%	9.5%	9.4%	9.3%	9.3%	9.2%
75th Percentile	8.3%	8.2%	8.2%	8.1%	8.1%	8.1%	8.0%	8.0%	8.0%	7.9%	7.9%	7.9%	7.9%	7.9%	7.8%
50th Percentile	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.8%	6.8%	6.9%	6.8%	6.9%	6.8%	6.8%	6.8%	6.8%
25th Percentile	5.5%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%
5th Percentile	3.2%	3.3%	3.4%	3.4%	3.5%	3.5%	3.6%	3.6%	3.7%	3.7%	3.8%	3.9%	3.9%	4.0%	4.0%
Prob > 6.5%	58.5%	58.7%	58.5%	58.5%	58.5%	58.0%	57.7%	57.8%	58.2%	58.1%	58.2%	58.1%	57.7%	57.7%	57.7%

Appendix E: Stochastic Analysis Support (continued)

Actuarially Determined Employer Contributions

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Mean	17.1%	17.6%	16.3%	17.1%	14.3%	12.9%	11.8%	11.4%	11.3%	11.1%	11.8%	11.0%	11.1%	11.0%	10.7%
Standard Dev	0.0%	0.5%	2.8%	4.4%	5.9%	6.8%	7.0%	7.2%	7.4%	7.5%	8.2%	7.9%	8.1%	8.1%	7.9%
95th Percentile	17.1%	17.5%	20.6%	24.3%	24.7%	26.0%	26.3%	26.3%	27.1%	27.4%	29.2%	28.2%	28.7%	29.0%	28.6%
75th Percentile	17.1%	17.5%	17.9%	19.9%	18.0%	17.2%	15.8%	15.2%	15.0%	14.6%	16.1%	14.3%	14.5%	14.0%	13.1%
50th Percentile	17.1%	17.5%	16.2%	16.8%	13.7%	11.6%	9.4%	7.9%	7.0%	6.0%	6.3%	6.0%	6.0%	6.0%	6.0%
25th Percentile	17.1%	17.5%	14.6%	14.2%	9.7%	6.3%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
5th Percentile	17.1%	17.5%	12.3%	10.3%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Prob > 6.00%	100.0%	100.0%	100.0%	99.4%	90.8%	76.3%	63.8%	56.6%	53.2%	49.4%	50.7%	44.8%	43.8%	42.0%	40.0%

	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
Mean	10.3%	10.4%	10.4%	10.3%	10.2%	10.0%	9.9%	9.7%	9.5%	9.4%	9.2%	9.1%	9.0%	8.9%	8.8%
Standard Dev	7.6%	7.8%	7.8%	7.8%	7.6%	7.5%	7.3%	7.2%	7.0%	6.9%	6.7%	6.6%	6.4%	6.3%	6.1%
95th Percentile	27.6%	28.1%	28.1%	27.9%	27.7%	27.4%	26.8%	26.4%	26.0%	25.8%	25.1%	24.5%	24.2%	23.7%	23.2%
75th Percentile	12.4%	12.8%	12.5%	12.2%	11.7%	11.4%	10.9%	10.4%	9.6%	8.8%	8.3%	7.9%	7.5%	7.0%	6.8%
50th Percentile	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
25th Percentile	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
5th Percentile	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Prob > 6.00%	37.4%	38.5%	37.4%	36.0%	35.5%	34.1%	32.7%	32.0%	31.0%	30.1%	28.9%	27.7%	26.9%	26.6%	26.0%

Appendix E: Stochastic Analysis Support (continued)

Funded Ratio

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Mean	89.8%	90.0%	90.1%	93.2%	95.8%	98.1%	100.0%	101.7%	103.3%	105.0%	106.6%	108.5%	110.4%	112.4%	114.5%
Standard Dev	1.7%	4.0%	6.4%	9.2%	11.9%	13.9%	15.8%	17.5%	19.2%	21.1%	23.0%	25.0%	27.1%	29.3%	31.4%
95th Percentile	92.2%	95.8%	100.0%	107.4%	114.5%	120.2%	125.9%	130.9%	136.1%	142.2%	147.6%	154.2%	160.7%	167.2%	174.1%
75th Percentile	90.8%	92.5%	94.4%	99.3%	103.6%	107.1%	109.9%	112.6%	114.9%	117.2%	119.5%	122.3%	124.9%	128.1%	130.8%
50th Percentile	89.9%	90.2%	90.5%	93.6%	96.1%	98.3%	99.8%	100.9%	102.4%	103.3%	104.3%	105.3%	106.4%	107.5%	108.6%
25th Percentile	88.9%	87.7%	86.2%	87.4%	88.2%	89.2%	89.6%	90.0%	90.4%	90.4%	91.0%	91.4%	92.0%	92.3%	92.7%
5th Percentile	87.4%	83.9%	79.7%	77.7%	75.6%	74.6%	74.2%	74.3%	73.8%	73.1%	72.8%	73.0%	73.3%	73.3%	73.9%

