Segal Consulting

TEACHERS' RETIREMENT SYSTEM OF THE STATE OF ILLINOIS

Discussion of Valuation Results

Actuarial Valuation as of June 30, 2018

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October 30, 2018

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Discussion Topics

- Overview of the Valuation Process
- Summary of Valuation Highlights
- Membership and Demographics
- Valuation Results
- Sensitivity Projections
- Other Actuarial Topics

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	Economic
• Retirement • Disability • Withdrawal • Mortality	• 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, most recently with the actuarial experience review for the period July 1, 2014 to June 30, 2017.

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

- The following assumption changes were approved by the Board on August 17, 2018, and are reflected in the June 30, 2018 actuarial valuation:
  - The rates of individual salary increase were increased based on plan experience
  - The assumed average severance payment was increased from 2.5% to 10.0% of other pensionable earnings in the last year of employment
  - The termination rates were decreased based on plan experience
  - The disability rates were decreased based on plan experience
  - The retirement rates for active Tier I members were adjusted based on plan experience. The previous service groups of 19 to 30 years of service and 31 years of service were updated to 19 to 29 years of service and 30 to 31 years of service, respectively
  - The healthy, disabled, and beneficiary post-retirement mortality assumptions were updated to use adjusted rate multipliers at various ages for males and females to better reflect recent plan experience
  - The mortality improvement scale was updated from Scale MP-2014 to Scale MP-2017
  - The sick leave service credit rates were adjusted based on plan experience
  - The optional service purchase rates were adjusted based on plan experience
- The impact of these assumption changes lowered the actuarial accrued liability as of June 30, 2018 by $712 million and lowered the FY 2020 State Contribution by $14 million

Changes Since Last Year's Valuation

- Public Act 100-0587 created two new buyout provisions for TRS members, effective through June 30, 2021:
  - Inactive vested buyout
    - Option for inactive vested members to receive immediate lump sum in exchange for retirement annuity
    - Lump sum equal to 60% of present value of future benefits
  - Automatic annual increase buyout
    - Option for Tier I actives to receive lump sum at retirement in exchange for automatic annual increase reduced to 1.5%, effective the later of:
      - January 1 following age 67, or
      - January 1 following first anniversary of retirement
    - Lump sum equal to 70% of difference between present value of benefits based on the Tier I automatic annual increase and the 1.5% automatic annual increase
- Public Act 100-0587 also revised the "FAS Cap" threshold from 6% to 3%, whereby the cost of benefits due to salary increases over 3% must be paid by employers (if that salary is used to determine final average salary)
- Due to this Public Act, the fiscal 2019 State contribution has been preliminarily revised from $4.47 billion to $4.35 billion

Changes Since Last Year's Valuation

- The preliminarily revised fiscal 2019 State contribution is based on the following:
  - Using the same buyout utilization assumptions as the Illinois legislation of 22% for inactive vested buyout and 25% for automatic annual increase buyout
    - These assumptions may be revised as experience emerges, which would affect the final recertification of the fiscal 2019 State contribution
  - Assuming the lower 3% "FAS Cap" threshold does not alter the salary increases provided to members nearing retirement
    - This is consistent with the individual salary increase assumption
    - This increases the projected school district contributions
    - The contribution increases were phased in to estimate the impact of when current CBAs expire
    - To the extent that school districts reduce salary increases for members nearing retirement to avoid the additional costs, the lower school district contributions will be offset by lower liabilities as a result of salary increases being lower than expected
    - We can review the impact of modifying this assumption before the final recertification of the fiscal 2019 State contribution

Summary of Valuation Highlights

- Required State contribution for fiscal 2020 is $4.81 billion, an 11% increase from the preliminarily revised fiscal 2019 contribution of $4.35 billion
- The fiscal 2020 State contribution under the Board-Adopted Actuarial Funding Policy is $7.88 billion
  - Statutory contribution is approximately 60% of the Board funding policy amount
  - The $3.07 billion contribution shortfall increases future contribution requirements
- Market value of assets returned 8.3% for year ending 6/30/18 (Segal calculation)
  - Gradual recognition of deferred gains and losses resulted in a 7.6% return on actuarial assets, compared to 7.0% expected
  - Gain on actuarial value of assets is $307 million
- Demographic and liability experience resulted in a loss of $1.3 billion
- Funded ratio based on the actuarial value of assets increased from 40.2% in 2017 to 40.7% in 2018
- The actuarial accrued liability increased from $122.9 billion (as of June 30, 2017) to $127.0 billion (as of June 30, 2018)
- The unfunded actuarial accrued liability (UAAL) increased from $73.4 billion to $75.3 billion
  - $1.9 billion increase results from net experience loss ($1.0 billion), gain from assumption changes ($0.7 billion), gain from buyout provisions ($0.4 billion), and inadequate State contributions ($1.9 billion)

Membership

Active membership statistics

	June 30, 2018	June 30, 2017	Change
Number			
Tier I	123,933	128,262	-3.4%
Tier II	36,492	31,323	+16.5%
Total	160,425	159,585	+0.5%
Average Salary	$71,845	$70,789	+1.5%
Median Salary (full-time/regular part-time)	65,630	64,699	+1.4%
Average Age	42.4 years	42.2 years	
Average Total Service	11.2 years	11.1 years	

