



Fiscal Year 2021
Actuarial Valuation Report
for the
New York City
Teachers' Retirement System

JUNE 30, 2019 (LAG) ACTUARIAL VALUATION

prepared by the
New York City
Office of the Actuary

2021



OFFICE OF THE ACTUARY

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SHERRY S. CHAN
CHIEF ACTUARY

December 29, 2021

Board of Trustees
New York City Teachers' Retirement System
55 Water Street, 16th Floor
New York, NY 10041

Re: Fiscal Year 2021 Actuarial Valuation Report (Report)

Dear Trustees:

This Report presents the results of the June 30, 2019 (Lag) actuarial valuation of the benefits under both the New York City Teachers' Retirement System (TRS) and Group Life Insurance Plan (collectively, the Plan). This valuation, known as the June 30, 2019 (Lag) valuation, forms the basis for determining the statutorily-required contribution (Statutory Contribution) of \$3,131,606,535 for Fiscal Year 2021 (i.e. for the period beginning July 1, 2020 and ending June 30, 2021). It is not intended, nor necessarily suitable, for other purposes. Calculations made for other purposes may differ significantly from those shown herein.

Results of the June 30, 2018 (Lag) actuarial valuation are shown in this Report for comparative purposes. Other historical information that the Actuary believes useful is also included.

The June 30, 2019 (Lag) and June 30, 2018 (Lag) actuarial valuations are based upon census data as of those dates submitted by the Plan's administrative staff and the employer's payroll facilities. Financial information was provided by TRS and the Office of the Comptroller as of June 30, 2019 and June 30, 2018.

Consistent with Actuarial Standards of Practice, the Office of the Actuary has reviewed census data and financial information for consistency and reasonability but has not audited it. The accuracy of the results and calculations presented in this Report are dependent on the accuracy of this census data and financial information. To the extent any such data or information provided is materially inaccurate or incomplete, the results contained herein will require revision.

A summary of the benefits available under the terms of the Plan is shown in SECTION VIII – SUMMARY OF PLAN PROVISIONS. The benefits under the Plan are unchanged from the prior valuation.

A summary of the actuarial assumptions and methods used in the valuation of the Plan is shown in SECTION XI – ACTUARIAL ASSUMPTIONS AND METHODS. The assumptions and

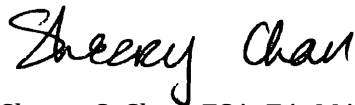
methods used for the June 30, 2019 valuation have changed from the prior valuation and were presented in the memorandum titled "Proposed Changes to Actuarial Assumptions and Methods (Revised 2021 A&M)" dated July 23, 2021 and were adopted by the Retirement Board at the September 20, 2021 Board meeting.

This Report does not present Governmental Accounting Standards Board (GASB) results. The Office of the Actuary published the Fiscal Year 2021 GASB67 and GASB68 results in a report dated September 24, 2021, which is available on the website of the Office of the Actuary (www.nyc.gov/actuary).

Also, note that this valuation does not reflect any potential cost due to *Gulino vs. Department of Education*, 96 Civ. 8414(KMW).

I, Sherry S. Chan, am the Chief Actuary for, and independent of, the New York City Retirement Systems and Pension Funds. I am a Fellow of the Society of Actuaries, an Enrolled Actuary under the Employee Retirement Income and Security Act of 1974, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. To the best of my knowledge, the results contained herein have been prepared in accordance with generally accepted actuarial principles and procedures and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

Best Regards,



Sherry S. Chan, FSA, EA, MAAA, FCA
Chief Actuary

SSC/eh

cc: Ms. Valerie Budzik - New York City Teachers' Retirement System
Ms. Dolores Capone - New York City Office of the Actuary
Ms. Melissa Chacko - New York City Office of the Actuary
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SECTION I – EXECUTIVE SUMMARY

This Report presents the results of the June 30, 2019 (Lag) actuarial valuation of the New York City Teachers' Retirement System (TRS) Qualified Pension Plan and Group Life Insurance Plan (collectively, the Plan).

