

TEACHERS' RETIREMENT SYSTEM OF THE STATE OF ILLINOIS

Discussion of Valuation Results

Actuarial Valuation as of June 30, 2019

Kim Nicholl, FSA, MAAA, FCA, EA

Matt Strom, FSA, MAAA, EA

October 29, 2019

This document has been prepared by Segal Consulting for the benefit of the Board of Trustees of the Teachers' Retirement System of the State of Illinois and is not complete without the presentation provided at the October 29, 2019 meeting of the Board of Trustees. This document should not be shared, copied or quoted, in whole or in part, without the consent of Segal Consulting, except to the extent otherwise required by law. Except where otherwise specifically noted, the actuarial calculations and projections were completed under the supervision of Matthew A. Strom, FSA, MAAA, Enrolled Actuary.

Discussion Topics

- Overview of the Valuation Process
- Summary of Valuation Highlights
- Membership and Demographics
- Valuation Results
- Sensitivity Projections
- Risk Assessment

Purposes of the Actuarial Valuation

- Report the System's actuarial assets
- Calculate the System's liabilities
- Determine the funding progress
- Calculate the Actuarially Determined Contribution
 - Board-Adopted Actuarial Funding Policy
- Determine the contribution under the Statutory Funding Plan
- Explore reasons why the current valuation differs from prior valuations
- Provide information for annual financial statements

The Valuation Process

Input

Member Data
Asset Information
Benefit Provisions
Actuarial Assumptions
Funding Methodology



Results

Actuarial Value of Assets
Normal Cost and Actuarial Liability
Unfunded Liability and Funded Ratio
Statutory Contribution
Actuarially Determined Employer Contribution
Accounting Results

Actuarial Assumptions

Two types:

Demographic

- Retirement
- Disability
- Withdrawal
- Mortality

Economic

- Inflation – 2.50%
- Interest rate – 7.00%, net of investment expenses
- Salary increases – 9.50% for members with one year of service to 4.00% for members with 20 or more years of service
- Payroll growth – based on open group projection with a level active population and new entrants similar to newly hired employees

Economic assumptions are reviewed annually and demographic assumptions are reviewed every three years.

Actuarial Methods

Asset Valuation Method (Actuarial Assets)

- Investment gains and losses recognized over a number of years
 - TRS uses a five-year smoothing period

Cost Method

- Allocation of liability to past and future service
- Projected unit credit required for **Statutory Contribution**
 - Current year's cost based on value of benefit earned that year, using projected salary
 - Results in back loading of normal cost
- Entry age normal used for **Board-Adopted Actuarial Funding Policy**
 - Allocates cost of member's benefit over expected career as a level % of salary
 - Most common cost method among public sector retirement systems
 - Required by GASB

Amortization Method

- **Statutory Contribution**
 - No explicit method to amortize the UAAL; the total contribution less the normal cost is the payment toward the UAAL
- **Board-Adopted Actuarial Funding Policy**
 - Layered amortization with new UAAL amortized over 20 years
 - Amortization payments increase at the rate of future State revenue growth, assumed to be 2%

Actuarially Determined Contribution vs. Statutory Contribution

Actuarially Determined Contribution (Board-Adopted Actuarial Funding Policy)

- Equal to the normal cost plus amortization of the unfunded actuarial accrued liability (UAAL)
- Benefits:
 - Entry age normal cost method
 - 100% funding target
 - Reflects appropriate tier of benefits of those in TRS, not those to be hired

Statutory Contribution under Illinois Funding Policy

- Equal to amount determined as a level percentage of payroll necessary to achieve a projected funded percentage of 90% by 2045
- Shortcomings:
 - Projected unit credit cost method
 - 90% funding target
 - Reflects effect of Tier II provisions for members who have not yet been hired

The Actuarially Determined Contribution is compared to the Statutory Contribution as measure of the inadequacy of the Statutory Contribution.

Changes Since Last Year's Valuation

➤ Public Act 101-0010

- The 3% “FAS Cap” threshold was reverted back to 6%
- The Automatic Annual Increase (AAI) and Inactive Vested buyouts were extended through fiscal year ending June 30, 2024

➤ Assumption changes

- AAI buyout election percent was updated from 25% to 15% to better reflect expectation
- Additionally, buyout payments were limited to a \$650M cap
- The impact of these changes increased the actuarial accrued liability as of June 30, 2019 by \$80M and increased the FY 2021 contribution by \$2M

Summary of Valuation Highlights

- Required State contribution for fiscal 2021 is \$5.14 billion, a 7% increase from the fiscal 2020 contribution of \$4.81 billion
- The fiscal 2021 State contribution under the Board-Adopted Actuarial Funding Policy is \$8.34 billion
 - Statutory contribution is approximately 60% of the Board funding policy amount
 - The \$3.20 billion contribution shortfall increases future contribution requirements
- Fair value of assets returned 5.1% for year ending 6/30/19 (Segal calculation)
 - Gradual recognition of deferred gains and losses resulted in a 5.8% return on actuarial assets, compared to 7.0% expected
 - Loss on actuarial value of assets is \$590 million
- Demographic and liability experience resulted in a loss of \$352 million
- Funded ratio based on the actuarial value of assets decreased from 40.7% in 2018 to 40.6% in 2019
- The actuarial accrued liability increased from \$127.0 billion (as of June 30, 2018) to \$131.5 billion (as of June 30, 2019)
- The unfunded actuarial accrued liability (UAAL) increased from \$75.3 billion to \$78.1 billion
 - \$2.8 billion increase results from net experience loss (\$0.9 billion), small loss from assumption changes related to buyout provisions (\$0.1 billion), and inadequate State contributions (\$1.8 billion)

Membership

Active membership statistics

	June 30, 2019	June 30, 2018	Change
Number			
Tier I	119,572	123,933	-3.5%
Tier II	<u>41,180</u>	<u>36,492</u>	+12.8%
Total	160,752	160,425	+0.2%
Average Salary (full-time/regular part-time)	\$73,106	\$71,845	+1.8%
Median Salary (full-time/regular part-time)	66,795	65,630	+1.8%
Average Age	42.6 years	42.4 years	
Average Total Service	11.3 years	11.2 years	

Member data used in the valuation is as of the prior valuation date.

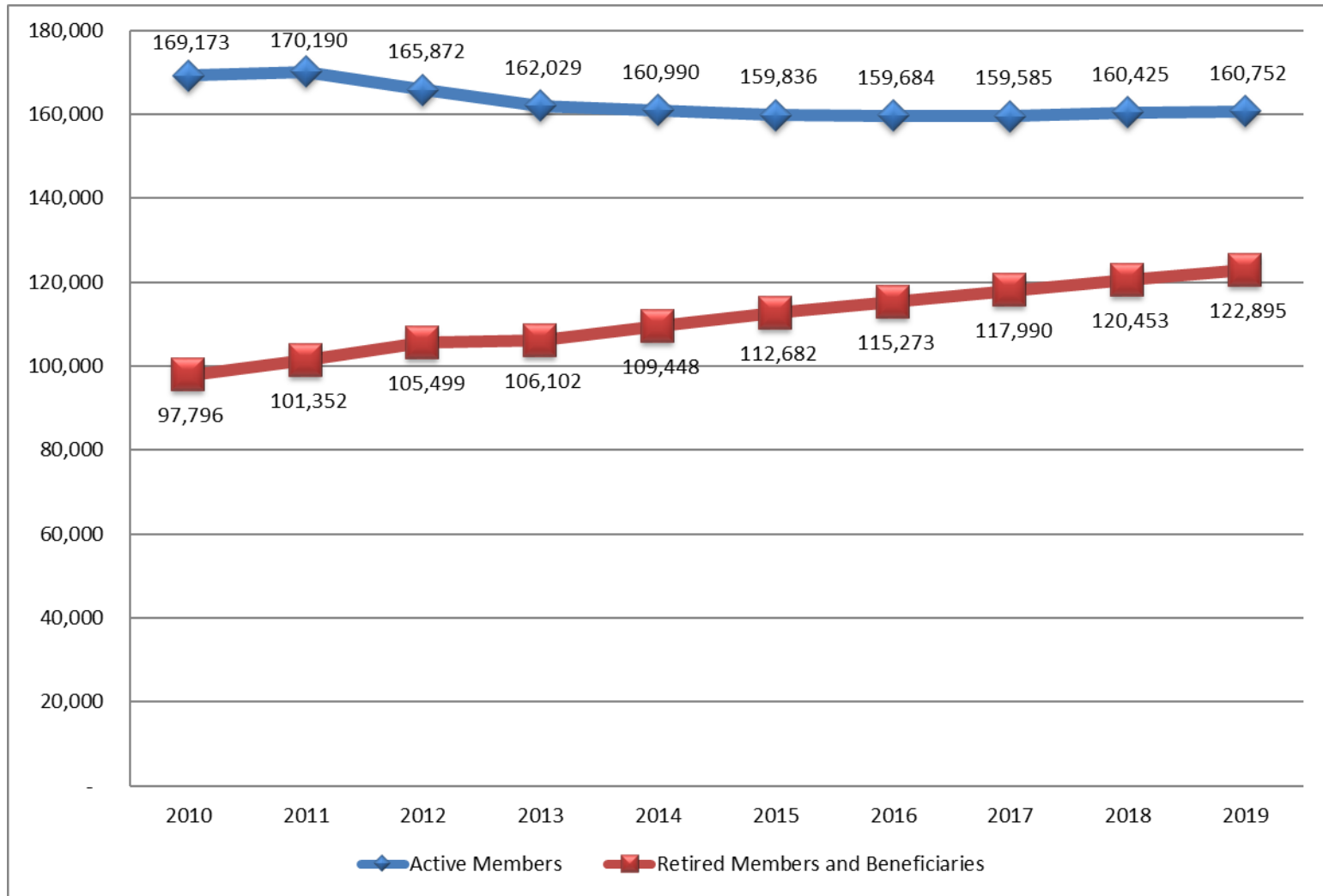
Membership

Retiree and beneficiary statistics

	June 30, 2019	June 30, 2018	Change
Number	122,895	120,453	+2.0%
Annual Annuities	\$6.640 billion	\$6.336 billion	+4.8%
Average Age	72.4 years	72.1 years	
Average Monthly Benefit	\$4,502	\$4,384	+2.7%