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

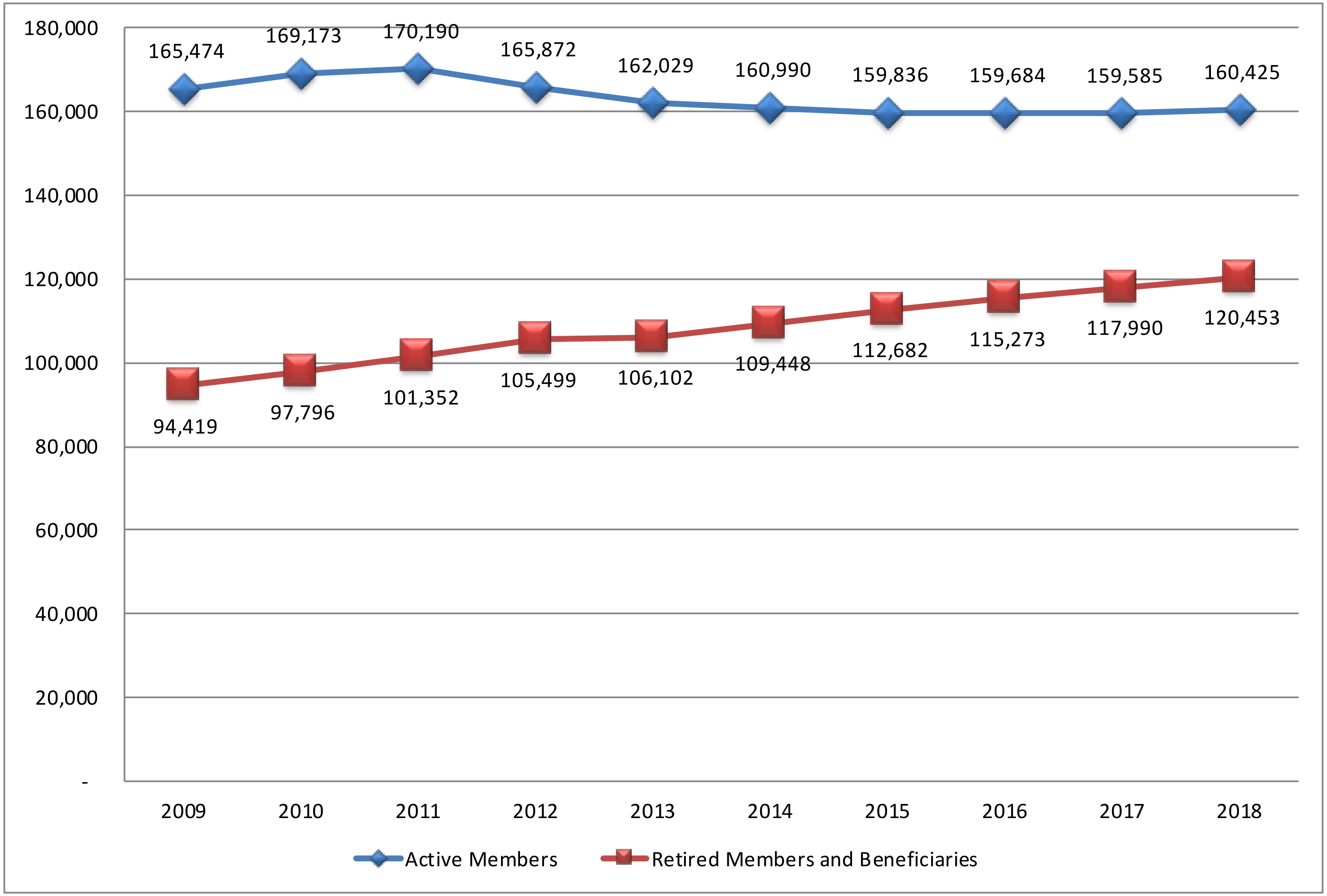
Membership

Retiree and beneficiary statistics

	June 30, 2018	June 30, 2017	Change
Number	120,453	117,990	+2.1%
Annual Annuities	$6.336 billion	$6.033 billion	+5.0%
Average Age	72.1 years	71.8 years	
Average Monthly Benefit	$4,384	$4,261	+2.9%

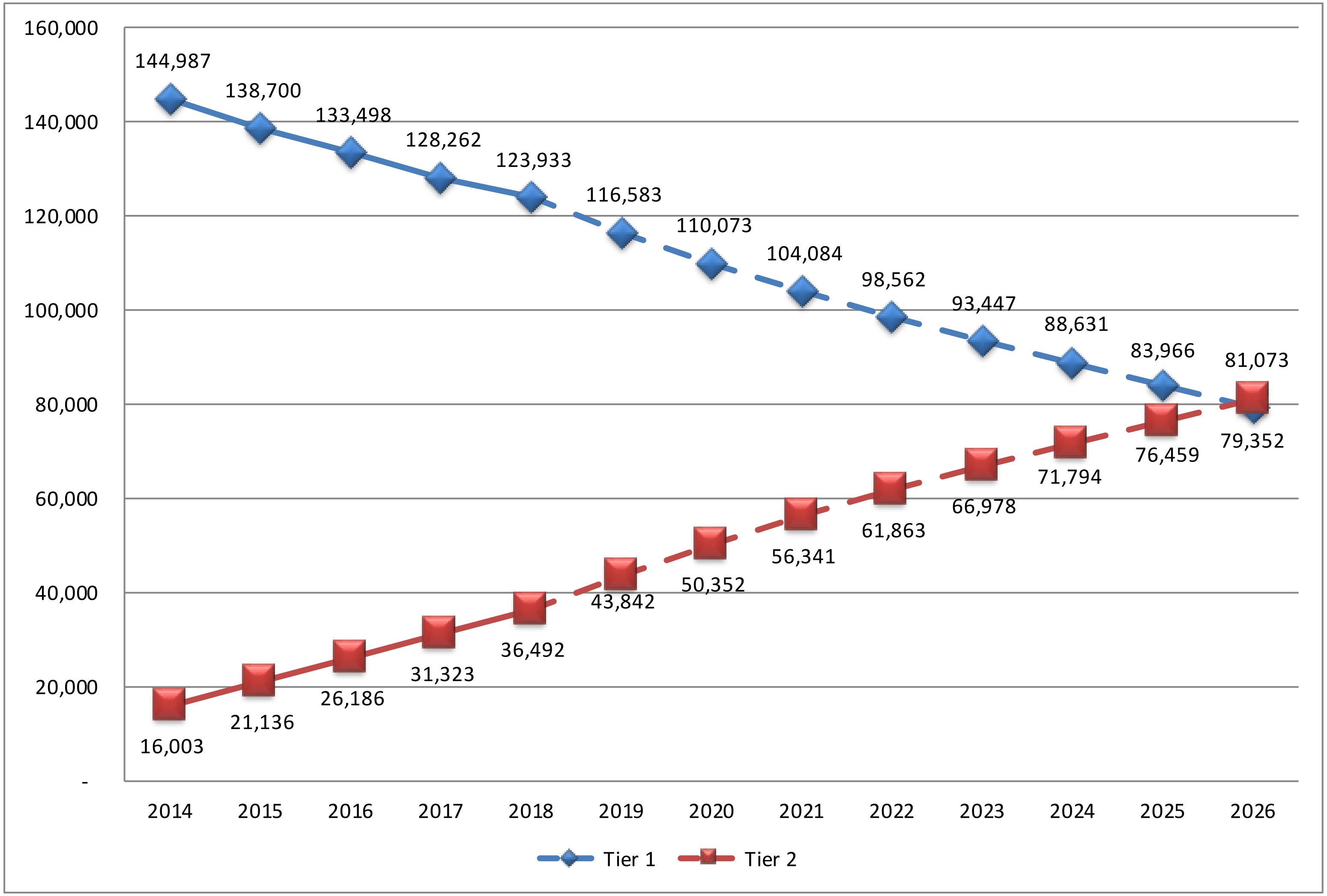
Member data used in the valuation is as of the prior valuation date.

Active and Retired Membership



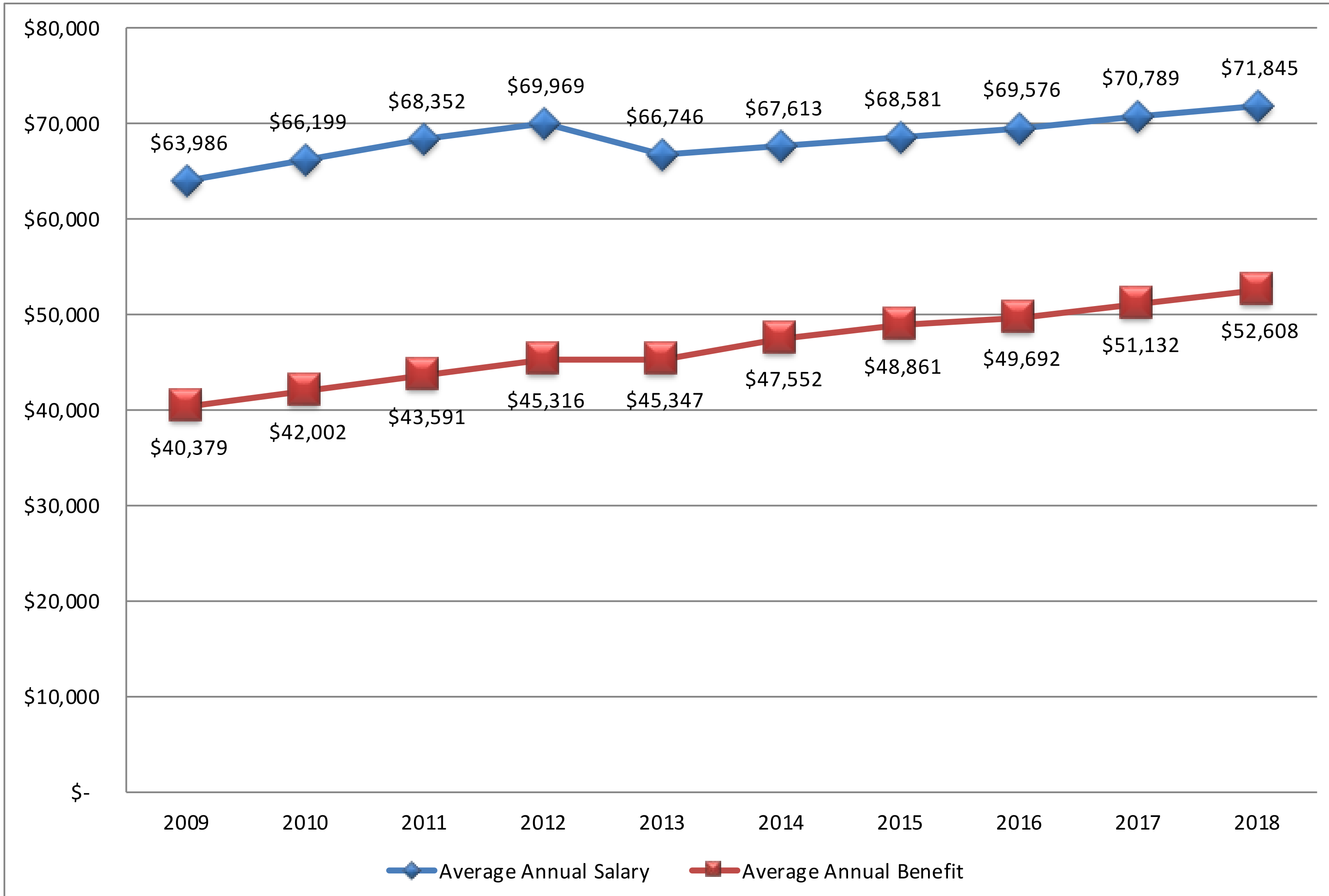
Active member and annuitant data used in the valuation is as of the prior valuation date. Prior to 2013, annuitant data used in the valuation was as of the valuation date.