	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
Mean	116.6%	118.9%	121.1%	123.6%	126.2%	128.8%	131.5%	134.2%	137.0%	139.9%	142.9%	145.9%	149.1%	152.3%
Standard Dev	33.7%	36.1%	38.8%	41.7%	44.6%	47.6%	50.8%	53.9%	56.9%	60.0%	63.2%	66.5%	70.2%	74.0%
95th Percentile	181.3%	187.8%	195.5%	204.3%	211.8%	219.1%	228.5%	238.2%	248.0%	259.3%	267.9%	280.0%	291.1%	301.8%
75th Percentile	133.8%	137.2%	140.2%	143.7%	146.8%	150.5%	154.5%	158.4%	161.8%	166.3%	170.3%	174.4%	178.1%	181.9%
50th Percentile	110.2%	111.6%	112.7%	114.0%	115.3%	116.6%	117.9%	119.1%	120.7%	122.5%	124.5%	126.6%	128.2%	129.5%
25th Percentile	93.1%	93.4%	94.2%	94.6%	95.1%	95.9%	96.6%	97.4%	97.9%	98.5%	99.2%	99.8%	100.6%	100.7%
5th Percentile	74.1%	74.0%	74.1%	74.1%	74.7%	75.1%	75.2%	75.4%	75.8%	76.1%	76.2%	77.0%	77.6%	77.9%

Appendix E: Stochastic Analysis Support (continued)

Asset allocation mapping

Asset Class	Target	Buck Asset Class Mapping
Public Equity	38%	Global Equity
Private Equity	7%	Private Equity
Non-Core Real Estate	3%	Direct Real Estate + 200 bps for Return, 150% of Volatility
Opportunistic Fixed Income	7%	75% Private Debt, 25% High Yield
Investment Grade Fixed Income	28%	27% Long Government, 31.50% Long Corporate, 31.50% Mortgage-Backed Securities, 10% Cash
Pension Cash	5%	Cash
Inflation Sensitive	6%	1/3 TIPS, 1/3 Infrastructure, 1/3 Direct Real Estate
Core Real Estate	5%	80% Direct Real Estate, 20% REITs
Multi-Strategy	1%	Hedge Funds
Total	100%	

Appendix E: Stochastic Analysis Support (continued)

Buck's January 2024 Capital Market Assumptions

	1st Year	10th Year	10 Years			20th Year	20 Years			30th Year	30 Years		
Asset Class	Arithmetic Mean	Arithmetic Mean	Arithmetic Mean	Geometric Mean	Standard Deviation	Arithmetic Mean	Arithmetic Mean	Geometric Mean	Standard Deviation	Arithmetic Mean	Arithmetic Mean	Geometric Mean	Standard Deviation
Global Equity	11.1%	7.9%	8.7%	7.7%	15.1%	7.7%	8.3%	7.3%	14.6%	7.9%	8.1%	7.2%	14.3%
Private Equity	17.0%	10.8%	12.4%	9.6%	25.8%	10.5%	11.5%	8.5%	26.0%	10.8%	11.2%	8.2%	25.9%
Direct Real Estate	4.5%	6.4%	6.3%	5.9%	9.1%	6.4%	6.2%	5.9%	9.1%	6.2%	6.2%	5.8%	9.2%
TSERS Non-Core Real Estate	5.8%	8.4%	8.3%	7.7%	13.6%	8.5%	8.5%	7.7%	13.7%	8.8%	8.5%	7.7%	13.7%
REITs	5.9%	10.6%	8.9%	7.2%	20.4%	10.3%	9.9%	8.1%	20.5%	10.8%	10.1%	8.3%	20.5%
Infrastructure	9.8%	8.8%	8.8%	8.1%	12.8%	8.9%	8.6%	7.9%	12.7%	8.4%	8.6%	7.9%	12.8%
US High Yield	5.1%	9.0%	8.3%	7.5%	13.0%	9.0%	8.6%	7.8%	13.3%	9.3%	8.8%	8.0%	13.3%
Long Government	3.4%	5.2%	4.3%	3.7%	11.0%	5.3%	4.7%	4.1%	11.3%	5.5%	4.9%	4.3%	11.4%
Long Corporate	4.3%	6.0%	5.2%	4.7%	10.4%	6.2%	5.7%	5.1%	10.6%	6.4%	5.9%	5.3%	10.7%
Cash	5.3%	2.8%	3.6%	3.6%	1.8%	2.7%	3.2%	3.1%	1.8%	2.7%	3.0%	3.0%	1.8%
Mortgage-Backed Securities	3.5%	4.5%	4.1%	4.1%	4.0%	4.6%	4.3%	4.3%	4.1%	4.7%	4.5%	4.4%	3.9%
Private Debt	10.2%	8.8%	9.1%	8.8%	8.4%	9.0%	9.0%	8.7%	8.4%	8.8%	8.9%	8.6%	8.4%
TIPS	4.6%	4.6%	4.6%	4.4%	6.4%	4.6%	4.6%	4.4%	6.6%	4.7%	4.6%	4.4%	6.6%
Hedge Funds	7.8%	6.3%	6.8%	6.4%	9.5%	6.4%	6.6%	6.2%	9.5%	6.6%	6.5%	6.1%	9.5%

