# SERS Stress Test Impact Analysis

Annual Report

2022

Independent Fiscal Office

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# INDEPENDENT FISCAL OFFICE

December 1, 2022

Governor Tom Wolf
The Honorable Members of the General Assembly

Act 128 of 2020 amended Title 71 of the Pennsylvania Consolidated Statutes to require the State Employees' Retirement System (SERS) to conduct an annual stress test of the system and submit the results to the Governor, the General Assembly and the Independent Fiscal Office (IFO). The act directs the IFO to produce a report that summarizes the results, including a calculation of projected employer contributions to projected state General Fund revenues under a scenario analysis. In fulfillment of that obligation, the IFO submits this report to the Governor and members of the General Assembly.

The data and projections used in this report are from various sources. The simulations and related data are from the report entitled *Commonwealth of Pennsylvania State Employees' Retirement System: 2022 Stress Testing and Risk Assessment* produced and certified by SERS and its contracted actuary. Revenue projections were performed by the IFO using data from IHS Markit and the IFO's *Pennsylvania Economic & Budget Outlook: Fiscal Years 2022-23 to 2027-28* released in November 2022. Other data sources are noted within this report.

The office would like to thank SERS and its staff, as well as all other individuals and organizations that assisted in the production of this report. Questions and comments can be submitted to contact@ifo.state.pa.us.

Sincerely,

Matthew J. Knittel

Dr. Matthew J. Knittel
Director

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# SERS Stress Test Impact Analysis

## Introduction

Act 128 of 2020 requires the Independent Fiscal Office (IFO) to summarize the results from the annual State Employees' Retirement System (SERS) Stress Testing and Risk Assessment ("the report"). [1] A stress test compares a set of simulations to certified baseline projections to illustrate the impact that changes in policy, economic or demographic variables could have on a pension system. Act 128 requires that SERS conduct three types of analyses based on published industry guidelines: (1) scenario, (2) simulation and (3) sensitivity.[2] The IFO summary must include a calculation of the ratio of projected employer contributions to projected state revenues under the scenario analysis.

The report includes nine scenarios, one simulation and one sensitivity analysis. The report separates scenarios into three groups based on risk factors:

- **Investment Risk** - Investment performance exceeds or fails to meet the assumed rate of return (6.875% net of fees for years after calendar year 2022).
- **Demographic Risk** - Demographic factors, such as mortality rates and employee salary growth, differ from the baseline.
- **Contribution Risk** - Employers contribute less, or more, than the actuarially defined contribution (ADC).

Of the nine scenarios included in the report, the IFO selected three to summarize (numbers in parentheses correspond to the numbering convention used in the SERS report). They are as follows:

- **Scenario 1: Future Investment Performance (2.1)** - Investment returns are 2% above or below the baseline for the first ten years, then revert to the baseline.
- **Scenario 2: Large Investment Loss (2.2)** - The system experiences a large loss (-20%) in the first year (2022), then reverts to the baseline rate each subsequent year.
- **Scenario 3: Changes in Rates of Member Salary Growth (3.2)** - Salary growth is 2% above or below the baseline for the first ten years, then reverts to the baseline.

The subsections that follow provide a brief description of (1) the methodology used by the IFO to compute the ratio of SERS employer pension contributions to General Fund revenues and (2) SERS baseline projections. The three summary scenarios then follow. The analysis concludes with results from the **simulation (2.4)** and **sensitivity (2.5) analyses** submitted by SERS in its report.