The purposes of the valuation are:

- To determine the actuarially-required contribution (Actuarial Contribution) for Fiscal Year 2021 (i.e. July 1, 2020 to June 30, 2021),
- To measure the funding progress of the Plan,
- To disclose the census data and financial information used in the valuation, and
- To disclose the actuarial assumptions and actuarial methods used to determine the Actuarial Contribution.

The statutorily-required contribution (Statutory Contribution) is also shown and compared to the Actuarial Contribution in historical years.

This Report does not provide financial and accounting information required by current GASB standards. That information is provided in a separate report.

Future measurements of this information may differ from current measurements for many reasons including, but not limited to, experience differing from economic or demographic assumptions, changes in actuarial assumptions and methods, and changes in applicable statute and plan provisions. These and additional risks may be present for the Plan. A further discussion is presented in SECTION VII – RISK AND UNCERTAINTY for consideration.

Table I-1
Executive Summary

Presented in **Table I-1** are the principal results of the June 30, 2019 (Lag) actuarial valuation and, for comparative purposes, the June 30, 2018 (Lag) actuarial valuation.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM		
SUMMARY OF VALUATION RESULTS		
Valuation Date	June 30, 2019 (Lag)	June 30, 2018 (Lag)
Fiscal Year	2021	2020
Funded Status		
1. Accrued Liability	\$ 73,938,546,544	\$ 72,205,318,401
2. Actuarial Value of Assets (AVA) ¹	<u>57,990,211,000</u>	<u>50,012,149,000</u>
3. Unfunded Accrued Liability (AVA Basis) (1. - 2.)	\$ 15,948,335,544	\$ 22,193,169,401
4. Funded Ratio (AVA Basis) (2. / 1.)	78.4%	69.3%
5. Market Value of Assets (MVA) ¹	57,990,211,000	54,532,476,000
6. Unfunded Accrued Liability (MVA Basis) (1. - 5.)	\$ 15,948,335,544	\$ 17,672,842,401
7. Funded Ratio (MVA Basis) (5. / 1.)	78.4%	75.5%
Contribution		
1. Normal Cost	\$ 1,402,110,016	\$ 1,358,558,635
2. Unfunded Accrued Liability	1,697,740,859	2,201,365,303
3. Administrative Expenses	57,455,660	56,397,773
4. ASAF Credit	(25,700,000)	(25,500,000)
5. BOE Pre-payment Credit	<u>-</u>	<u>(20,450)</u>
6. Actuarial Contribution (1. + 2. + 3. + 4. + 5.)	\$ 3,131,606,535	\$ 3,590,801,261
7. Statutory Contribution	\$ 3,131,606,535	\$ 3,590,801,261
Participant Data		
1. Active Members		
a. Number	123,336	121,764
b. Annual Salary	\$ 10,903,755,059	\$ 10,404,403,684
c. Average Salary	\$ 88,407	\$ 85,447
2. Active Off Payroll Members ²	8,174	9,416
3. Terminated Vested Members	13,410	16,433
4. Retirees and Beneficiaries		
a. Number	88,507	86,295
b. Total Annual Benefits	\$ 4,370,615,951	\$ 4,234,276,918
c. Average Benefit	\$ 49,382	\$ 49,067

¹ Actuarial Value of Assets and Market Value of Assets are rounded to the nearest thousand.

² Represents members no longer on payroll, but not otherwise classified.