Appendix E: Stochastic Analysis Support (continued)

Buck's January 2024 Capital Market Assumptions - Correlations

	Global Equity	US All Cap Equity	US Large Cap Equity	US Mid Cap Equity	US Small Cap Equity	Low Volatility Equity	Global Equity ex US	MSCI EAFE Equity	MSCI Emerging Markets Equity	Private Equity	Direct Real Estate	REITs	Infrastructure	Hedge Funds	Commodities	Aggregate Bonds	Global Aggregate Bonds	Short Government	Short Corporate	Short Credit	Short Government/Credit	Intermediate Government	Intermediate Corporate	Intermediate Credit	Intermediate Government/Credit	Core Government	Core Corporate	Core Credit	Core Government/Credit	Long Government	Long Corporate	Long Credit	Long Government/Credit	STRIPS	TIPS	Mortgage-Backed Securities	US High Yield	Emerging Market Debt	Global ex-US Debt	Private Debt	Cash	Inflation	Inflation – Wages	Medical Trend – Professional	Medical Trend – Hospital
Global Equity	1.0																																												
US All Cap Equity	0.9	1.0																																											
US Large Cap Equity	0.9	1.0	1.0																																										
US Mid Cap Equity	0.8	0.9	0.9	1.0																																								
US Small Cap Equity	0.8	0.9	0.8	0.9	1.0																																							
Low Volatility Equity	0.7	0.7	0.7	0.6	0.6	1.0																																							
Global Equity ex US	0.8	0.5	0.5	0.5	0.5	0.3	1.0																																						
MSCI EAFE Equity	0.6	0.3	0.3	0.3	0.3	0.2	0.9	1.0																																					
MSCI Emerging Markets Equity	0.8	0.7	0.7	0.6	0.6	0.5	0.7	0.4	1.0																																				
Private Equity	0.9	1.0	1.0	0.9	0.8	0.7	0.5	0.2	0.7	1.0																																			
Direct Real Estate	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	1.0																																		
REITs	0.5	0.5	0.5	0.5	0.5	0.4	0.3	0.1	0.4	0.5	0.1	1.0																																	
Infrastructure	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.2	0.3	0.1	0.1	1.0																																
Hedge Funds	0.6	0.6	0.6	0.5	0.5	0.4	0.3	0.2	0.4	0.6	0.1	0.3	0.2	1.0																															
Commodities	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	1.0																															
Aggregate Bonds	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.2	1.0																															
Global Aggregate Bonds	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.5	1.0																														
Short Government	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.2	0.9	0.5	1.0																													
Short Corporate	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.2	0.9	0.5	1.0	1.0																												
Short Credit	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.2	0.9	0.5	1.0	1.0	1.0																											
Short Government/ Credit	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.2	0.9	0.5	1.0	1.0	1.0	1.0																										
Intermediate Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	1.0	0.5	1.0	0.9	0.9	1.0	1.0																								
Intermediate Corporate	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2	1.0	0.5	0.9	0.9	0.9	0.9	0.9	1.0																							
Intermediate Credit	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.2	1.0	0.5	0.9	0.9	0.9	0.9	0.9	1.0	1.0																						

Appendix E: Stochastic Analysis Support (continued)

Buck's January 2024 Capital Market Assumptions – Correlations (continued)