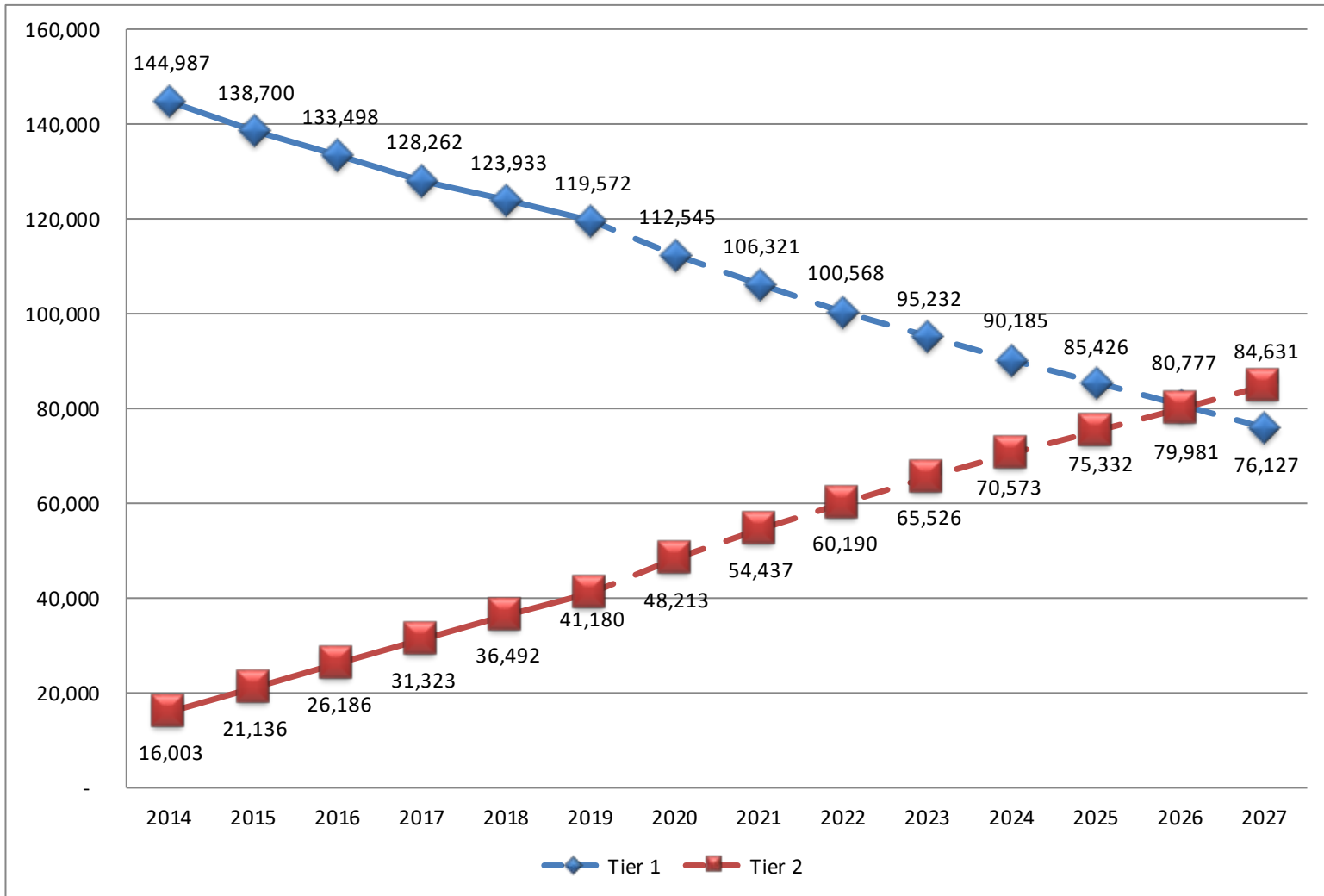
Member data used in the valuation is as of the prior valuation date.

Active and Retired Membership



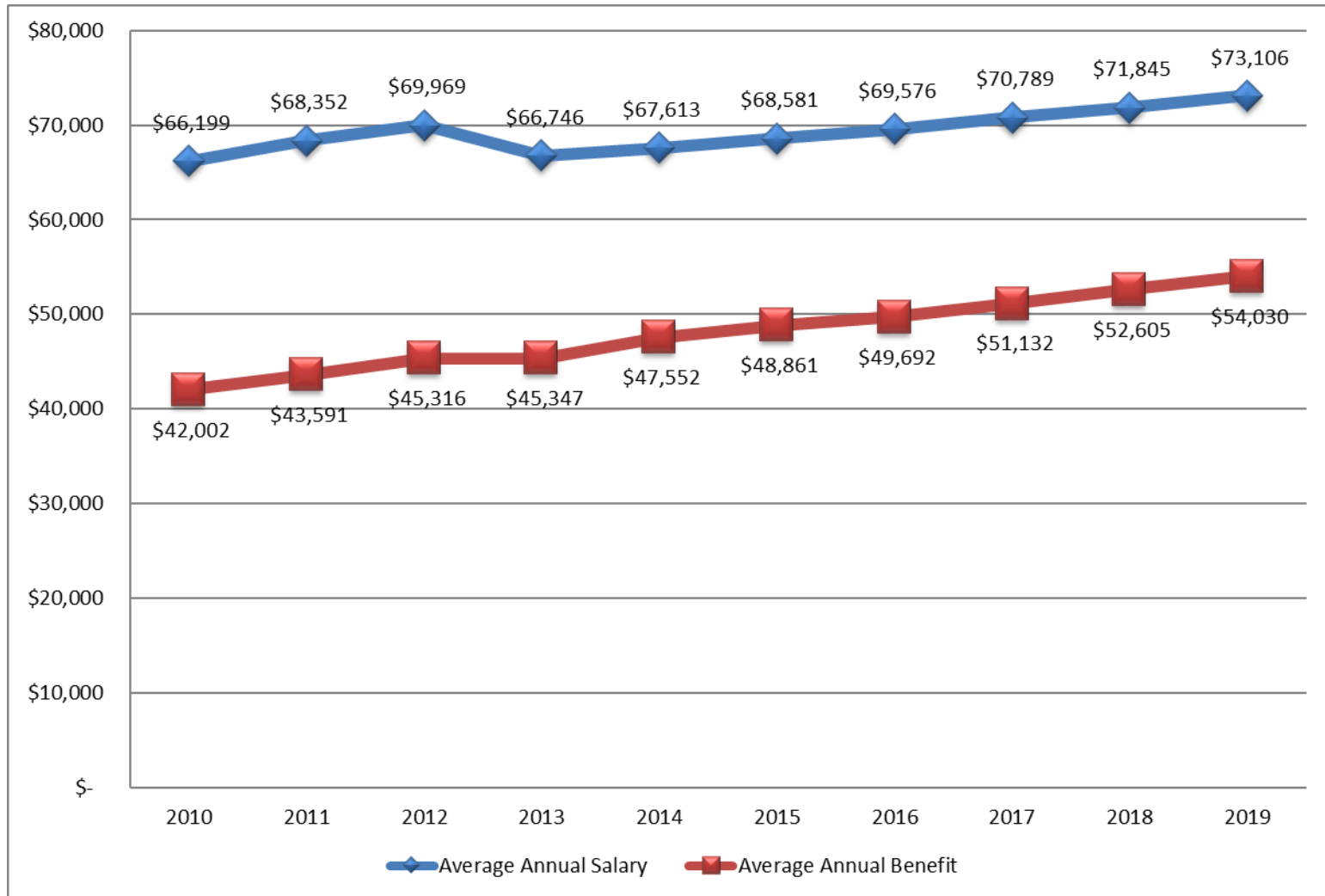
Active member and annuitant data used in the valuation is as of the prior valuation date. Prior to 2013, annuitant data used in the valuation was as of the valuation date.

Projection of Active Membership by Tier



Active member data used in the valuation is as of the prior valuation date.
Dashed lines represent a projection of membership.

Average Salary and Average Benefit



The average annual benefit for all benefit recipients has increased by 3.2% per year. Starting in 2013, salaries were revised to reflect the reported rate of pensionable salary.

Assets

- The fair value of assets increased from \$52.0 billion (as of June 30, 2018) to \$53.3 billion (as of June 30, 2019)
 - Segal determined the investment return was +5.1%, net of investment expenses
- The actuarial value of assets – which smoothes unexpected investment gains and losses over five years – increased from \$51.7 billion (as of June 30, 2018) to \$53.4 billion (as of June 30, 2019)
 - Return of +5.8%, net of investment expenses
 - Actuarial value is 100.2% of fair value
 - There is a total of \$129 million of deferred investment losses that will be recognized in future years
- Average annual returns are:

	Fair Value	Actuarial Value
5-year average	5.8%	7.8%
10-year average	9.4%	6.3%
15-year average	6.8%	6.7%
20-year average	6.2%	6.2%

Assets

Fair Value of Assets (in millions)

	June 30, 2019	June 30, 2018
Beginning of Year	\$51,970	\$49,376
Contributions		
> State	\$4,466	\$4,095
> Employers	89	85
> Members	<u>964</u>	<u>938</u>
> Total	\$5,519	\$5,118
Benefits Paid	(6,819)	(6,551)
Administrative Expenses	(24)	(22)
Investment Income (net)	<u>2,616</u>	<u>4,049</u>
End of Year	\$53,262	\$51,970
Rate of Return	+5.10%	+8.32%