## Methodology

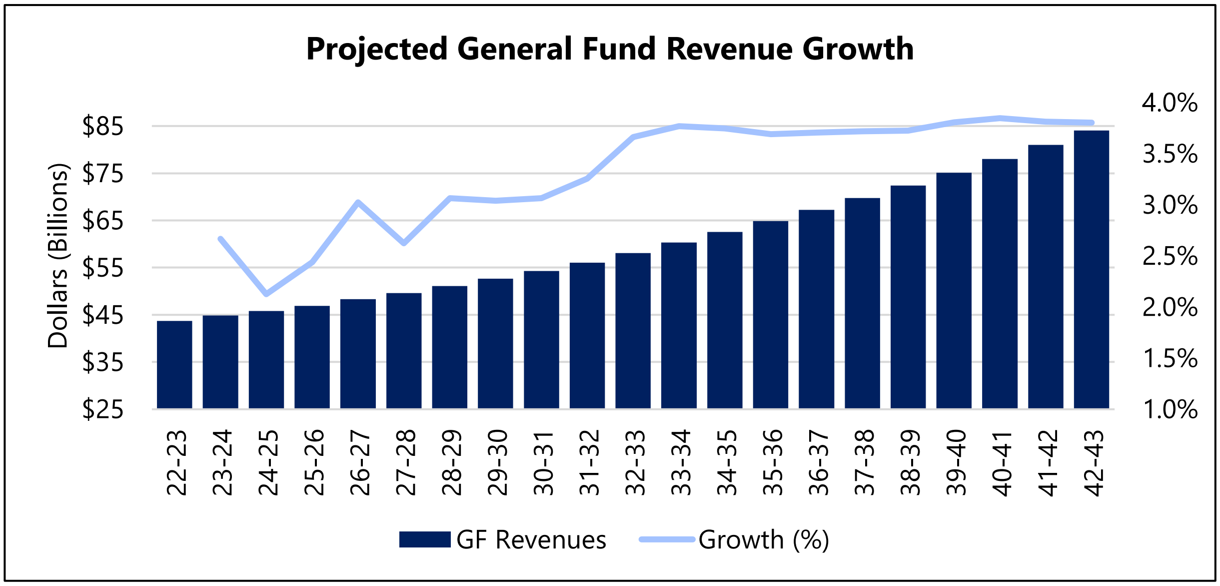
Act 128 requires the IFO to compare employer pension contributions in the scenario analysis to state revenues the Commonwealth is projected to receive in that fiscal year. The report projects the employer contributions as the Actuarially Determined Contributions (ADC) for fiscal years (FY) 2023-24 through FY 2042-43. The IFO regularly projects General Fund revenue collections, and this analysis reflects revenue

[1] See: *Commonwealth of Pennsylvania State Employees' Retirement System 2022 Stress Testing and Risk Assessment* (September 2022) https://sers.pa.gov/pdf/2022-SERS-StressTestingandRiskAssessmentReport.pdf.

[2] A scenario analysis alters a specific parameter or assumed return for a single year or multiple years but does not change the long-term rate of return assumed by the system. A simulation analysis allows future returns to be determined stochastically (i.e., randomly, as opposed to a single deterministic return) over the 20-year window. A sensitivity analysis changes the assumed rate of return in all future years by a specified percentage, such as 1.0 percentage point higher or lower, to display one-year impacts to funding and budgetary measures.

projections and pension contributions attributable only to the General Fund.[3] It does not include revenue projections and pension contributions for federal and state special funds.

General Fund revenue estimates through FY 2027-28 are from the IFO's *Economic and Budget Outlook* (November 2022). Tax revenues for FY 2028-29 and beyond are assumed to grow at the same rate as nominal state GDP (IHS Markit forecast, October 2022). Nontax revenues for FY 2028-29 and beyond are assumed to grow at a rate of 2% per annum. Estimates include the phase-in of the reduced corporate net income tax rate through tax year 2031.