	Global Equity	US All Cap Equity	US Large Cap Equity	US Mid Cap Equity	US Small Cap Equity	Low Volatility Equity	Global Equity ex US	MSCI EAFE Equity	MSCI Emerging Markets Equity	Private Equity	Direct Real Estate	REITs	Infrastructure	Hedge Funds	Commodities	Aggregate Bonds	Global Aggregate Bonds	Short Government	Short Corporate	Short Credit	Short Government/Credit	Intermediate Government	Intermediate Corporate	Intermediate Credit	Intermediate Government/Credit	Core Government	Core Corporate	Core Credit	Core Government/Credit	Long Government	Long Corporate	Long Credit	Long Government/Credit	STRIPS	TIPS	Mortgage-Backed Securities	US High Yield	Emerging Market Debt	Global ex-US Debt	Private Debt	Cash	Inflation	Inflation – Wages	Medical Trend – Professional	Medical Trend – Hospital
Intermediate Government/Credit	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.2	1.0	0.5	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0																			
Core Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	1.0	0.5	0.9	0.9	0.9	0.9	1.0	0.9	0.9	1.0	1.0																			
Core Corporate	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.9	0.5	0.8	0.9	0.9	0.8	0.9	1.0	1.0	0.9	0.9	1.0																		
Core Credit	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2	1.0	0.5	0.8	0.9	0.9	0.8	0.9	1.0	1.0	1.0	0.9	1.0	1.0																	
Core Government/Credit	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.2	1.0	0.5	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0																
Long Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.9	0.5	0.8	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.0	0.9	0.9	0.9	1.0															
Long Corporate	0.2	0.2	0.2	0.3	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.9	0.5	0.7	0.8	0.8	0.7	0.8	0.9	0.9	0.9	0.9	1.0	1.0	0.9	0.9	1.0														
Long Credit	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.9	0.5	0.7	0.8	0.8	0.7	0.8	0.9	0.9	0.9	0.9	1.0	1.0	0.9	0.9	1.0	1.0													
Long Government/Credit	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.2	1.0	0.5	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0												
STRIPS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.9	0.5	0.7	0.7	0.7	0.7	0.9	0.8	0.8	0.9	0.9	0.8	0.9	0.9	1.0	0.9	0.9	1.0	1.0											
TIPS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.6	0.6	0.3	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.7	1.0											
Mortgage-Backed Securities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.9	0.5	0.9	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.8	0.8	0.9	0.9	0.6	1.0									
US High Yield	0.6	0.7	0.7	0.6	0.6	0.5	0.3	0.2	0.5	0.7	0.2	0.4	0.2	0.4	0.2	0.6	0.4	0.4	0.6	0.6	0.5	0.5	0.7	0.7	0.6	0.5	0.8	0.7	0.6	0.5	0.8	0.8	0.6	0.5	0.3	0.5	1.0								
Emerging Market Debt	0.5	0.5	0.5	0.4	0.4	0.3	0.5	0.2	0.7	0.5	0.1	0.2	0.1	0.3	0.1	0.0	0.4	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.3	1.0							
Global ex-US Debt	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.2	1.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.3	0.5	1.0						
Private Debt	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.1	0.3	0.4	0.1	0.2	0.1	0.2	0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.2	0.2	0.1	1.0				
Cash	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.2	0.3	0.2	0.6	0.6	0.6	0.6	0.4	0.3	0.3	0.4	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.3	0.4	0.1	0.1	0.1	0.0	1.0			
Inflation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.2	-0.7	-0.3	-0.6	-0.6	-0.6	-0.6	-0.7	-0.6	-0.7	-0.7	-0.7	-0.6	-0.7	-0.7	-0.6	-0.5	-0.6	-0.6	-0.5	-0.2	-0.6	-0.3	0.0	-0.2	0.1	0.1	1.0		
Inflation – Wages	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.2	-0.1	-0.1	0.1	0.1	0.1	0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	0.0	0.0	-0.1	0.0	0.0	0.1	0.6	0.5	1.0	
Medical Trend – Professional	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.5	0.1	0.4	1.0
Medical Trend – Hospital	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.5	0.4	0.7	0.7	1.0

Appendix F: ECRSP Policy

Teachers' and State Employees' Retirement System Board of Trustees

Employer Contribution Rate Stabilization Policy for the Teachers' and State Employees' Retirement System

This ECRSP policy was adopted by the TSERS Board of Trustees at its meeting on April 29, 2021.

Policy Purpose

This policy provides for continued operation of an Employer Contribution Rate Stabilization Policy (ECRSP) for the Teachers' and State Employees' Retirement System (TSERS). On January 21, 2016, the Board of Trustees (Board) of TSERS approved an ECRSP to be in place for fiscal years ending 2017 through 2022. Having adopted the Experience Study of the 2015 - 2019 calendar years on January 28, 2021, which will be effective for plan funding purposes for fiscal years ending 2023 and later, the Board wishes to institute an ECRSP effective for contributions during the five fiscal years ending 2023 through 2027.