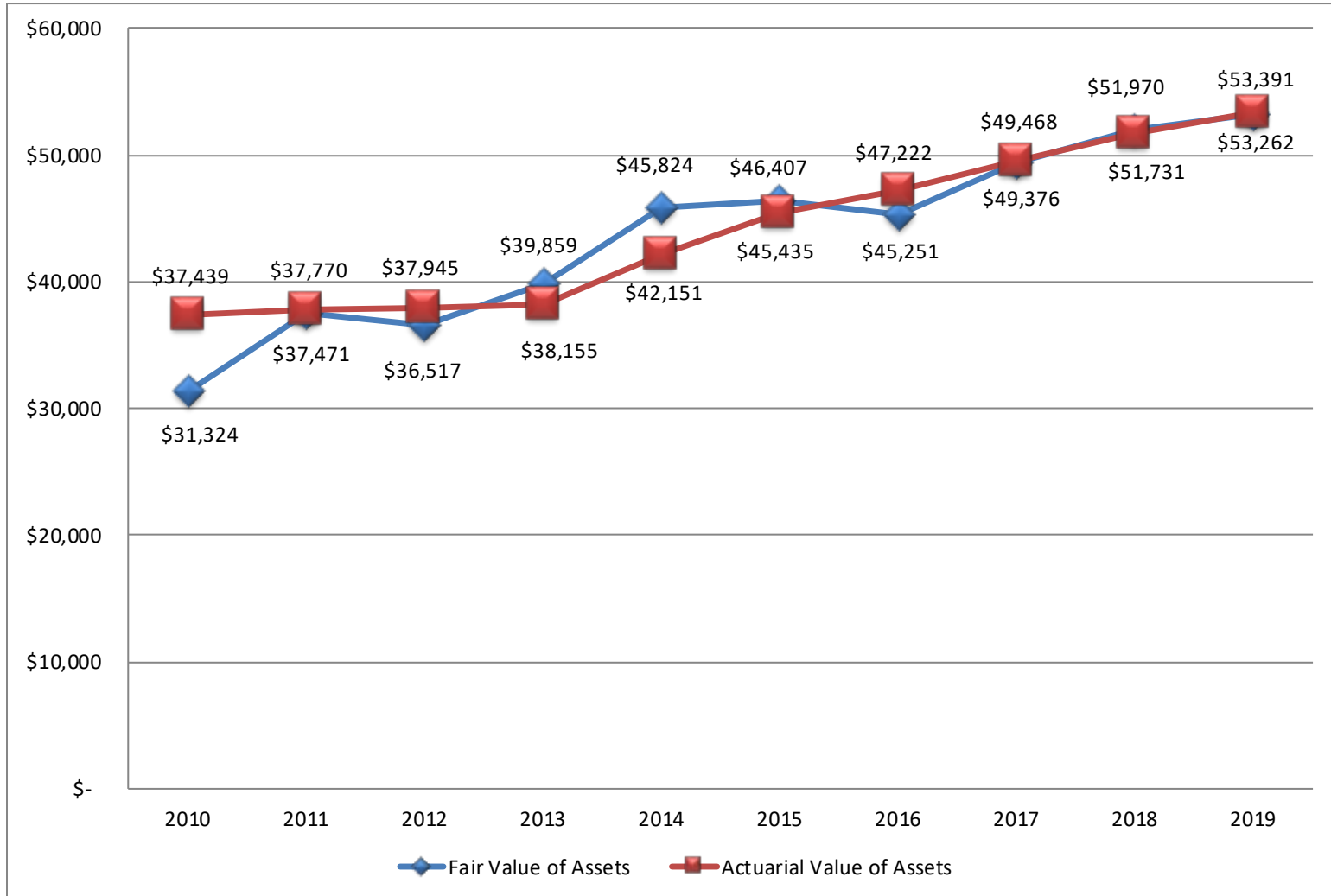
Assets

Actuarial Value of Pension Assets (in millions)

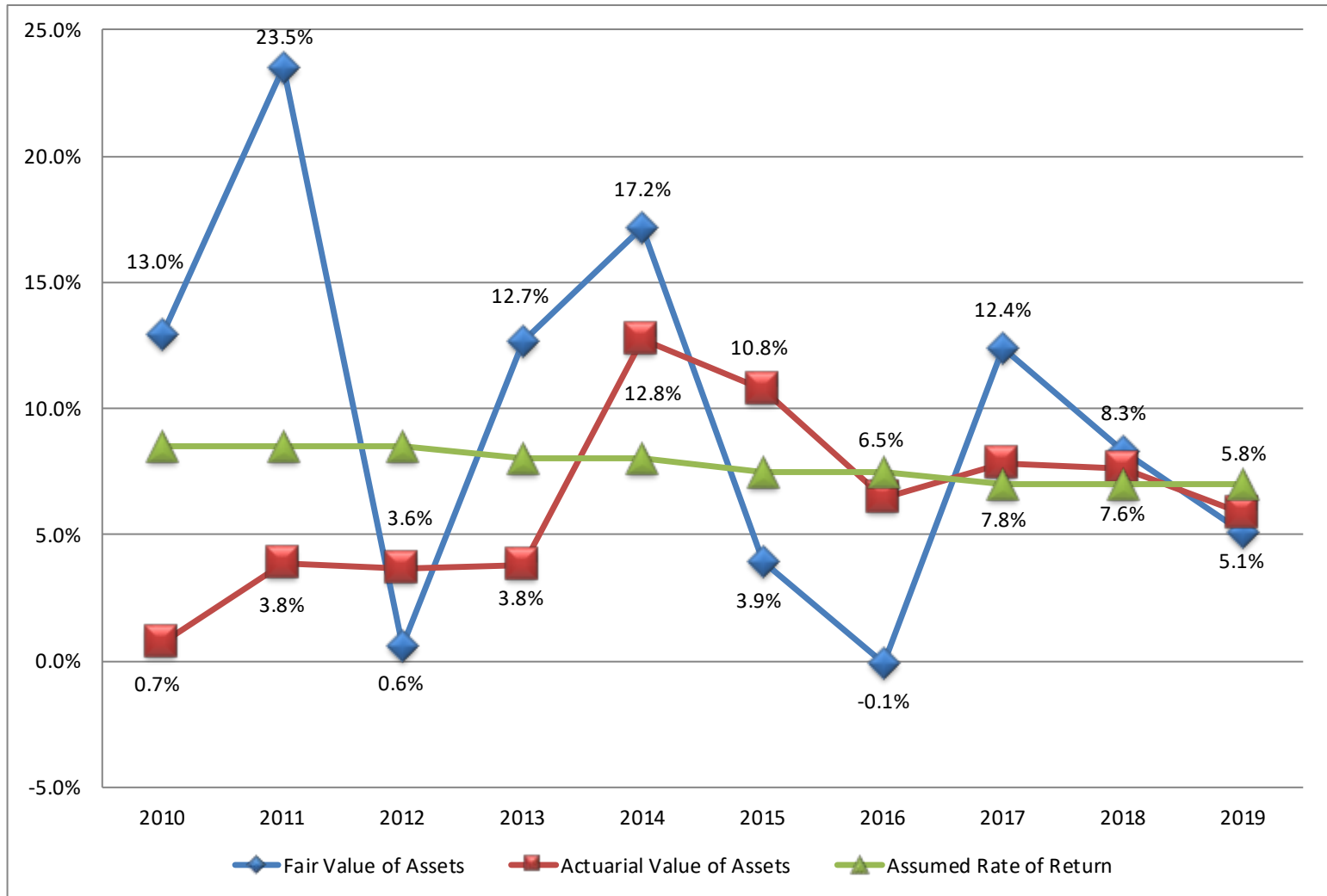
Fair Value of Pension Assets as of June 30, 2019			\$53,262
Gain or (Loss) on Assets	Original Amount	% Deferred	Deferred Amount
Year ended June 30, 2019	(\$974)	80%	(\$779)
Year ended June 30, 2018	644	60%	386
Year ended June 30, 2017	2,402	40%	961
Year ended June 30, 2016	(3,483)	20%	(697)
Year ended June 30, 2015	(1,622)	0%	<u>0</u>
Total			(\$129)
Actuarial Value as of June 30, 2019			\$53,391
Actuarial Value as a Percent of Fair Value			100.2%
Rate of Return			5.84%