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 3.4% per year.
Starting in 2013, salaries were revised to reflect the reported rate of pensionable salary.

Assets

- The market value of assets increased from $49.4 billion (as of June 30, 2017) to $52.0 billion (as of June 30, 2018)
  - Segal determined the investment return was +8.3%, net of investment expenses
- The actuarial value of assets – which smoothes investment gains and losses over five years – increased from $49.5 billion (as of June 30, 2017) to $51.7 billion (as of June 30, 2018)
  - Return of +7.6%, net of investment expenses
  - Actuarial value is 99.5% of market value
  - There is a total of $239 million of deferred investment gains that will be recognized in future years
- The average annual return on <u>market</u> assets:
  - Past 10 years is 6.1%
  - Past 15 years is 7.5%
  - Past 20 years is 6.5%
- The average annual return on <u>actuarial</u> assets:
  - Past 10 years is 5.9%
  - Past 15 years is 7.4%
  - Past 20 years is 6.4%

Assets

Market Value of Assets (in millions)

	June 30, 2018	June 30, 2017
Beginning of Year	$49,376	$45,251
Contributions		
➢ State	$4,095	$3,986
➢ Employers	85	150
➢ Members	938	929
➢ Total	$5,118	$5,065
Benefits Paid	(6,551)	(6,438)
Administrative Expenses	(22)	(23)
Investment Income (net)	4,049	5,521
End of Year	$51,970	$49,376
Rate of Return	+8.32%	+12.39%

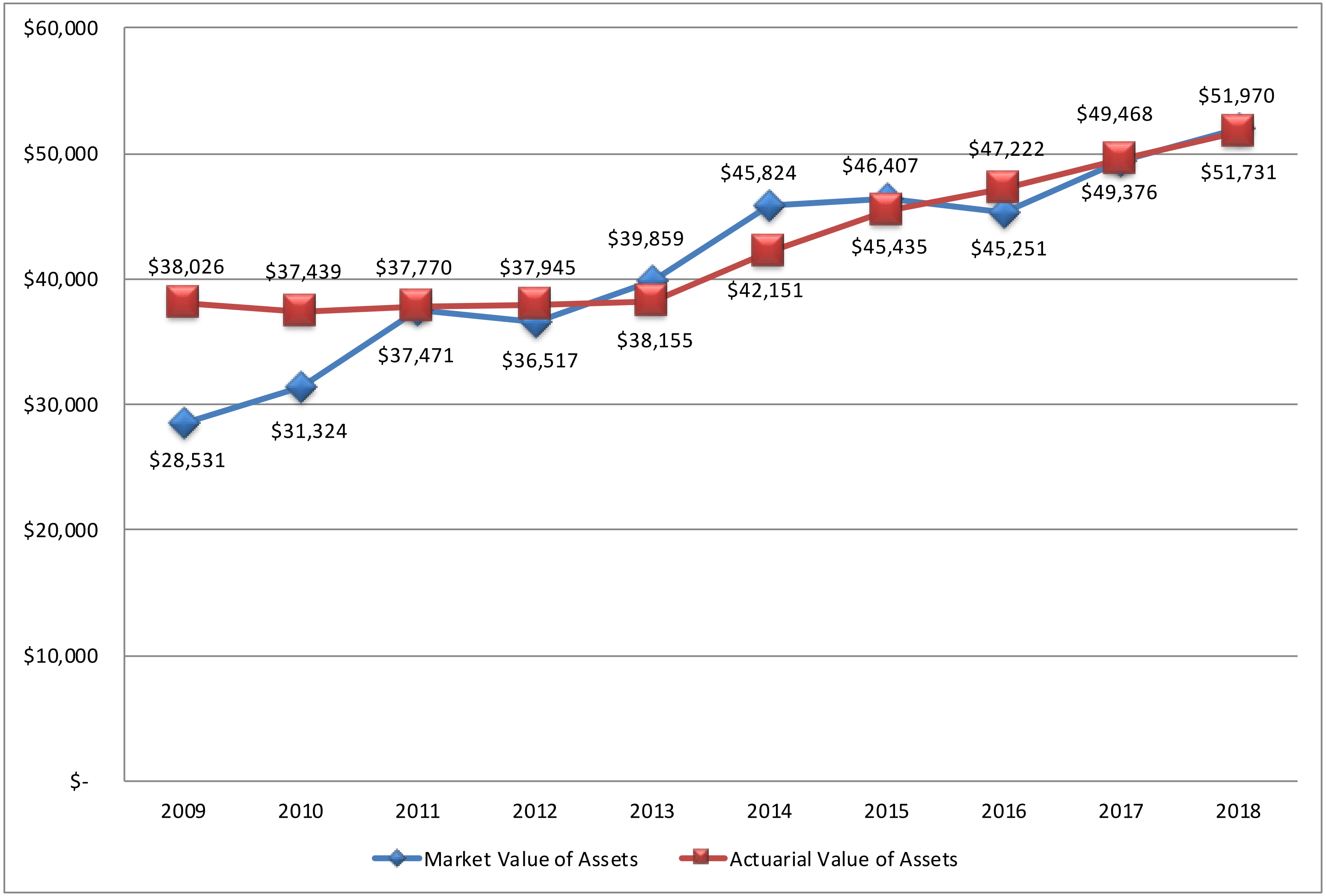
Assets

Actuarial Value of Pension Assets (in millions)