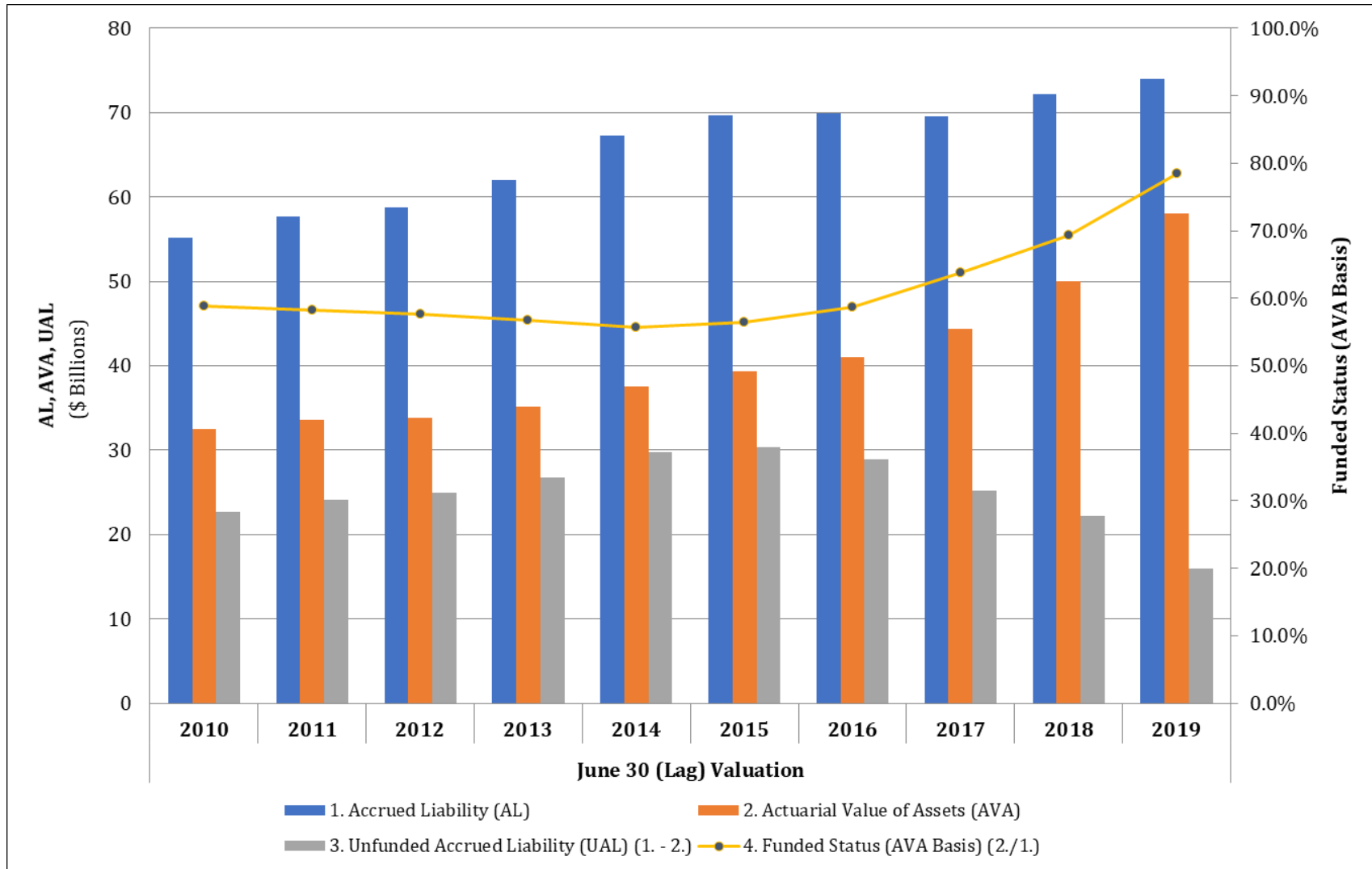
Table I-2
Actuarial Liabilities

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM		
ACTUARIAL LIABILITIES BY STATUS		
Valuation Date	June 30, 2019 (Lag)	June 30, 2018 (Lag)
Fiscal Year	2021	2020
Accrued Liability		
1. Active Members	\$ 28,711,678,928	\$ 27,097,508,402
2. Active Off Payroll Members ¹	320,115,473	556,523,957
3. Terminated Vested Members	1,159,485,346	1,394,420,845
4. Retirees and Beneficiaries	<u>43,741,266,797</u>	<u>43,150,865,197</u>
5. Accrued Liability Pre-Adjustments (1. to 4.)	\$ 73,932,546,544	\$ 72,199,318,401
6. Actuarial Adjustments ²	<u>6,000,000</u>	<u>6,000,000</u>
7. Total Accrued Liability (AL) (5. + 6.)	\$ 73,938,546,544	\$ 72,205,318,401
Present Value of Benefits		
1. Active Members	\$ 46,939,656,475	\$ 44,557,292,753
2. Active Off Payroll Members ¹	320,115,473	556,523,957
3. Terminated Vested Members	1,159,485,346	1,394,420,845
4. Retirees and Beneficiaries	<u>43,741,266,797</u>	<u>43,150,865,197</u>
5. Present Value of Benefits (1. to 4.)	\$ 92,160,524,091	\$ 89,659,102,752
6. Actuarial Adjustments ²	<u>6,000,000</u>	<u>6,000,000</u>
7. Total Present Value of Benefits (5. + 6.)	\$ 92,166,524,091	\$ 89,665,102,752

¹ Represents members no longer on payroll, but not otherwise classified.

² Related to actuarial loading adjustments.

Graph I-3
Historical Funded Status



SECTION II – MARKET AND ACTUARIAL VALUES OF ASSETS

Information on the Market Value of Assets (MVA) of the Plan is provided by the Office of the Comptroller. An Actuarial Asset Valuation Method (AAVM) is used to determine the Actuarial Value of Assets (AVA) of the Plan.

The Actuary reset the AVA to the market value as of June 30, 2011 and as of June 30, 2019. Beginning with the June 30, 2020 (Lag) actuarial valuation, the AAVM recognizes investment returns greater or less than expected over a period of five years. In accordance with this AAVM, the Unexpected Investment Returns (UIR) are phased into the AVA at rates 20% per year.

UIR is defined as the excess of net investment return over the Expected Investment Return (EIR) based on the expected rate of return and the MVA, where EIR equals the sum of beginning-of-fiscal-year MVA plus one-half of net cash flow, multiplied by the expected rate of return.

The AVA is further constrained to be within a corridor of 80% to 120% of the market value.

Beginning with the June 30, 2018 (Lag) actuarial valuation, the Actuarial Value of Assets is determined by re-characterizing the interest credited on TDA Fixed Fund account balances as investment income instead of as a cash disbursement.