Fair and Actuarial Values of Assets

\$ Millions

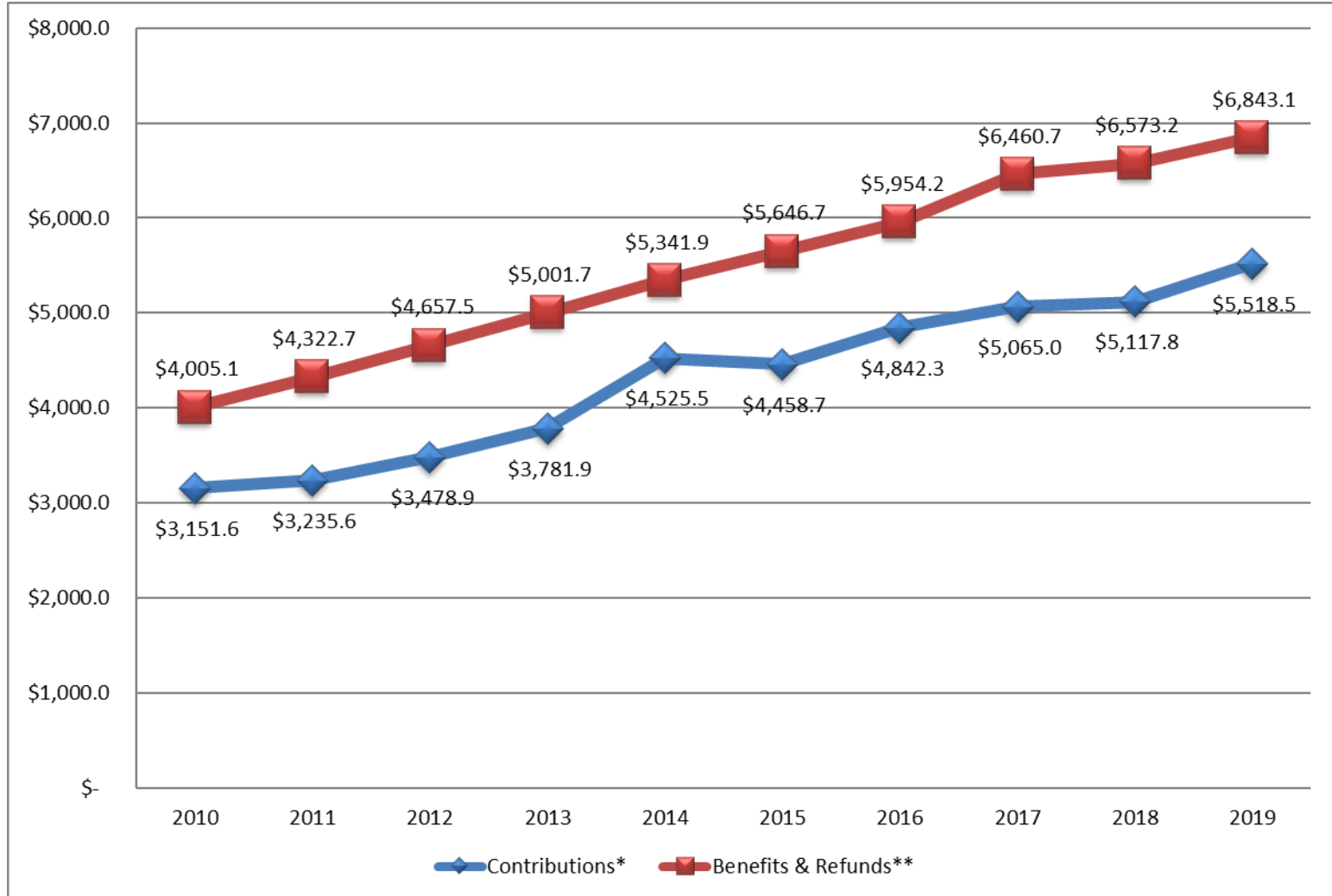


Asset Returns



Contributions vs Disbursements

\$ Millions



* Includes member, employer and state contributions

** Includes benefit payments, refunds and administrative expenses

Valuation Results

Comparison of current year to prior year (in millions)

	June 30, 2019	June 30, 2018
Actuarial Accrued Liability:		
• Active Members	\$42,130	\$40,890
• Retirees and Beneficiaries	85,789	82,968
• Inactive Members with Deferred Benefits	<u>3,538</u>	<u>3,161</u>
Total	\$131,457	\$127,019
Actuarial Assets	<u>53,391</u>	<u>51,731</u>
Unfunded Accrued Liability	\$78,066	\$75,288
Funded Ratio	40.6%	40.7%

Valuation Results

Summary of State Contribution for Fiscal Year (in millions)

	FY 2021	FY 2020
Based on Statutory Funding Plan	\$5,141	\$4,814
Based on Board-Adopted Actuarial Funding Policy	8,344	7,879
Difference Between Statutory Amount and Board-Adopted Actuarial Funding Policy	\$3,203	\$3,065

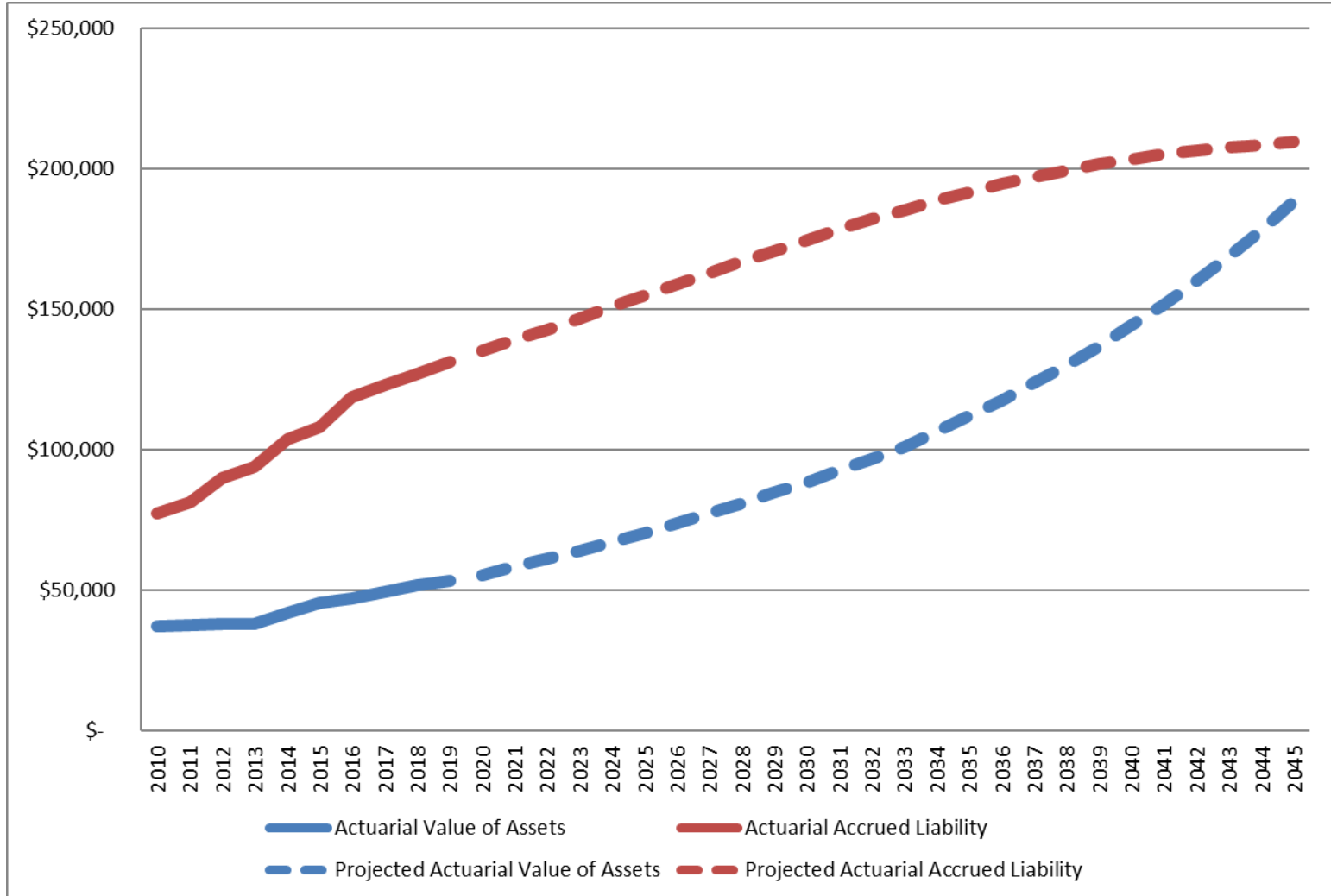
Valuation Results

Reconciliation of State Statutory Funding Plan Contribution
from Fiscal Year 2020 to 2021 (in millions)

	Statutory Funding Contribution
FY 2020 State Contribution	\$4,814
Expected Increase	263
Investment Loss	12
All Other Net Actuarial Losses	50
Assumption Changes	<u>2</u>
FY 2021 State Contribution	\$5,141