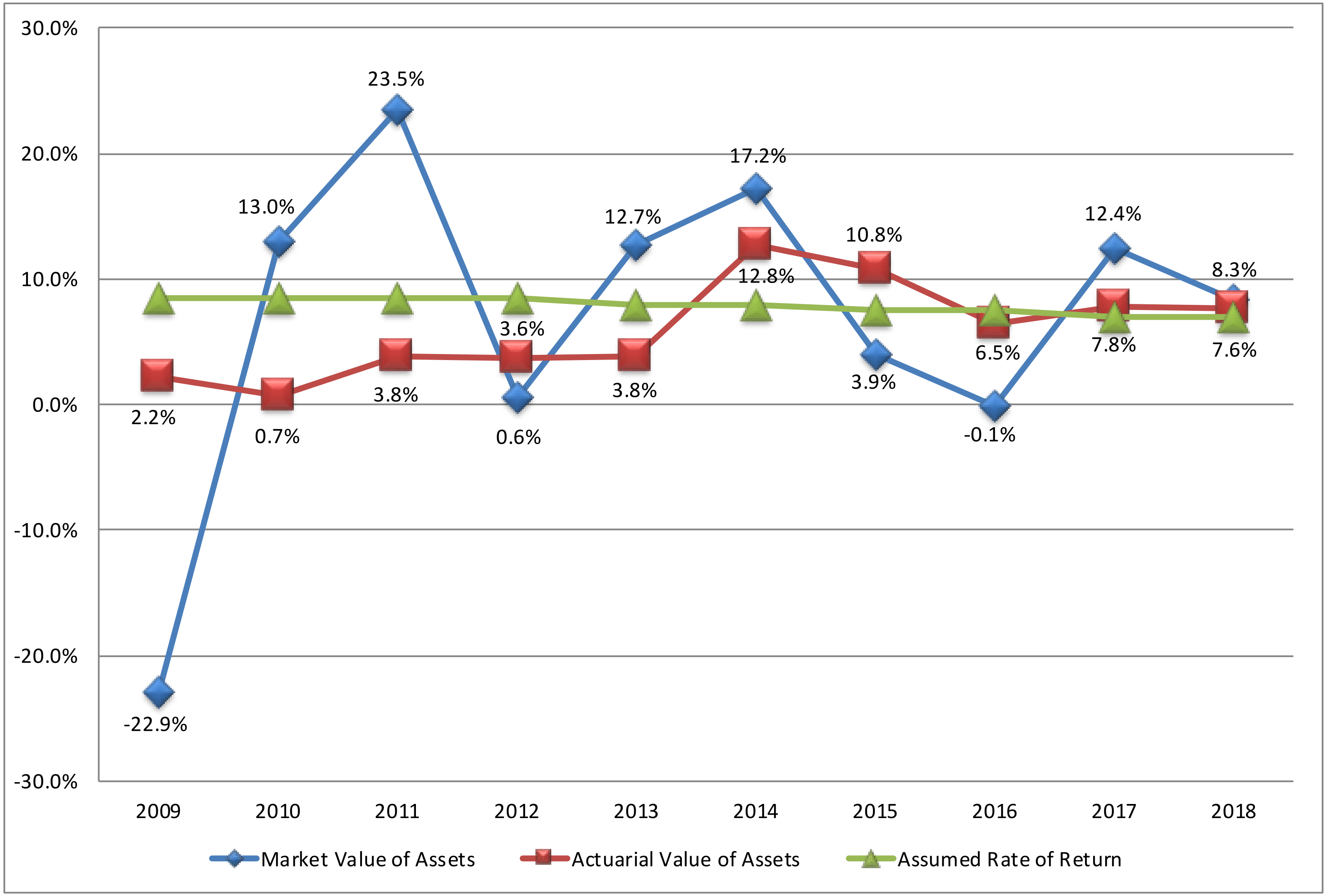
Market Value of Pension Assets as of June 30, 2018			$51,970
Gain or (Loss) on Assets	Original Amount	% Deferred	Deferred Amount
Year ended June 30, 2018	$644	80%	$515
Year ended June 30, 2017	2,402	60%	1,441
Year ended June 30, 2016	(3,483)	40%	(1,393)
Year ended June 30, 2015	(1,622)	20%	(324)
Year ended June 30, 2014	3,626	0%	0
Total			$239
Actuarial Value as of June 30, 2018			$51,731
Actuarial Value as a Percent of Market Value			99.5%
Rate of Return			7.63%

Market and Actuarial Values of Assets

$ Millions

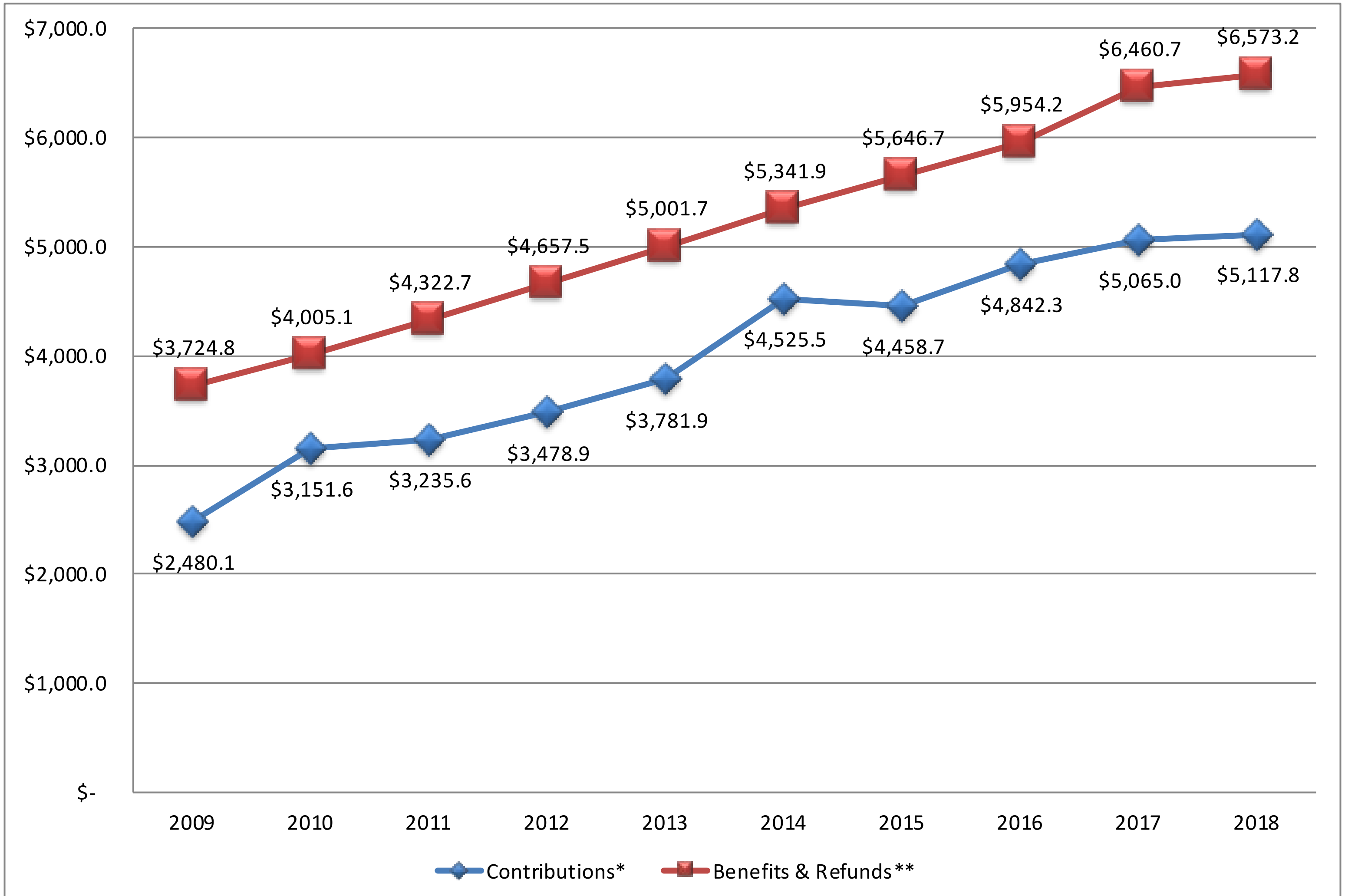


Asset Returns



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, 2018	June 30, 2017
Actuarial Accrued Liability:		
• Active Members	$40,890	$38,620
• Retirees and Beneficiaries	82,968	80,882
• Inactive Members with Deferred Benefits	3,161	3,402
Total	$127,019	$122,904
Actuarial Assets	51,731	49,468
Unfunded Accrued Liability	$75,288	$73,436
Funded Ratio	40.7%	40.2%

Valuation Results

Summary of State Contribution for Fiscal Year (in millions)

	FY 2020	FY 2019*
Based on Statutory Funding Plan	$4,814	$4,354
Based on Board-Adopted Actuarial Funding Policy	7,879	7,340
Difference Between Statutory Amount and Board-Adopted Actuarial Funding Policy	$3,065	$2,986