The IFO analysis also projects the share of pension contributions that will be made using General Fund revenues. Using data from the *Economic and Budget Outlook*, the IFO estimates that 48% (FY 2022-23) to 54% (FY 2027-28) of the ADC will come from the General Fund.[4] By FY 2042-43, the share is projected to fall to 52% of contributions. Note that figures include offsets for credits claimed by The Pennsylvania State University and Pennsylvania State System of Higher Education (PASSHE) due to their participation in the pre-funding option provided by Act 105 of 2019.[5,6]

[3] See: *Pennsylvania Economic & Budget Outlook: Fiscal Years 2022-23 to 2027-28* (November 2022) at http://www.ifo.state.pa.us/download.cfm?file=Resources/Documents/Five_Year_Outlook_2022.pdf.
[4] The increase in the ratio of General Fund pension contributions to total contributions is due to the shift of personnel costs from certain state special funds (i.e., Motor License Fund) to the General Fund and other technical factors.
[5] See: *Financial Impact of Act 105 of 2019* (June 2022) at http://www.ifo.state.pa.us/download.cfm?file=Resources/Documents/RB_2022_06_Act_105_Pre-Funding_Impact.pdf.
[6] The projections assume that neither education system uses General Fund revenues for pension contributions.

## Baseline Projections

The table below displays SERS baseline projections. The baseline assumes a net investment return of 7.00% for 2022 and 6.875% for all future years. Fiscal year 2022-23 is consistent across all scenarios as the employer contribution rate and projected payroll have been determined. Therefore, that fiscal year is not included in totals for any table in this report and is displayed for informational purposes only.

**SERS Baseline Projections**

| Fiscal Year | Gen. Fund Revenue | Projected GF ADC | Share of Revenue | Employer ADC (%) | Funded Ratio |
|---|---|---|---|---|---|
| 2022-23 | $43.69 | $1.01 | 2.3% | 31.4% | 70% |
| 2023-24 | 44.85 | 1.03 | 2.3 | 30.4 | 72 |
| 2024-25 | 45.80 | 1.00 | 2.2 | 27.7 | 76 |
| 2025-26 | 46.92 | 0.97 | 2.1 | 25.8 | 79 |
| 2026-27 | 48.34 | 0.95 | 2.0 | 24.2 | 81 |
| 2027-28 | 49.61 | 0.97 | 1.9 | 23.6 | 82 |
| 2028-29 | 51.13 | 0.96 | 1.9 | 22.7 | 84 |
| 2029-30 | 52.68 | 0.95 | 1.8 | 21.9 | 85 |
| 2030-31 | 54.29 | 0.95 | 1.7 | 21.2 | 86 |
| 2031-32 | 56.06 | 0.94 | 1.7 | 20.6 | 87 |
| 2032-33 | 58.11 | 0.94 | 1.6 | 20.1 | 88 |
| 2033-34 | 60.30 | 0.94 | 1.6 | 19.5 | 89 |
| 2034-35 | 62.56 | 0.94 | 1.5 | 19.0 | 91 |
| 2035-36 | 64.87 | 0.94 | 1.5 | 18.5 | 92 |
| 2036-37 | 67.28 | 0.94 | 1.4 | 18.0 | 94 |
| 2037-38 | 69.78 | 0.94 | 1.3 | 17.6 | 96 |
| 2038-39 | 72.38 | 0.94 | 1.3 | 17.1 | 98 |
| 2039-40 | 75.13 | 0.94 | 1.3 | 16.7 | 100 |
| 2040-41 | 78.02 | 0.71 | 0.9 | 12.3 | 102 |
| 2041-42 | 81.00 | 0.55 | 0.7 | 9.3 | 104 |
| 2042-43 | 84.08 | 0.29 | 0.3 | 4.8 | 105 |
| **Total** | **$1,223.20** | **$17.80** | **1.5%** | **18.7%** | **--** |

Notes: Dollars in billions. Baseline ADC from SERS, General Fund projections by the IFO. Funded status refers to end of valuation year that determines rates for associated fiscal year (e.g., FY 2022-23 funded status is of December 31, 2021).

The projected share of the General Fund ADC accounts for 2.3% of General Fund revenues in FY 2022-23 and falls to 0.3% in FY 2042-43 if all assumptions and projections hold. From FY 2023-24 to FY 2042-43, the forecast projects that the Commonwealth will contribute $17.80 billion in General Fund revenues (1.5% of revenues) to SERS for employee pensions.