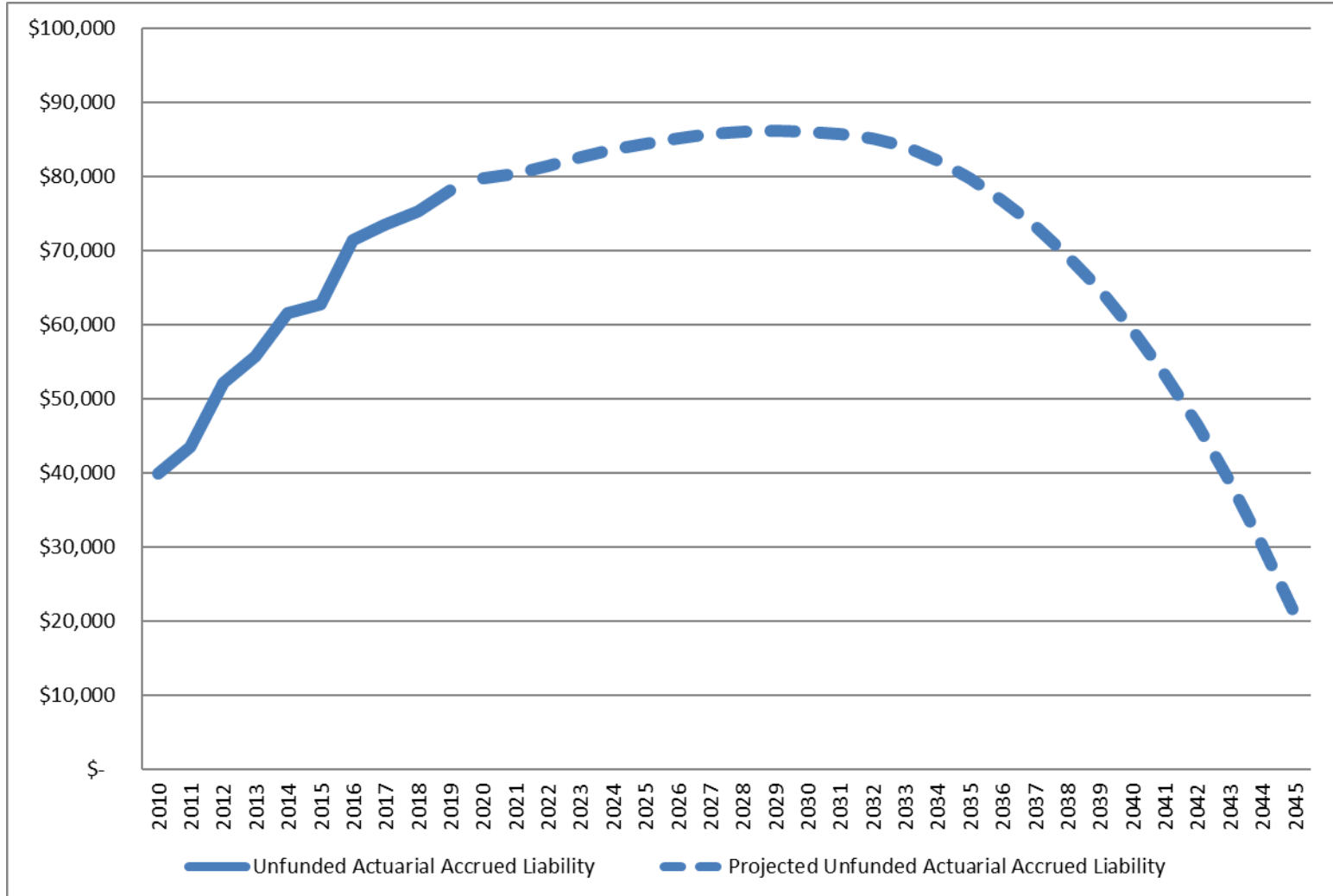
Assets and Liabilities

\$ Millions

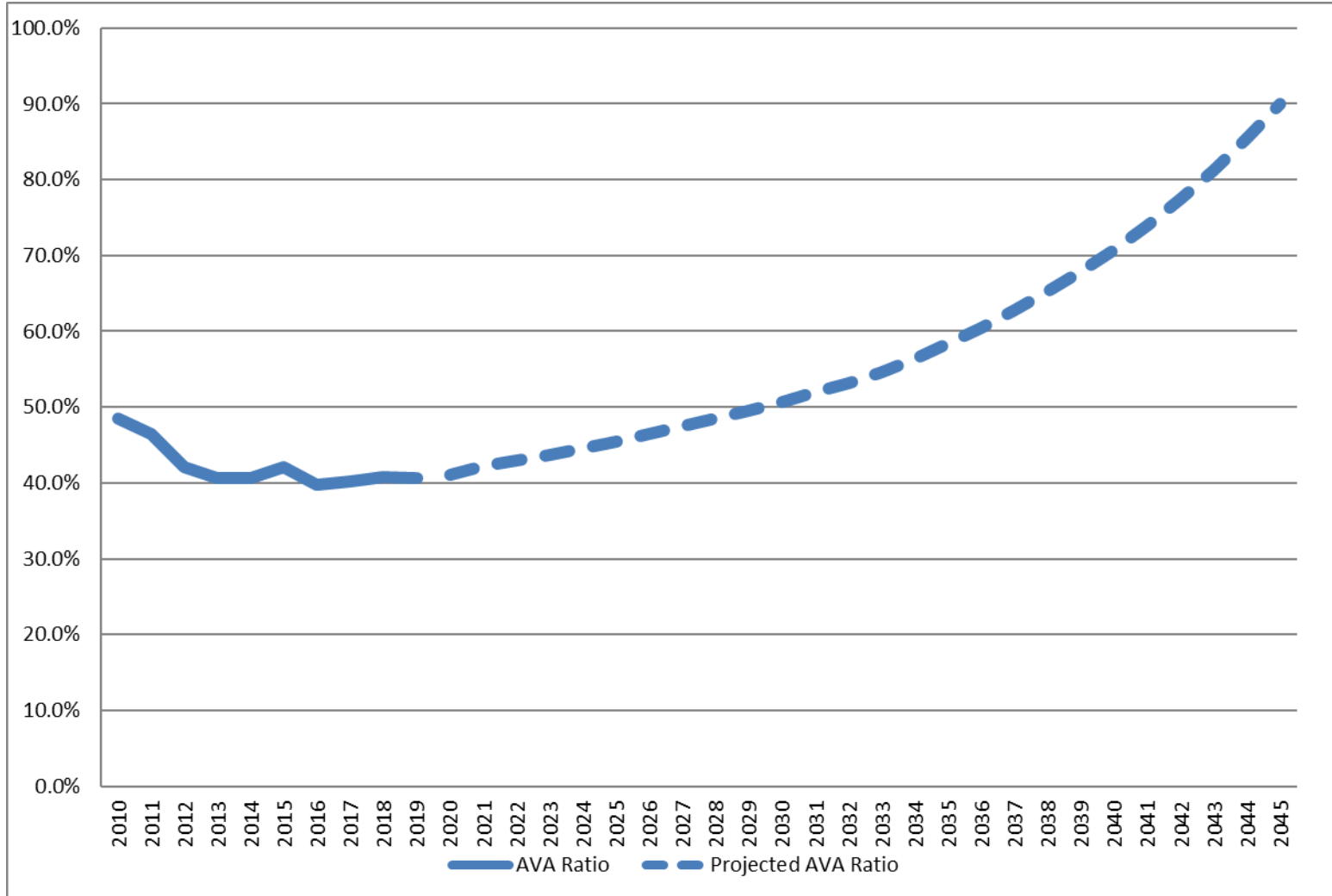


Unfunded Actuarial Accrued Liability

\$ Millions

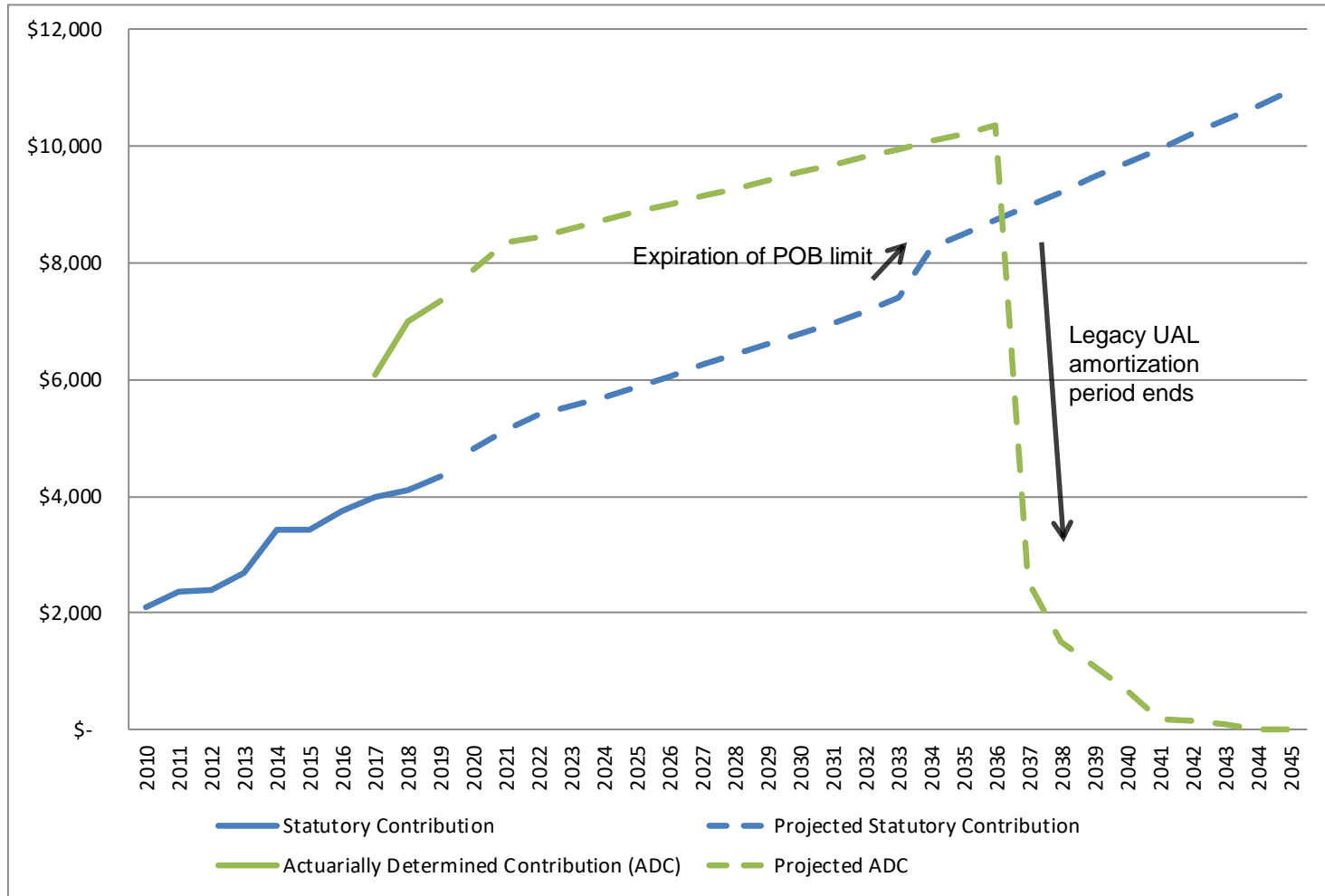


Funded Ratio



State Contributions

\$ Millions



Note: The Board-Adopted Actuarial Funding Policy is the ADC

- The cumulative Statutory contribution from FY 2021 through FY 2045 is \$196 billion
- The cumulative ADC contribution from FY 2021 through FY 2045 is \$156 billion