* Preliminarily revised to reflect Public Acts 100-0587

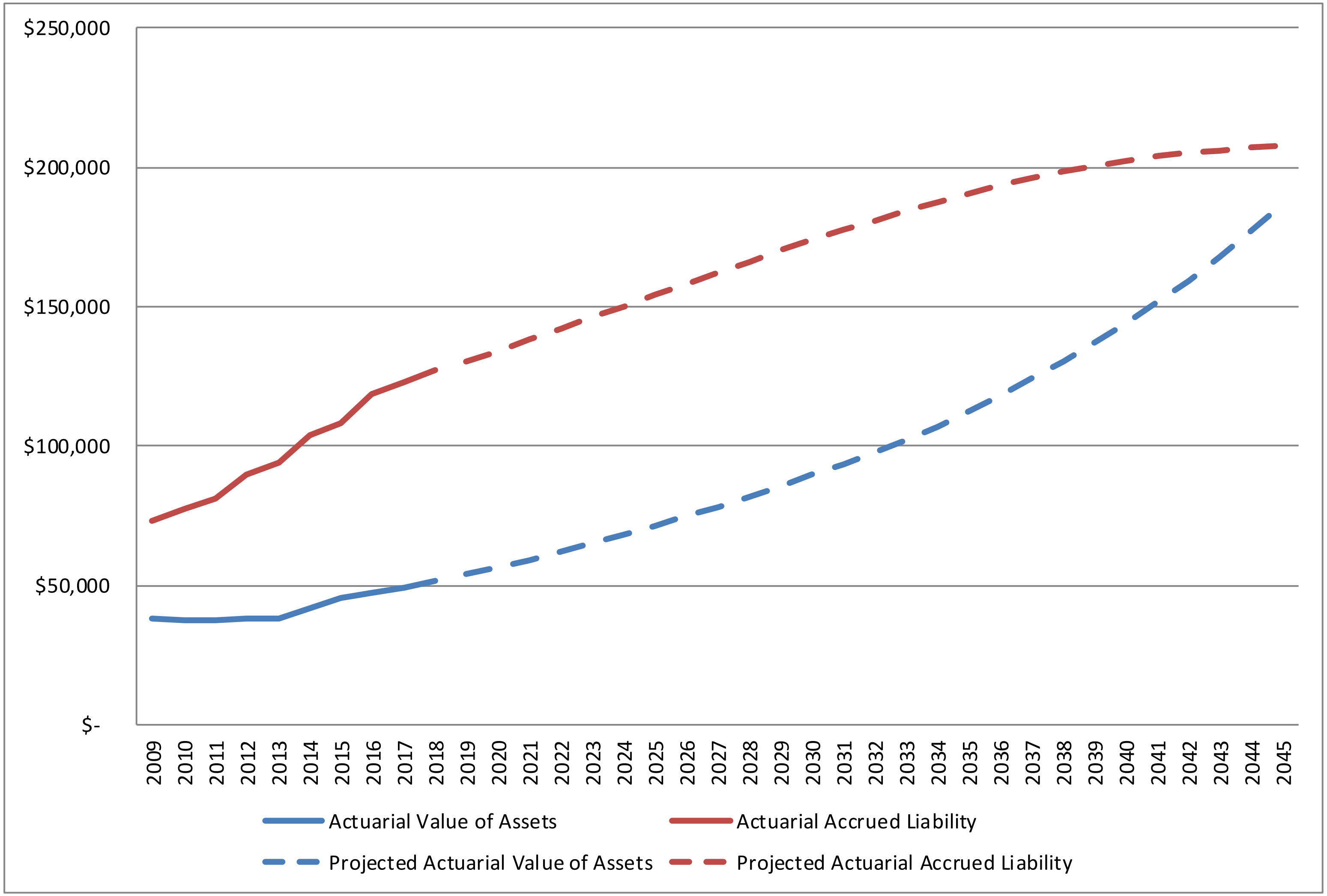
Valuation Results

Reconciliation of State Statutory Funding Plan Contribution
from Fiscal Year 2019 to 2020 (in millions)

	Statutory Funding Contribution
Original FY 2019 State Contribution	$4,466
Impact of Public Act 100-0587	(112)
Preliminarily Revised FY 2019 State Contribution	$4,354
Expected Increase	322
Investment Gain	(8)
All Other Net Actuarial Losses	160
Assumption Changes	(14)
FY 2020 State Contribution	$4,814