Policy Objectives

This policy establishes how the Board will develop an annual appropriation amount to recommend to the General Assembly to fund TSERS and to establish the "required employer contribution rate" pursuant to G.S. 135-8(d)(a3).

Definitions

- Actuarial Measurement

  The result of an analysis by the Board's consulting actuary, presented in a public report, based on actuarial assumptions and methods adopted by the Board for purposes of funding of TSERS.

- Policy Contribution

  The State appropriation to be recommended by the Board under this policy.

- Underlying Actuarially Determined Employer Contribution (Underlying ADEC)

  The amount developed annually by the Board's consulting actuary, representing a funding requirement according to the Board's actuarial assumptions and methods before applying this policy.

Annual Appropriation Recommendation

This policy calls for continuing the approach used for the fiscal years ending 2017 through 2022, whereby the Board recommends an appropriation at least equal to the Underlying ADEC, and also at least equal to the prior year's recommendation (as adjusted) plus 0.35% of retirement eligible compensation. This may result in an appropriation recommendation exceeding the Underlying ADEC.

Accordingly, for each year that this policy is in effect, the Policy Contribution recommended by the Board will be the greater of (1) the Underlying ADEC for the upcoming fiscal year or (2) 0.35% of eligible compensation greater than the appropriation recommended by the Board for the current fiscal year. However, if the Policy Contribution is determined by part (2) of the definition, it can be no greater than (3) the Underlying ADEC if it were determined using a discount rate equal to the annual yield on 30-year U.S. Treasury securities as of the date of the actuarial valuation used to determine the Underlying ADEC for the upcoming fiscal year.

Appendix F: ECRSP Policy (continued)

Teachers' and State Employees' Retirement System Board of Trustees

Employer Contribution Rate Stabilization Policy for the Teachers' and State Employees' Retirement System (continued)

In developing Parts (1) and (3) of this definition, the Underlying ADEC should be adjusted to include the effect of any benefit change enacted by the General Assembly that was not incorporated in the consulting actuary's annual valuation report. This adjustment should be equal to the Actuarial Measurement of the effect of the benefit change for purposes of the legislative actuarial note.

In developing Part (2) of this definition, this policy provides the following guidance.

- The appropriation that was recommended for the current fiscal year should be adjusted for the effect of any permanent cost-of-living allowance (COLA) or other permanent benefit change enacted by the General Assembly, taking effect during the current fiscal year, that was not incorporated in the Board's recommendation for the current fiscal year. This adjustment should be equal to the Actuarial Measurement of the effect of the benefit change on the Underlying ADEC for purposes of the legislative actuarial note.

- The appropriation that was recommended for the current fiscal year should be adjusted for the effect of any one-time supplemental payment (COLA supplements) enacted by the General Assembly, taking effect during the current fiscal year, that was not incorporated in the Board's recommendation for the current fiscal year, only if the General Assembly made a recurring appropriation associated with the supplemental payment. In that case, the adjustment should be equal to the percentage of eligible compensation equivalent to the recurring appropriation. Otherwise, the appropriation that was recommended for the current fiscal year should not be adjusted for the cost of a one-time supplemental payment.

- The appropriation that was recommended for the current fiscal year should be adjusted for the effect of any benefit change enacted by the General Assembly, taking effect during the upcoming fiscal year, including COLA supplements, that was not incorporated in the Board's recommendation for the current fiscal year. This adjustment should be equal to the Actuarial Measurement of the effect of the benefit change on the Underlying ADEC for purposes of the legislative actuarial note.

- The appropriation that was recommended for the current fiscal year should be adjusted for the effect of any changes in actuarial assumptions or methods adopted by the Board that were not incorporated in the Board's recommendation for the current fiscal year. The adjustment should be equal to the Actuarial Measurement of the effect on the Underlying ADEC.

- The appropriation that was recommended for the current fiscal year should exclude any appropriations to the Unfunded Liability Solvency Reserve for distribution to TSERS.

The Policy Contribution will be deemed by the Board to be the annual actuarially determined employer contribution (funding ADEC) and the "required employer contribution rate" for TSERS, pursuant to G.S. 135-8(d)(a3) as in effect at the date of adoption of this policy.

Policy Effective Date

This policy is effective through the fiscal year ending June 30, 2027. The Board may vote to extend it for any period of time.

Gallagher

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