Summary of GASB Accounting Results

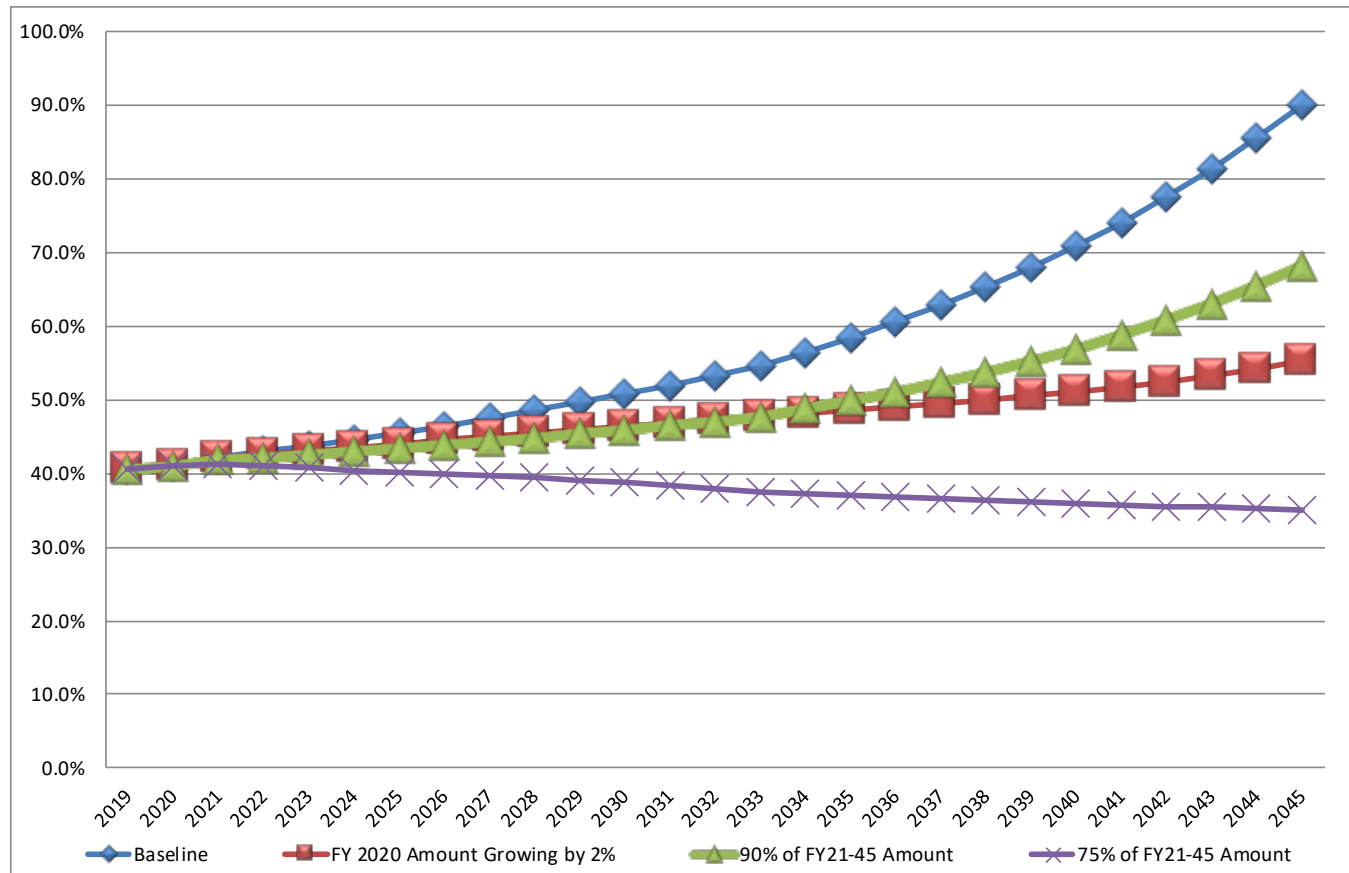
GASB Information (\$ in millions)

	June 30, 2019	June 30, 2018
Long-term Expected Rate of Return	7.00%	7.00%
Municipal Bond Index	3.50%	3.87%
Single Equivalent Discount Rate	7.00%	7.00%
Total Pension Liability	\$134,371	\$129,915
Plan Fiduciary Net Position	<u>53,262</u>	<u>51,970</u>
Net Pension Liability	\$81,109	\$77,945
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	39.6%	40.0%
Total Pension Expense	\$8,519	\$6,957

Sensitivity Projections

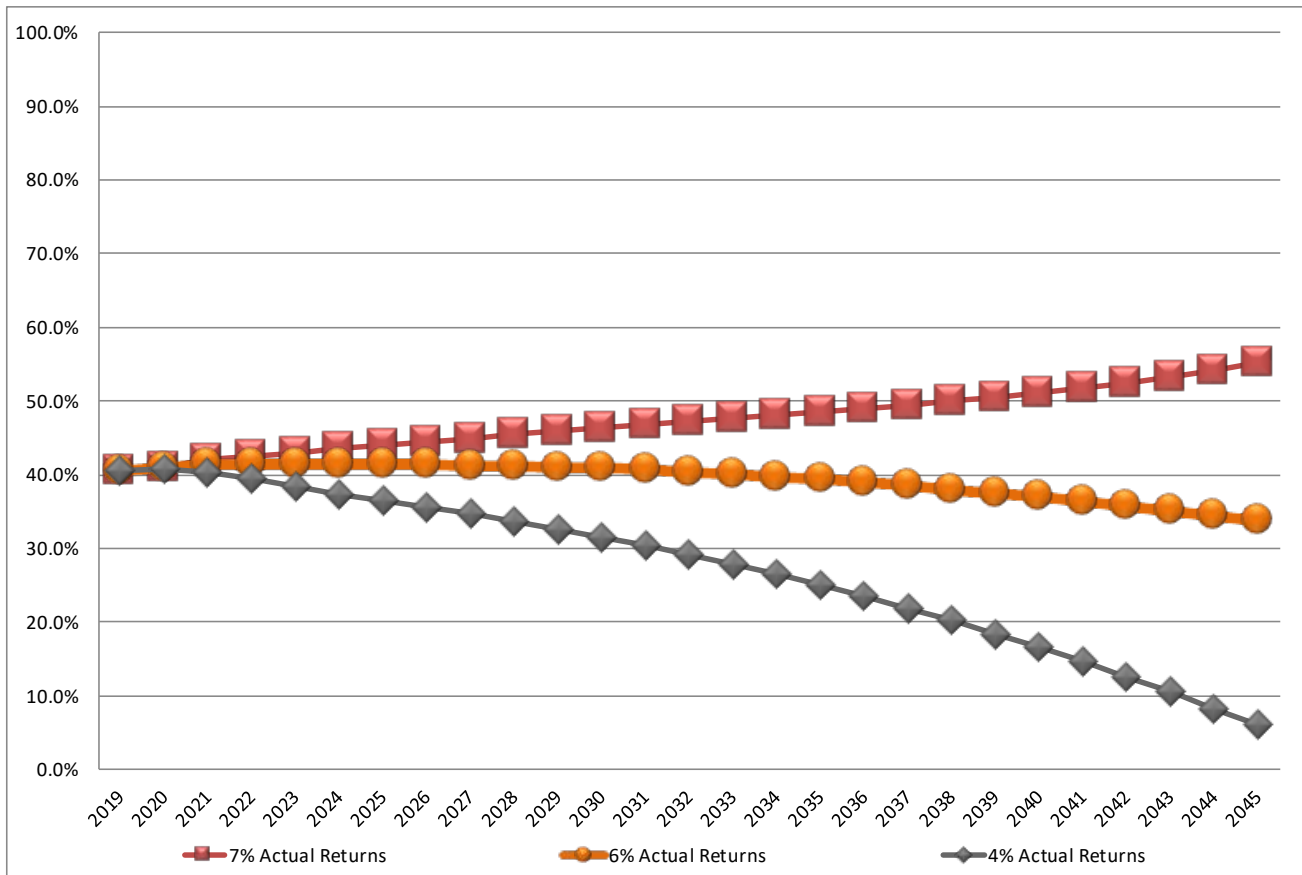
- Included in the determination of the statutorily-required State contribution is the assumption that the State will continue to contribute the required amounts, which increase by about 3.4% per year, on average
- To test the sensitivity of this assumption, we created projections based on the following contribution scenarios:
 - The FY 2020 amount is contributed, and future contributions increase by 2%
 - 90% of the FY 2021-2045 amounts are contributed
 - 75% of the FY 2021-2045 amounts are contributed
- We have also tested the sensitivity of the 7% return assumption by creating projections based on the State contribution scenario of the FY 2020 amount increasing by 2% using the following actual investment returns in each future year:
 - Actual returns of 6% per year
 - Actual returns of 4% per year

Sensitivity Projection #1



- If the FY 2020 State contribution is made, and future contributions increase by 2%, TRS is projected to remain solvent, but the funded ratio is projected to be 55% in 2045
- If 90% of the FY 2021-2045 State contributions are made, the funded ratio is projected to be 68% in 2045
- If 75% of the FY 2021-2045 State contributions are made, the funded ratio is projected to be 35% in 2045

Sensitivity Projection #2



- If the FY 2020 State contribution is made, future contributions increase by 2%, and actual investment returns are 6% rather than 7%, the funded ratio is projected to be 34% in 2045
- If the FY 2020 State contribution is made, future contributions increase by 2%, and actual investment returns are 4% rather than 7%, the funded ratio is projected to be 6% in 2045

ASOP 51 - Assessment and Disclosure of Risk

- Effective for measurements on or after November 1, 2018
- Additional information is required to be provided to intended users of the risks of future experience differing from the assumptions
 - Intended users of these measurements may not understand the effect of future experience differing from the assumptions
- Applies when performing an actuarial funding valuation or a pricing valuation of a proposed change
- Steps that actuary takes:
 - Identify the risks
 - Assess each of the risks
 - Assessment need not be based on numerical calculations
 - Assessment should account for applicable plan circumstances – funding policy, investment policy, funded status, demographics, etc.
 - Recommend a more detailed assessment if actuary believes it would be beneficial to intended users

Segal recommends that a more detailed assessment of risk be performed.