The report also details the projected employer contribution rate as a share of payroll. This employer contribution rate reflects future changes in plan participation, including impacts from Act 5 of 2017. Baseline effective employer contribution rates begin at 31.4% in FY 2022-23 and fall to 4.8% by FY 2042-43. The final column of the table displays the system's projected funded level in the baseline scenario at the end of the calendar/valuation year. If current projections hold, the fund will reach 100% funded status in 2038, and 105% funded status by 2041.

## Scenario 1: Future Investment Performance

The first scenario illustrates the potential impact from long-term investment over or underperformance on required employer contributions. For the scenario, SERS modeled the impact of the fund outperforming or underperforming the assumed net investment rate of return by 2% (200 basis points) each year for the first ten years, followed by reversion to the baseline rate of return (6.875%) for future years. The table below displays the 20-year projections (five-year increments) if the fund underperformed its assumed net investment rate of return by 2% each year for ten years.

**Future Investment Performance (2% Underperformance)**

| Fiscal Years Ending | Gen. Fund Revenue | Projected GF ADC | Share of Revenue | Change from Baseline Percent | Change from Baseline Amount |
|---|---|---|---|---|---|
| 2024-28 | $235.52 | $5.15 | 2.2% | 4.6% | $0.23 |
| 2029-33 | 272.28 | 5.79 | 2.1 | 22.4 | 1.06 |
| 2034-38 | 324.79 | 6.45 | 2.0 | 37.1 | 1.75 |
| 2039-43 | 390.61 | 5.30 | 1.4 | 54.2 | 1.86 |
| **Total** | **$1,223.20** | **$22.70** | **1.9%** | **27.5%** | **$4.89** |

Notes: Dollars in billions. Baseline ADC from SERS, General Fund projections by the IFO.

If long-term underperformance occurs, then employers would contribute $4.89 billion (27.5%) more than the baseline scenario and total General Fund contributions would increase to $22.70 billion. The impact from long-term underperformance compounds over time and results in contributions that are 54% higher in the final five years of the projection period compared to the baseline. The system's funded status is 92% in 2041, 13 percentage points lower than the baseline (not shown).

The table on the next page displays results from 2% overperformance for the first ten years. In the overperformance scenario, cumulative savings ($5.21 billion) exceed additional costs in the underperformance scenario ($4.89 billion) and reduces employer contributions by 29% compared to the baseline. By the end of the projection period, the funded ratio is 121%, 16 percentage points higher than the baseline (not shown).

| Future Investment Performance (2% Overperformance) | | | | | |
|---|---|---|---|---|---|
| Fiscal Years Ending | Gen. Fund Revenue | Projected GF ADC | Share of Revenue | Change from Baseline | |
| | | | | Percent | Amount |
| 2024-28 | $235.52 | $4.69 | 2.0% | -4.9% | -$0.24 |
| 2029-33 | 272.28 | 3.54 | 1.3 | -25.1 | -1.19 |
| 2034-38 | 324.79 | 2.61 | 0.8 | -44.6 | -2.10 |
| 2039-43 | 390.61 | 1.75 | 0.4 | -49.1 | -1.69 |
| **Total** | **$1,223.20** | **$12.59** | **1.0%** | **-29.3%** | **-$5.21** |

Notes: Dollars in billions. Baseline ADC from SERS, General Fund projections by the IFO.