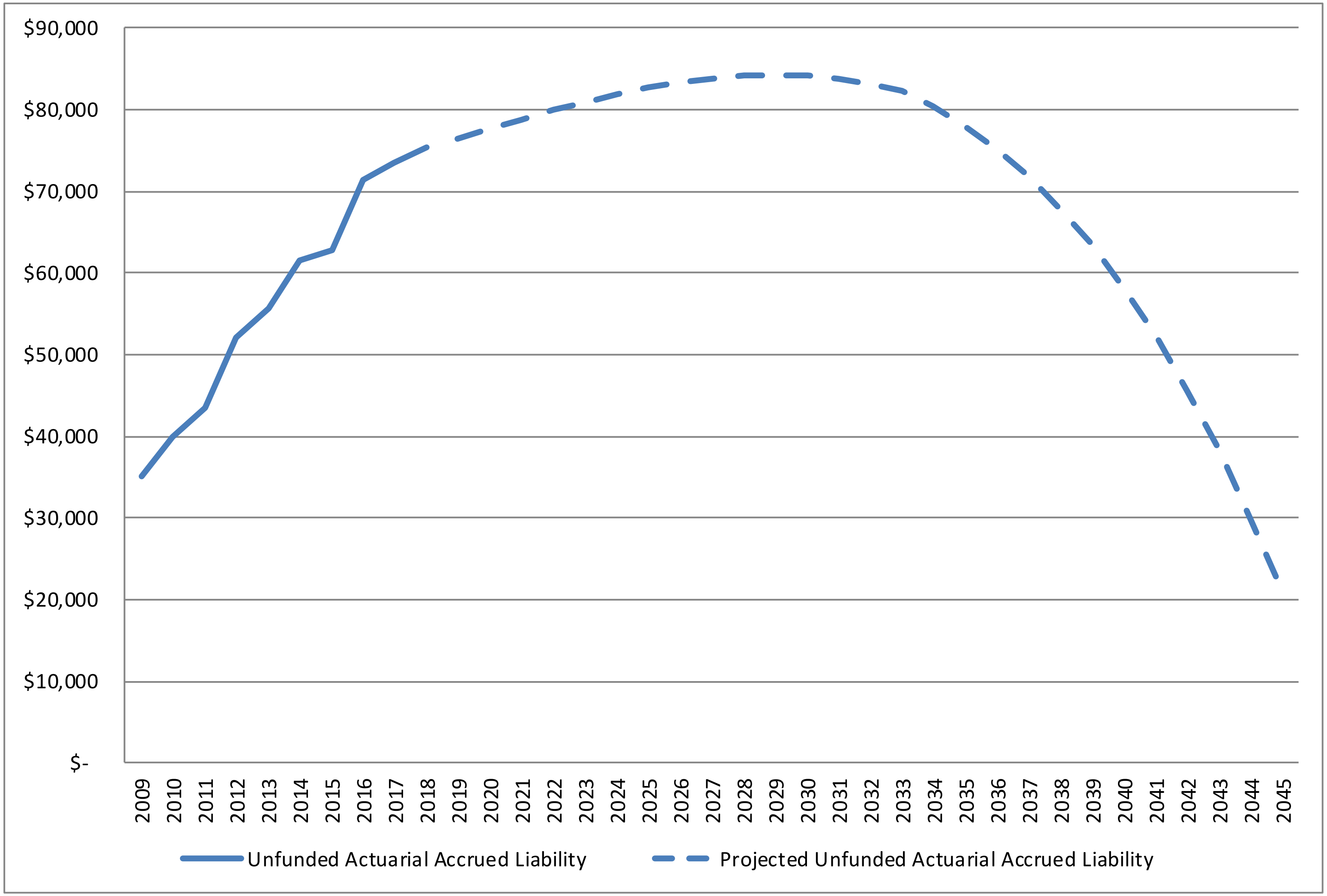
Assets and Liabilities

$ Millions

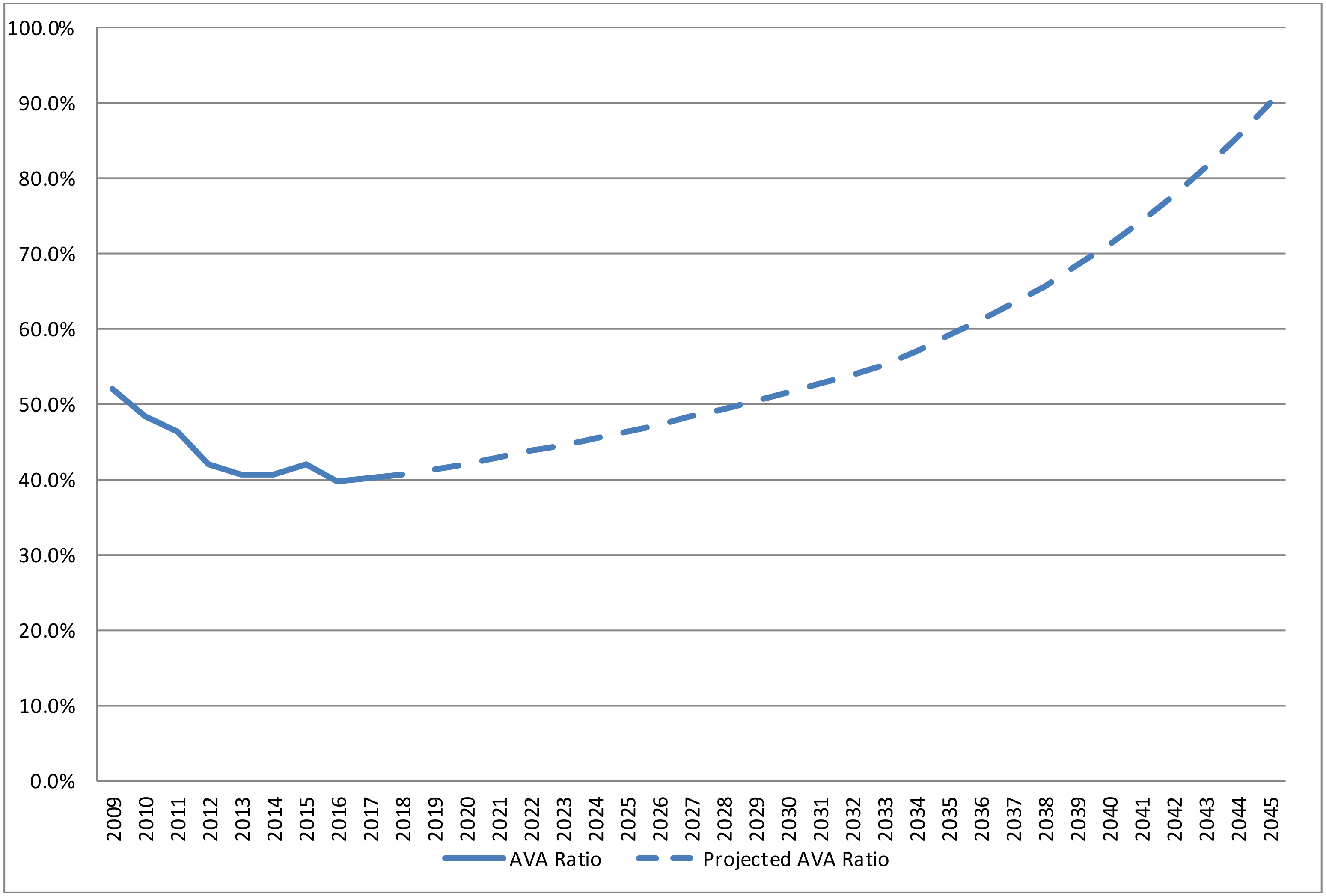


Unfunded Actuarial Accrued Liability

$ Millions

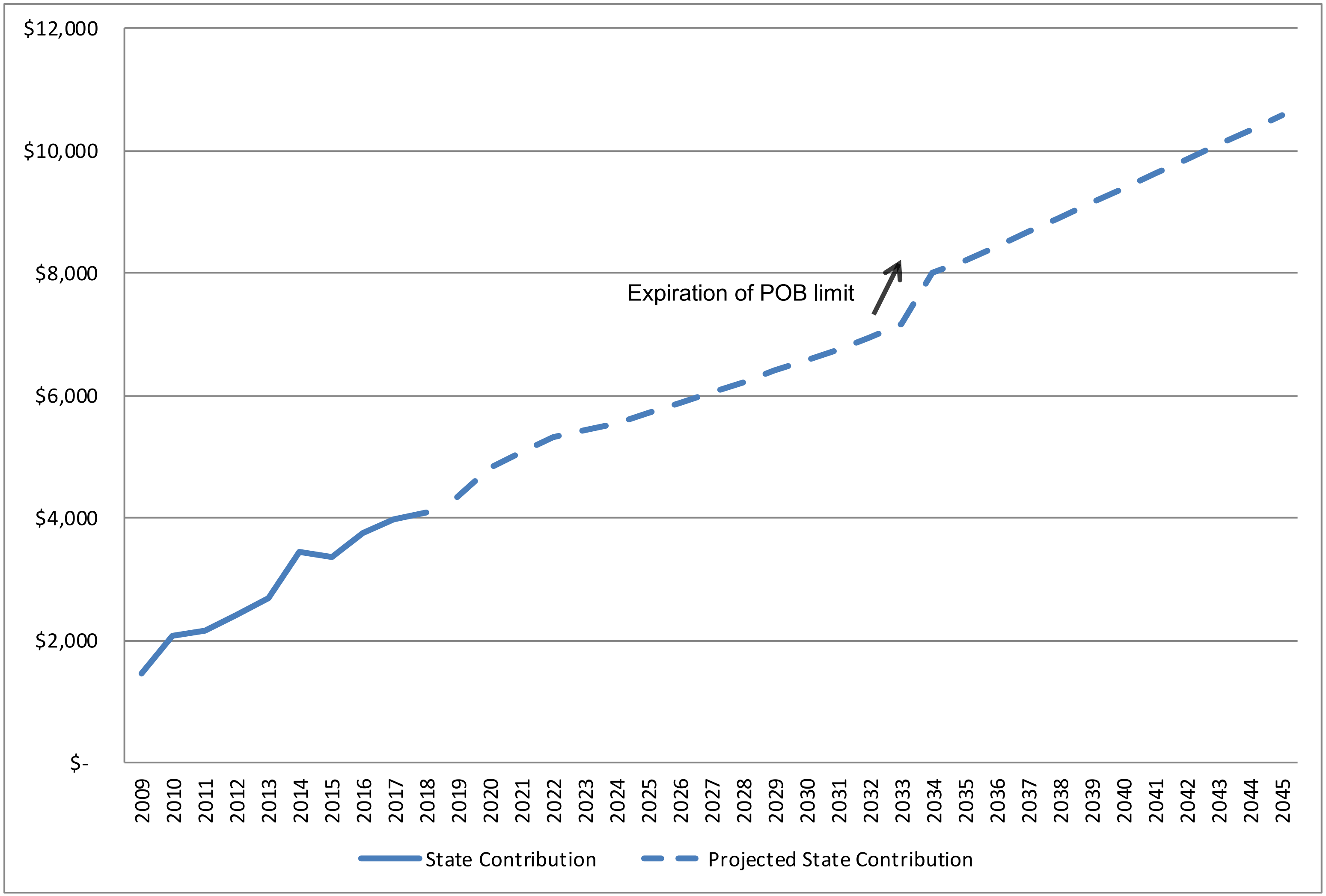


Funded Ratio



State Contributions

$ Millions



Summary of GASB Accounting Results

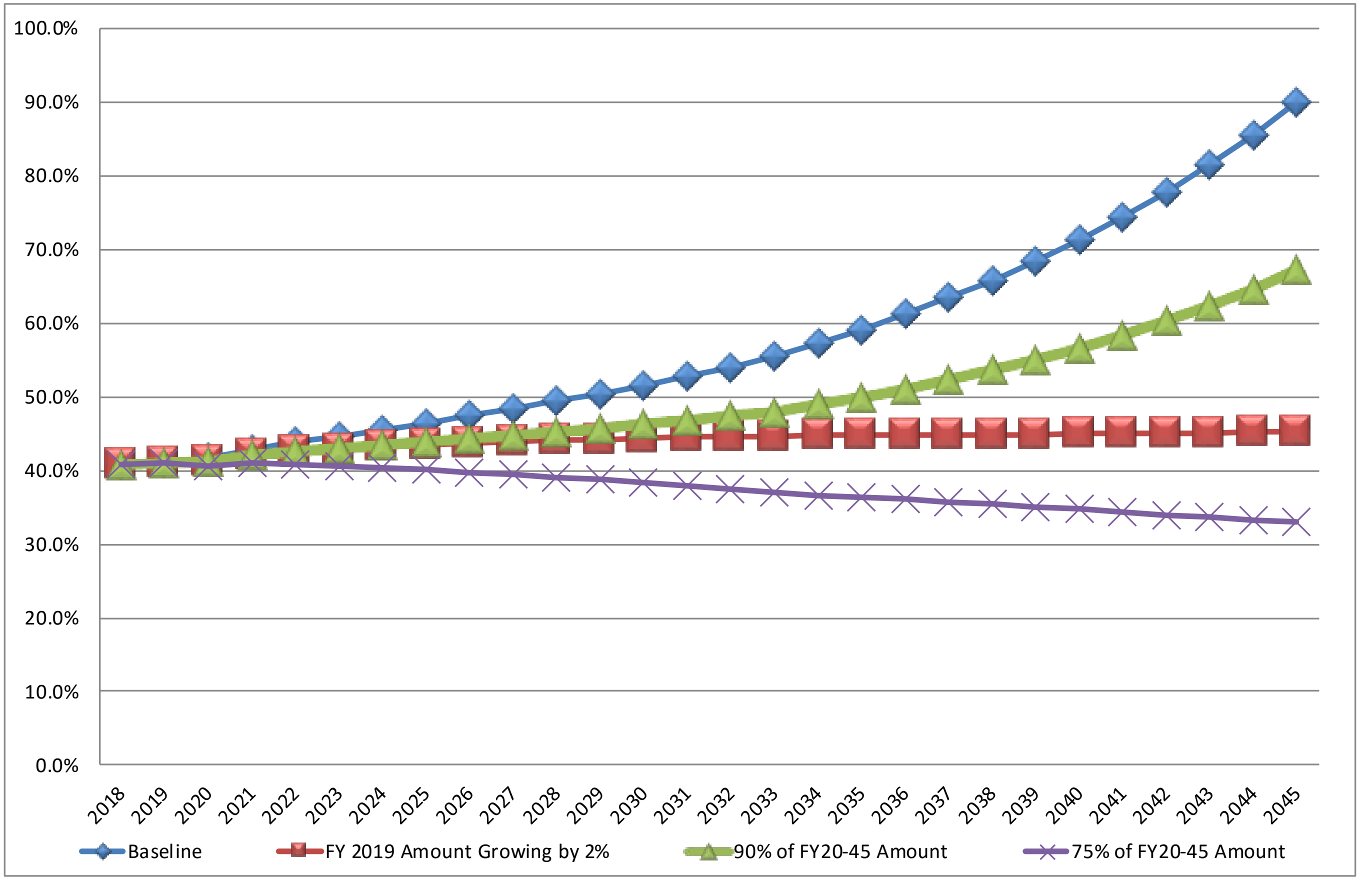
GASB Information ($ in millions)

	June 30, 2018	June 30, 2017
Long-term Expected Rate of Return	7.00%	7.00%
Municipal Bond Index	3.87%	3.58%
Single Equivalent Discount Rate	7.00%	7.00%
Total Pension Liability	$129,915	$125,774
Plan Fiduciary Net Position	51,970	49,376
Net Pension Liability	$77,945	$76,398
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	40.0%	39.3%
Total Pension Expense	$6,957	$7,387

Sensitivity Projections

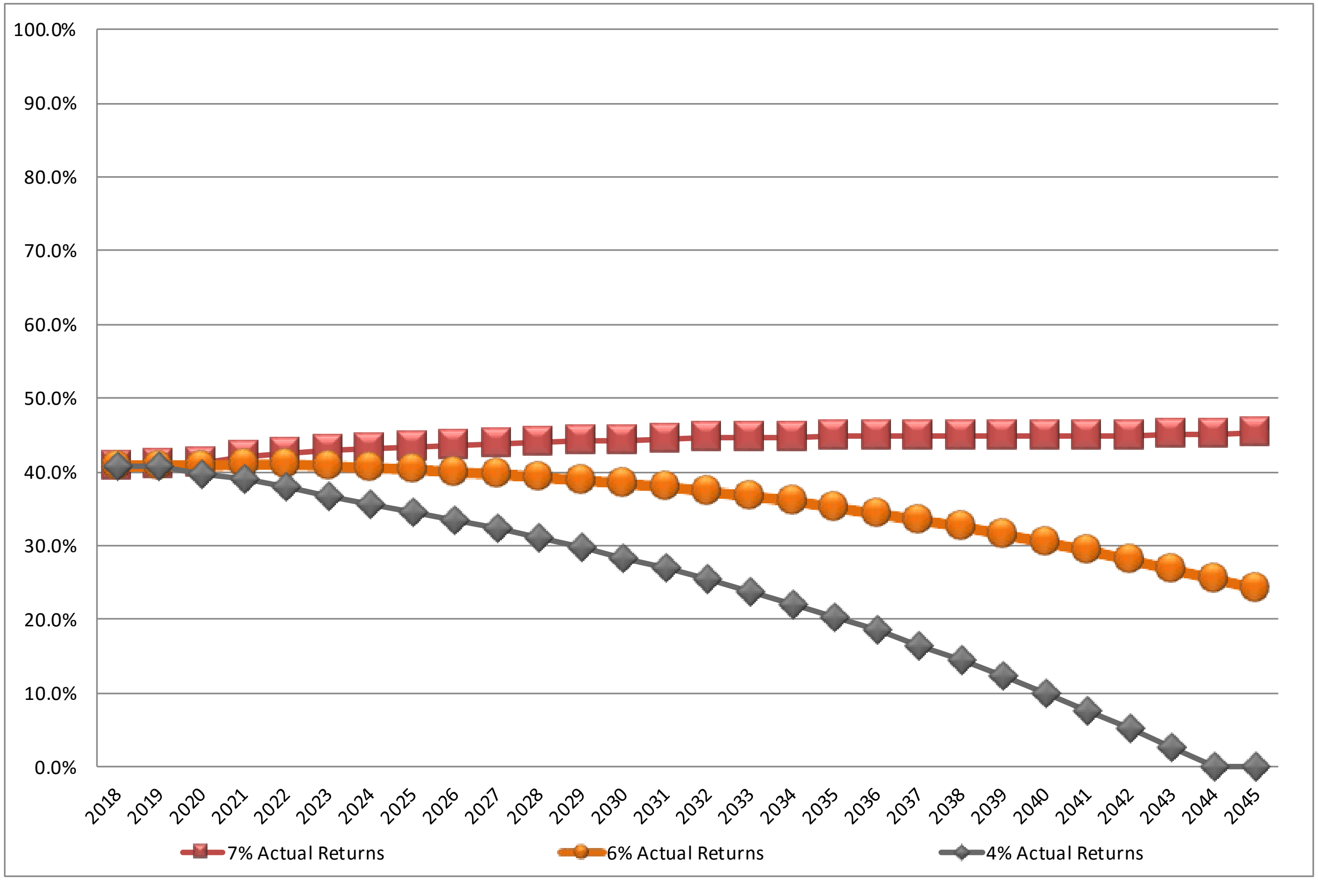
- Included in the determination of the statutorily-required State contribution is the assumption that State will continue to contribute the required amounts, which increase by about 3.5% per year, on average
- To test the sensitivity of this assumption, we created projections based on the following contribution scenarios:
  - The preliminary revised FY 2019 amount is contributed, and future contributions increase by 2%
  - 90% of the FY 2020-2045 amounts are contributed
  - 75% of the FY 2020-2045 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 preliminary revised FY 2019 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 preliminary revised FY 2019 State contribution is made, and future contributions increase by 2%, TRS is projected to remain solvent, but the funded ratio is projected to be 45% in 2045
- If 90% of the FY 2020-2045 State contributions are made, the funded ratio is projected to be 67% in 2045
- If 75% of the FY 2020-2045 State contributions are made, the funded ratio is projected to be 33% in 2045

Sensitivity Projection #2



- If the preliminary revised FY 2019 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 24% in 2045
- If the preliminary revised FY 2019 State contribution is made, future contributions increase by 2%, and actual investment returns are 4% rather than 7%, TRS is projected to become insolvent in 2044