Risks Facing TRS

Risks related to economic variables

- Investment return
- Inflation
 - Price inflation
 - Wage inflation

Risks related to demographic events

- Mortality
- Payroll and/or population growth
- Retirement, disability, termination

Risks related to external forces

- State budget
- Regulatory risk
- Litigation risk
- Political risk

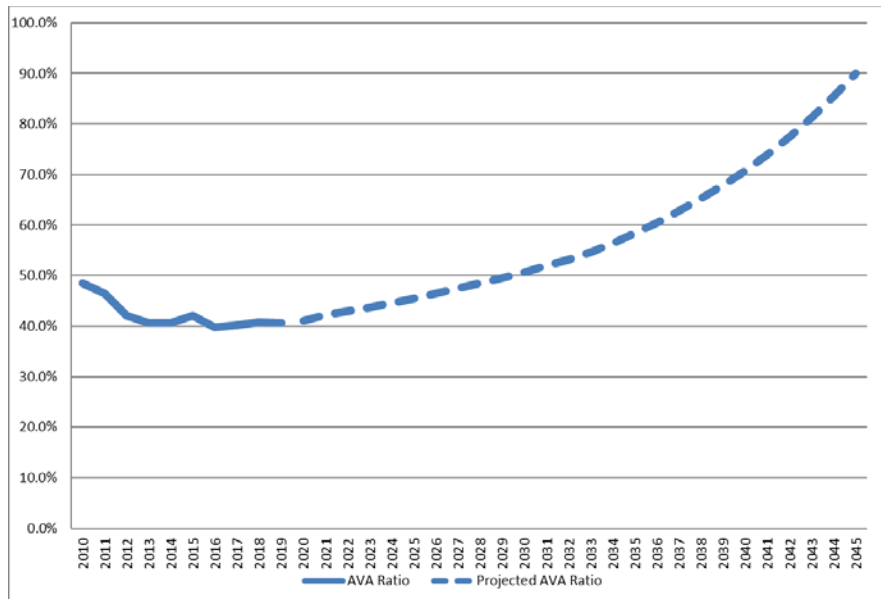


These risks are challenging to manage effectively

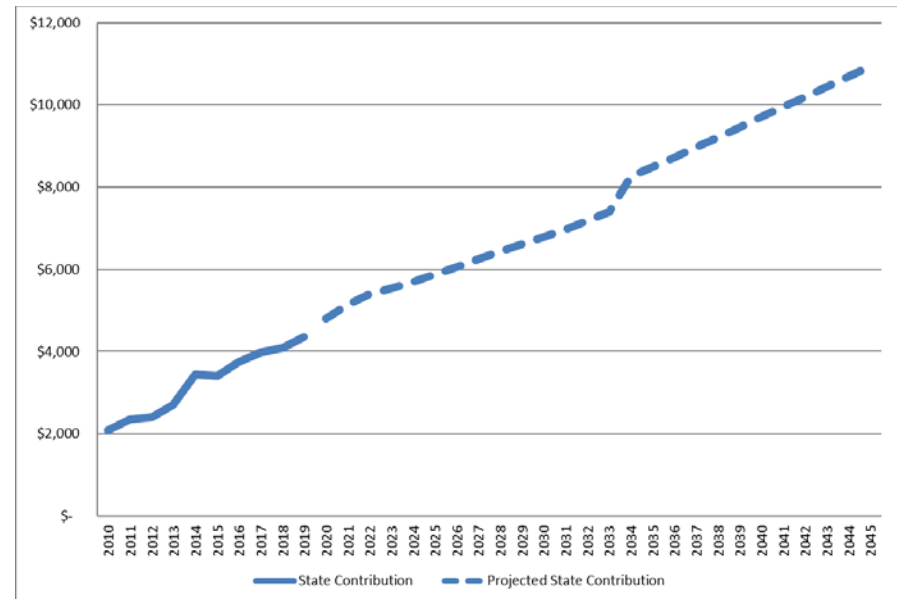
Deterministic Projections

- Projections provide a meaningful way to assess the long-term health of a pension plan
 - Not only provides information on what future funding measures might look like, but also their value relative to the current valuation date
- Deterministic projections are based on a defined set of inputs
 - “If this happens, then this is the result”
 - Useful for evaluating expected values for a given set of parameters
 - Quite often, inputs are based on all assumptions being met, with perhaps one or two deviations to demonstrate sensitivity

FUNDED RATIO



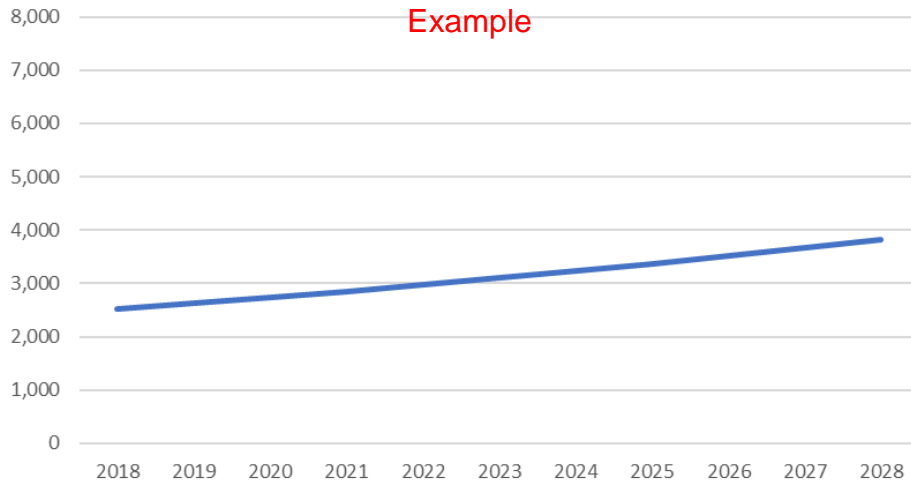
STATE CONTRIBUTION



Explanation of Deterministic vs. Stochastic

Deterministic Assets

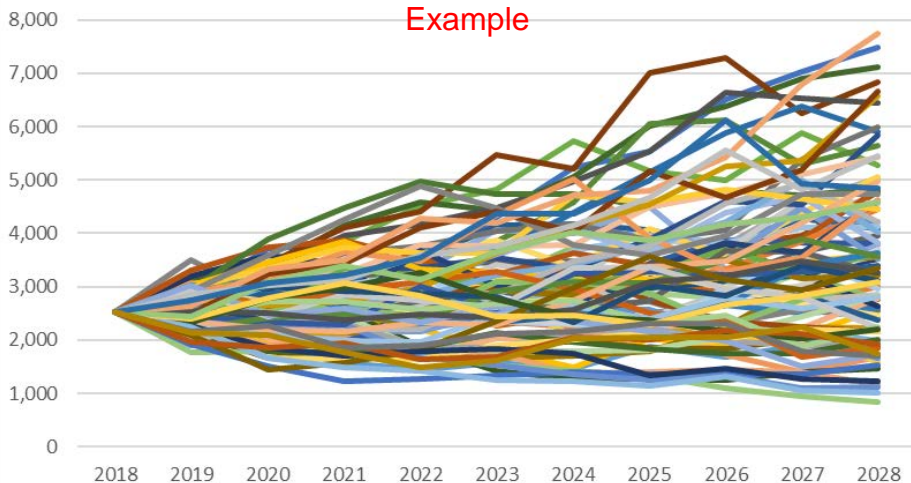
Example



- Deterministic projections convey **expectation** and directional trend, but give no sense of the possible volatility of results
- They are **simpler and easier** to understand but are difficult to use in assessing alternative and do not measure risk/reward trade-offs

Stochastic Asset Trials

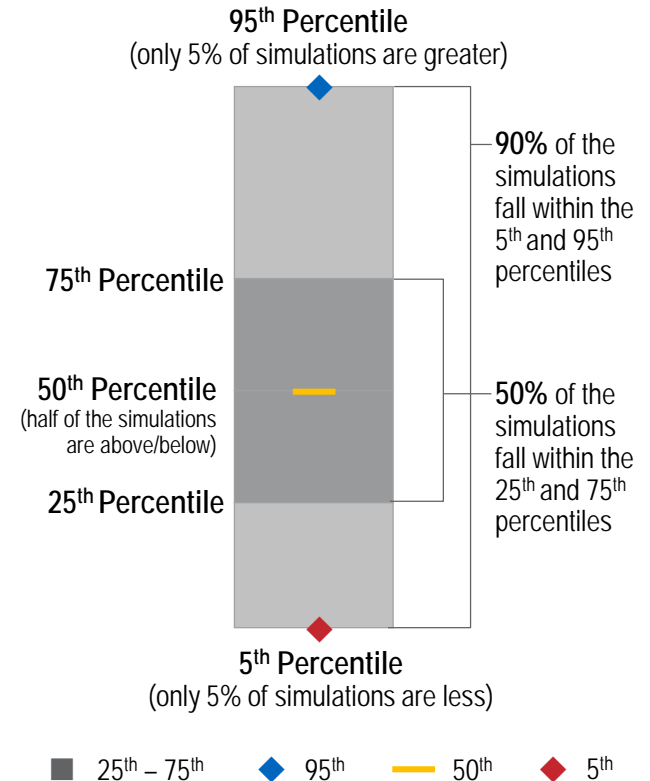
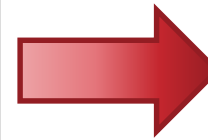
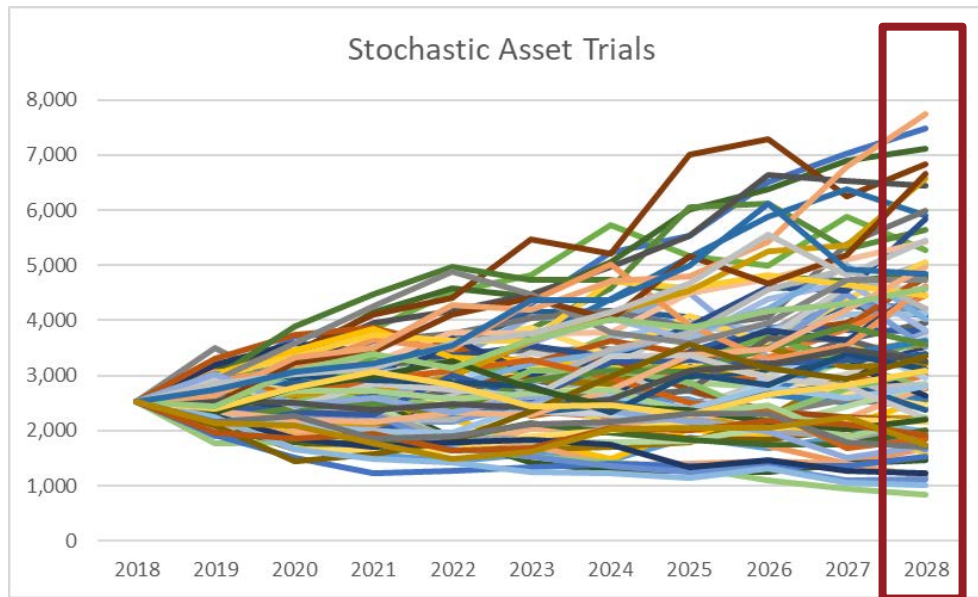
Example



- Stochastic projections produce a distribution of results so expectation and **volatility** around expected results can be calculated
- They are **complex** and require many assumptions but are superior in terms of aiding decisions that require the weighing of **risk/reward** trade-offs
- Typically 2,500 to 5,000 trials are run

Explanation of Deterministic vs. Stochastic

The data is grouped into percentiles and summarized as a range



- The median is represented by the yellow line at the center of the distribution
- The dark gray shaded rectangle represents 50% of all outcomes around the median
- The large, light gray rectangle (inclusive of the dark gray area) represents 90% of all outcomes around the median
- Other percentile results are calculated as well

Stochastic Modeling

➤ **Given a certain set of assumptions:**

- What is the range of possible results?
- What is the probability of achieving certain metrics (e.g., funded percentage)?
- What are the chances of a declining funded percentage over time?
- Alternatively, what is the likelihood of long-term “success?”