## Scenario 2: Large Investment Loss

The second scenario considers the impact from a single-year large investment loss on the system. The scenario assumes a -20% net investment return in 2022 and immediate reversion to the baseline return in all future years. This is a notable scenario because major stock market indexes have declined significantly to date in 2022. For the *Economic and Budget Outlook*, the IFO requested a simulation from SERS that assumed a -10% net investment return for 2022, and through November 30, the S&P 500 Index was down 14.4% from the end of 2021.

| Large Investment Loss (-20% Return CY 2022) | | | | | |
|---|---|---|---|---|---|
| Fiscal Years Ending | Gen. Fund Revenue | Projected GF ADC | Share of Revenue | Change from Baseline | |
| | | | | Percent | Amount |
| 2024-28 | $235.52 | $6.25 | 2.7% | 26.8% | $1.32 |
| 2029-33 | 272.28 | 7.16 | 2.6 | 51.3 | 2.43 |
| 2034-38 | 324.79 | 7.16 | 2.2 | 52.1 | 2.45 |
| 2039-43 | 390.61 | 5.89 | 1.5 | 71.5 | 2.46 |
| **Total** | **$1,223.20** | **$26.46** | **2.2%** | **48.6%** | **$8.65** |

Notes: Dollars in billions. Baseline ADC from SERS, General Fund projections by the IFO.

The significant investment loss increases employer contributions by $8.65 billion over the 20-year period. This amount is 77% higher than the $4.89 billion from the ten-year 2% underperformance scenario (page four). Over the 20 years, required employer contributions are 2.2% (+0.7 percentage points) of projected General Fund revenues, and the system achieves 90% funded status by 2041 (15 percentage points lower than the baseline). For 2022, the funded status would be 68% – four percentage points lower than the baseline, and two percentage points lower than the prior year.

## Scenario 3: Member Salary Growth

The third scenario considers changes in the rate of salary growth for participating employees. The scenario assumes that the salary scale is the same as used in the December 31, 2021 Actuarial Valuation but increases or decreases by 2 percentage points in each of the first 10 years, then reverts to the baseline assumptions for all future years.[7] Although assumed growth rates revert to baseline assumptions in year 11, it should be noted that payroll will be much higher in the reversion year due to the cumulative impact of the additional 2 percentage point growth for the first ten years of the projection.[8] The tables below do not include the actual costs of the salaries, or any other personnel costs that may be related to salary (e.g., Social Security) other than SERS employer pension contributions.

The tables that follow display the impact if salary growth is 2 percentage points higher or lower than the baseline assumptions. The SERS baseline assumes employee salaries of $6.65 billion in FY 2022-23, and the IFO estimates that the General Fund will supply approximately $3.11 billion. That amount does not include the state university system, state-related universities and other non-Commonwealth agencies that participate in SERS.

**Member Salary Growth (+2% in Projected Growth)**

| Fiscal | Gen. Fund | Projected | Share of | Change from Baseline | |
|---|---|---|---|---|---|
| Years Ending | Revenue | GF ADC | Revenue | Percent | Amount |
| 2024-28 | $235.52 | $5.25 | 2.2% | 6.5% | $0.32 |
| 2029-33 | 272.28 | 5.75 | 2.1 | 21.5 | 1.02 |
| 2034-38 | 324.79 | 6.06 | 1.9 | 28.8 | 1.35 |
| 2039-43 | 390.61 | 4.79 | 1.2 | 39.5 | 1.36 |
| **Total** | **$1,223.20** | **$21.85** | **1.8%** | **22.8%** | **$4.05** |

Notes: Dollars in billions. Baseline ADC from SERS, General Fund projections by the IFO.

If employee payroll growth exceeds baseline assumptions by 2 percentage points in each of the first ten years, then employer pension contributions (General Fund portion only) would increase by $4.05 billion. Using the payroll projections from the report, employee salaries increase by nearly $32 billion over the 20-year projection period, and approximately half are funded by the General Fund. Approximately $20 billion in General Fund salary and pension costs would be added to the budget over 20 years, prior to inclusion of other personnel costs (e.g., healthcare costs and Social Security contributions). The scenario results in a funded ratio of 99% by the end of the 20-year period (six percentage points lower than the baseline).

If payroll grows 2% slower than the baseline, then General Fund savings are approximately $17 billion: $3.37 billion from reduced pension contributions and the remainder from lower salaries. The scenario results in a funded ratio of 116% at the end of the 20-year period (11 percentage points higher than the baseline).