Other Actuarial Topics

- Society of Actuaries’ Public Sector Mortality Table Analysis
- Actuarial Standard of Practice
  - ASOP 4 - Measuring Pension Obligations and Determining Pension Plan Costs or Contributions

SOA's Public Sector Mortality Table Analysis

- The analysis is complete and a new series of tables have been released in "exposure draft" form for comment
  - New nomenclature as table name refers to central year of the data
    - New public sector tables are called Pub-2010, which are actually 4 years newer than the RP-2014 tables, NOT 4 years older
    - Base mortality rates in RP-2014 tables have been released as "RP-2006"
- Study identified differences among three job categories that were studied individually, and published mortality tables accordingly: general employees (PubG-2010), safety employees (PubS-2010), and teachers (PubT-2010)

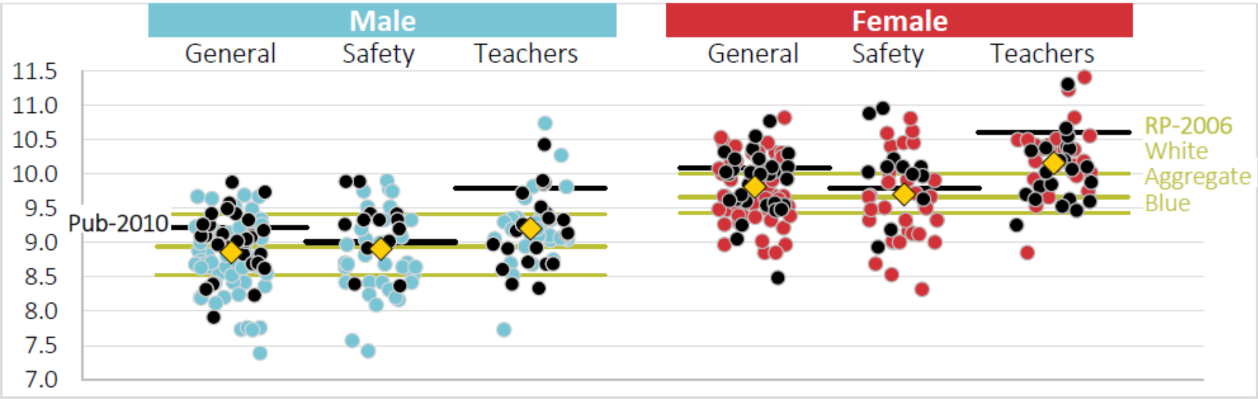
Key Findings

- Pub-2010 annuity factors exceed the comparable average annuity factor under assumptions currently used by public sector plans
- Pub-2010 average annuity factors range from 0.9% greater for age 75 female safety employee to 6.3% greater for age 75 male teachers
- Mortality analysis performed in the recent experience study considered plan's own experience, which was fully credible for participants and nearly fully credible for beneficiaries

SOA's Public Sector Mortality Table Analysis (cont.)

Figure 3

2018 AGE 75 ANNUITY FACTORS WITH PUB-2010 AND RP-2006



Legend

Black dots	Plans that use RP-2006 or RP-2014 mortality rates (possibly adjusted) in the base table
Blue/red dots	Plans that use neither RP-2006 nor RP-2014 mortality rates (adjusted or otherwise) in the base table
Yellow diamonds	Average of all plans in the job category, weighted one per plan
Black lines	Pub-2010 Mortality Tables (amount-weighted) generationally projected with Scale MP-2017
Green lines	RP-2006 Mortality Tables (amount-weighted) generationally projected with Scale MP-2017: white collar (top), aggregate (middle) and blue collar (bottom)
Assumptions	Monthly single life annuities beginning in 2018, computed at 7% interest with 2% annual benefit increases

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- In general, Safety mortality is slightly worse than General, and Teacher mortality is better than both other groups
- Plans with “non-credible” experience may see an increase in liabilities if Pub-2010 tables are adopted

Actuarial Standard of Practice (ASOP) 4 – Draft

- ASOP 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions
- Actuarial Standards Board (ASB) released exposure draft in March 2018
- ASB requested comments by July 31, 2018
  - Segal comments included concerns and suggested clarifying revisions
- Exposure draft includes two new requirements
  - Calculate and disclose a reasonable actuarially determined contribution
    - TRS already does this
  - Calculate and disclose an Investment Risk Defeasement Measure (IRDM)
    - Obligation measure that reflects cost of defeasing the investment risk
    - Present value of benefits accrued to date (no future service or salary increase)
    - Discount rate based on market yields for hypothetical bond portfolio
      - U.S. Treasury yields; or
      - Fixed income security yields that receive one of the two highest ratings
    - Intended to measure the amount of investment risk taken by a System

Actuarial Standard of Practice (ASOP) 4 – Draft

- Concerns about IRDM
  - Investment risk cannot be defeased in any practical sense
  - The IRDM will not measure the amount of investment risk taken by TRS
    - The IRDM is not comparable to any other liability calculated in the valuation (or for most public retirement systems) because the "present value of benefits accrued to date" method is not used in any other liability
  - The IRDM is likely to be misused, misinterpreted, and/or misunderstood
- Segal has members on both the ASB and the ASB's Pension Committee
  - ASB's next steps
    - Review comments submitted
    - Release a second exposure draft that will request additional comments
    - Review those comments and develop the final ASOP
  - The final ASOP is not expected anytime soon (possibly 2019 or 2020) and will be effective after it is issued

Appendix

- FY 2020 State Contribution Certification Exhibit A
- FY 2020 THIS Fund Certification Exhibit B

Exhibit A

Summary of State Contributions under Illinois Pension Code and Board-Adopted Actuarial Funding Policy	Fiscal Year 2020
1. Based on Statutory Funding Plan	
Total State Contribution for fiscal year 2020:	
a. Benefit Trust Reserve*:	
i. 46.01% of membership payroll	$ 5,040,022,842
ii. Minus School Districts Contributions:	
(0.58% of membership payroll)	(63,536,585)
(3%/6% FAS cap increases)	(20,435,968)
(10.66% of membership payroll above the Governor's salary)	(3,113,849)
iii. Minus Federal Funds Contribution	
(10.66% of membership payroll from federal funds)	(23,355,172)
iv. Minus phase-in of the effect of assumption changes	(116,503,572)
v. State Contribution	$ 4,813,077,696
b. Guaranteed Minimum Annuity Reserve	500,000
c. Total State Contribution (current law)	$ 4,813,577,696
2. Based on Board-Adopted Actuarial Funding Policy**	
a. Benefit Trust Reserve*:	
i. Normal cost plus amortization	$ 7,988,612,283
ii. Minus School Districts Contributions	
(0.58% of membership payroll)	(63,536,585)
(3%/6% FAS cap increases)	(20,435,968)
(10.66% of membership payroll above the Governor's salary)	(3,113,849)
iii. Minus Federal Funds Contribution	
(10.66% of membership payroll from federal funds)	(23,355,172)
iv. State Contribution	$ 7,878,170,709
b. Guaranteed Minimum Annuity Reserve	500,000
c. Total State Contribution	$ 7,878,670,709
3. Total Normal Cost and Employer Normal Cost Rate for Fiscal Year 2020	
a. Total Normal Cost Rate (including administrative expenses)	19.66%
b. Member Rate	(9.00%)
c. Employer Normal Cost Rate	10.66%
4. Federal Contribution Rate (Employer Normal Cost Rate, per PA 100-0340)	10.66%

* Expected fiscal year 2020 membership payroll is $10,954,583,571

** 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 2020	Fiscal Year 2020
Expected State Contribution for Fiscal Year 2020 to THIS Fund:	
1. Fiscal Year 2020 membership payroll:	
a. Total	$ 10,954,583,571
b. Minus members who do not contribute to THIS Fund	(49,599,516)
c. Members who do contribute to THIS Fund	$ 10,904,984,055
2. Member contribution rate (assumed)	1.30%
3. Matching State contribution: 1.c. x 2.	$ 141,764,793
4. Adjustment to THIS Fund for overestimating fiscal year 2018 member THIS Fund contributions	(3,063,242)
5. Total THIS Fund State contribution*	$ 138,701,551

* 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 2020 payroll from the June 30, 2018 valuation