➤ **What are metrics for success?**

- Probability of reaching a 100% funding level?
- Probability of avoiding insolvency?
- Other?

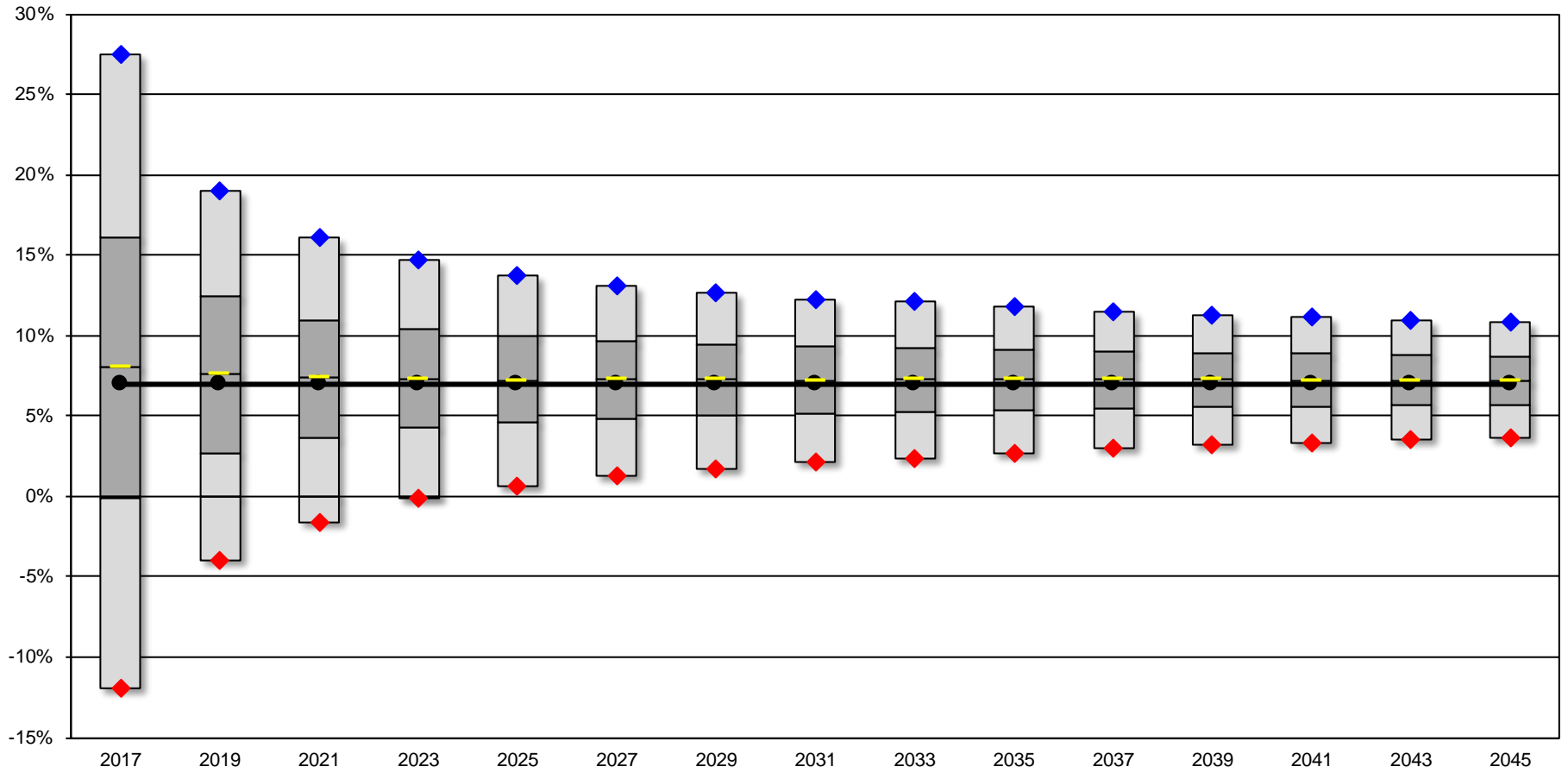
➤ **More than one metric can be modeled**

- Stochastically model investment returns and overlay the results on various payroll growth or decline assumptions

Segal performed stochastic modeling for TRS in 2017. We recommend that the Board consider updating the results based on the June 30, 2019 actuarial valuation.

Stochastic Projection of TRS Cumulative Investment Returns (every other year) – From 2017 Analysis

Projected Cumulative Investment Return for Plan Years Ending June 30



◆ 95th	27.4%	18.9%	16.1%	14.7%	13.7%	13.1%	12.7%	12.3%	12.1%	11.8%	11.5%	11.3%	11.1%	11.0%	10.9%
— 75th	16.1%	12.4%	10.9%	10.4%	10.0%	9.7%	9.5%	9.4%	9.2%	9.2%	9.0%	8.9%	8.9%	8.8%	8.7%
— 50th	8.0%	7.6%	7.4%	7.3%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.3%	7.2%	7.2%	7.2%	7.2%
— 25th	-0.2%	2.7%	3.6%	4.3%	4.6%	4.9%	5.0%	5.2%	5.2%	5.3%	5.5%	5.6%	5.6%	5.7%	5.7%
◆ 5th	-12.0%	-4.0%	-1.6%	-0.1%	0.6%	1.3%	1.7%	2.1%	2.4%	2.7%	3.0%	3.2%	3.3%	3.5%	3.6%
●	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%

● Baseline deterministic projection using current 7.00% investment return assumption

Possible State Contribution Scenarios for Future Analysis

- State pays 100% of all required contributions which vary based on investment returns
- State pays 75% of all required contributions which vary based on investment returns
- State pays 100% of required contributions, but capped at 100% of FY 2021 contribution increasing 2% per year
- State pays 100% of required contributions, capped at 75% of FY 2021 contribution increasing 2% per year

Appendix

- FY 2021 State Contribution Certification Exhibit A
- FY 2021 THIS Fund Certification Exhibit B

Exhibit A

Summary of State Contributions under Illinois Pension Code and Board-Adopted Actuarial Funding Policy	Fiscal Year 2021
1. Based on Statutory Funding Plan	
Total State Contribution for fiscal year 2021:	
a. Benefit Trust Reserve*:	
i. 47.12% of membership payroll	\$ 5,284,597,987
ii. Minus School Districts Contributions:	
(0.58% of membership payroll)	(65,044,913)
(6% FAS cap increases)	(4,119,231)
(10.41% of membership payroll above the Governor's salary)	(4,948,241)
iii. Minus Federal Funds Contribution	
(10.41% of membership payroll from federal funds)	(23,348,881)
iv. Minus phase-in of the effect of assumption changes	<u>(46,800,000)</u>
v. State Contribution	\$ 5,140,336,721
b. Guaranteed Minimum Annuity Reserve	<u>400,000</u>
c. Total State Contribution (current law)	\$ 5,140,736,721
2. Based on Board-Adopted Actuarial Funding Policy**	
a. Benefit Trust Reserve*:	
i. Normal cost plus amortization	\$ 8,441,257,567
ii. Minus School Districts Contributions:	
(0.58% of membership payroll)	(65,044,913)
(6% FAS cap increases)	(4,119,231)
(10.41% of membership payroll above the Governor's salary)	(4,948,241)
iii. Minus Federal Funds Contribution	
(10.41% of membership payroll from federal funds)	<u>(23,348,881)</u>
iv. State Contribution	\$ 8,343,796,301
b. Guaranteed Minimum Annuity Reserve	<u>400,000</u>
c. Total State Contribution	\$ 8,344,196,301
3. Total Normal Cost and Employer Normal Cost Rate for Fiscal Year 2021	
a. Total Normal Cost Rate (including administrative expenses)	19.41%
b. Member Rate	<u>(9.00%)</u>
c. Employer Normal Cost Rate	10.41%
4. Federal Contribution Rate (Employer Normal Cost Rate, per PA 100-0340)	10.41%

* Expected fiscal year 2021 membership payroll is \$11,214,640,162

** Board-Adopted Actuarial Funding Policy is based on the entry age normal actuarial cost method, current asset valuation method and an amortization policy as follows:

- 20-year closed amortization of Unfunded Actuarial Accrued Liability (UAAL) beginning with Fiscal Year 2017
- Use layered amortization, with new UAAL after Fiscal Year 2017 being amortized over 20 years regardless of source
- Amortization payment increase at the rate of future State revenue growth (assumed to be 2.0%)
- Minimum total contribution is no less than the normal cost in any given year

Exhibit B

Teacher Health Insurance Security Fund Contribution Amount to be Certified by the Board for Fiscal Year 2021	Fiscal Year 2021
Expected State Contribution for Fiscal Year 2021 to THIS Fund:	
1. Fiscal Year 2021 membership payroll:	
a. Total	\$ 11,214,640,162
b. Minus members who do not contribute to THIS Fund	(53,140,960)
c. Members who do contribute to THIS Fund	\$ 11,161,499,202
2. Member contribution rate (assumed)	1.30%
3. Matching State contribution: 1.c. x 2.	\$ 145,099,490
4. Adjustment to THIS Fund for overestimating Fiscal Year 2019 member THIS Fund contributions	(1,998,066)
5. Total THIS Fund State contribution*	\$ 143,101,424

* This certification does not include other State contributions to THIS Fund, which are not part of the statutory certification requirement.

- Illinois Statute requires the TRS Board to certify the THIS Fund State contribution amount by November 15 each year
- State contribution amount is based on the projected fiscal 2021 payroll from the June 30, 2019 valuation