[7] See: *Commonwealth of Pennsylvania State Employees' Retirement System 2021 Actuarial Report* (June 2022) at https://sers.pa.gov/pdf/Actuarial_Valuations/ActuarialValuation2021.pdf.

[8] For context, the baseline assumes an average annual payroll growth of 2.8%.

**Member Salary Growth (-2% in Projected Growth)**

| Fiscal Years Ending | Gen. Fund Revenue | Projected GF ADC | Share of Revenue | Change from Baseline | |
|---|---|---|---|---|---|
| | | | | Percent | Amount |
| 2024-28 | $235.52 | $4.63 | 2.0% | -6.0% | -$0.30 |
| 2029-33 | 272.28 | 3.85 | 1.4 | -18.6 | -0.88 |
| 2034-38 | 324.79 | 3.56 | 1.1 | -24.4 | -1.15 |
| 2039-43 | 390.61 | 2.39 | 0.6 | -30.4 | -1.04 |
| **Total** | **$1,223.20** | **$14.43** | **1.2%** | **-18.9%** | **-$3.37** |

Notes: Dollars in billions. Baseline ADC from SERS, General Fund projections by the IFO.

## Summary of Simulation and Sensitivity Analyses

In addition to various scenarios, the report includes a simulation analysis and a sensitivity analysis. The **Simulation Analysis (2.4)** is a stochastic analysis that uses results from 5,000 simulated investment returns over a 20-year period to illustrate the likelihood of potential outcomes for the system. The analysis presents four potential outcomes from the simulations based on the distribution of outcomes. The figures in the table below represent average returns over the 20 years, 20-year totals or final ratios at the end of year 20 (final column):

- 5th Percentile: A highly unlikely scenario, strong favorable results.
- 25th Percentile: A reasonably likely, favorable scenario.
- 75th Percentile: A reasonably likely, unfavorable scenario.
- 95th Percentile: A highly unlikely scenario, strong unfavorable results.

**Summary Results from Simulation Analysis**

| Distribution Percentiles | Average Return (%) | Additional ADC (Total) | Additional ADC (GF) | Final Fund. Ratio (%) |
|---|---|---|---|---|
| 5th Percentile | 11.8% | -$21.73 | -$10.82 | 187% |
| 25th Percentile | 8.5 | -15.58 | -7.77 | 129 |
| Baseline | 6.9 | -- | -- | 105 |
| 75th Percentile | 4.1 | 20.10 | 10.02 | 69 |
| 95th Percentile | 0.9 | 36.17 | 18.03 | 45 |

Notes: Dollars in billions. Data from SERS, General Fund projections by the IFO.

Results from the **Sensitivity Analysis (2.5)** do not quantify 20-year impacts. Instead, the analysis shows the initial impact that a change in the assumed net investment rate of return would have on several metrics in the first projection year. These metrics include total and employer normal cost rates (as a share of payroll), employer contributions, unfunded actuarial accrued liability (UAAL) and the funded ratio. The table below summarizes the impact on two of those measures. The valuation would be as of December 31, 2022 and would also be the effective date of the funded ratio. The impact on employer contributions represents a single fiscal year (FY 2023-24) but would also impact future contribution rates and amounts (not simulated).

**Summary Results from Sensitivity Analysis (FY 2023-24)**

| Assumed Invest. Return Rate | Change from Baseline (%) | Additional ADC (Total) | Additional ADC (GF) | Funded Ratio (%) |
|---|---|---|---|---|
| 7.875% | +1.00% | -$0.46 | -$0.21 | 79.46% |
| 6.875 | -- | -- | -- | 72.47 |
| 5.875 | -1.00 | 0.49 | 0.23 | 65.69 |
| 4.875 | -2.00 | 1.04 | 0.48 | 59.15 |

Notes: Dollars in billions. Data from SERS, General Fund projections by the IFO.