Table II-1
Statement of Plan Net Assets

(\$ Thousands)		
	June 30, 2019	June 30, 2018
ASSETS		
Cash	\$ 76,796	\$ 75,847
Receivables		
Investment Securities Sold	\$ 2,305,855	\$ 839,544
Member Loans	320,976	312,219
Accrued Interest and Dividends	<u>290,228</u>	<u>273,387</u>
Total Receivables	\$ 2,917,059	\$ 1,425,150
INVESTMENTS AT FAIR VALUE		
Pooled NYC Pension Fund Assets (Fixed-Return Fund)		
Short-Term Investments		
Commercial Paper	\$ 567,394	\$ 6,487
Short-term Investment Fund	779,479	1,578,263
U.S. Treasury Bills & Agencies	100,011	0
Discount Notes	203,555	111,733
Debt Securities		
U.S. Government	11,074,088	13,288,993
Corporate & Other	11,914,295	7,016,574
Equity Securities	24,374,505	20,536,514
Alternative Investments	10,069,086	8,926,759
Collective Trust Funds		
Fixed Income	0	1,848,081
International Equity	15,224,013	15,436,970
Mortgage Debt Security	0	555,508
Treasury Inflation Protected Securities	3,387,131	3,106,109
Collateral from securities lending (Fixed Return Fund)	1,182,863	1,048,388
Diversified Equity Fund		
Short-Term Investments	123,852	135,558
Equity Securities	5,826,298	6,125,780
Debt Securities	120,152	127,150
Bond Fund		
Short-Term Investments	775	849
Equity Securities	62,502	70,562
Debt Securities	0	0
International Equity Fund		
Short-Term Investments	65	80
Equity Securities	11,131	12,076
Inflation Protection Fund		
Short-Term Investments	13	3
Equity Securities	3,930	4,596
Socially Responsive Equity Fund		
Short-Term Investments	410	453
Equity Securities	10,975	11,654
International equity	985	717
Collateral from securities lending (Variable Return Fund)	<u>39,451</u>	<u>69,204</u>
TOTAL INVESTMENTS	\$ 85,076,959	\$ 80,019,061
OTHER ASSETS	<u>42,615</u>	<u>62,852</u>
TOTAL ASSETS	\$ 88,113,429	\$ 81,582,910
LIABILITIES		
Accounts Payable	\$ 646,918	\$ 643,567
Payable for Investment Securities Purchased	2,574,584	1,568,064
Accrued Benefits Payable	77,154	13,858
Due to TDA Program's Fixed Return Fund	25,602,248	23,707,352
Security Lending	<u>1,222,314</u>	<u>1,117,593</u>
TOTAL LIABILITIES	\$ 30,123,218	\$ 27,050,434
PLAN ASSETS HELD IN TRUST FOR PENSION BENEFITS	\$ 57,990,211	\$ 54,532,476

Table II-2
Statement of Changes in Plan Net Assets

(\$ Thousands)		
	June 30, 2019	June 30, 2018
ADDITIONS		
Contributions		
Member Contributions	\$ 217,205	\$ 195,241
Employer Contributions	3,696,685	3,889,710
Other Employer Contributions ¹	<u>62,513</u>	<u>59,979</u>
Total Contributions	\$ 3,976,403	\$ 4,144,930
Investment Income		
Interest Income	\$ 1,148,789	\$ 1,330,009
Dividend Income	1,112,731	1,056,636
Net Appreciation in Fair Value of Investments	<u>3,749,095</u>	<u>4,223,813</u>
Total Investment Income	\$ 6,010,615	\$ 6,610,458
Less:		
Investment Expenses	\$ 307,370	\$ 356,269
Net (Decrease) in Fair Variable Expense Provision	<u>(5,933)</u>	<u>(5,601)</u>
Net Investment Income	\$ 5,709,178	\$ 6,259,790
Securities Lending Transactions		
Securities Lending Income	\$ 13,416	\$ 16,654
Securities Lending Fees	<u>(1,283)</u>	<u>(1,329)</u>
Net Securities Lending Income (Loss)	\$ 12,133	\$ 15,325
Other		
Net Receipts from (to) Other Retirement Systems	\$ 1,222	\$ (3,534)
TOTAL ADDITIONS	\$ 9,698,936	\$ 10,416,511
DEDUCTIONS		
Benefit Payments and Withdrawals	\$ 4,487,680	\$ 4,351,924
Administrative Expenses	64,291	65,076
Other		
Interest from (to) TDA Program's Fixed Return Fund	\$ 1,716,679	\$ 1,595,462
TDA Rebalance	<u>\$ (27,449)</u>	<u>\$ (32,704)</u>
TOTAL DEDUCTIONS	\$ 6,241,201	\$ 5,979,758
NET INCREASE (DECREASE) IN PLAN NET ASSETS	\$ 3,457,735	\$ 4,436,753
PLAN NET ASSETS HELD IN TRUST FOR PENSION BENEFITS		
Beginning of Year	\$ 54,532,476	\$ 50,095,723
End of Year	\$ 57,990,211	\$ 54,532,476

¹ Includes amounts for employer's portion of Additional Member Contributions and supplemental contributions for the ASAF and ASF Funds.

Table II-3
Development of Actuarial Value of Assets

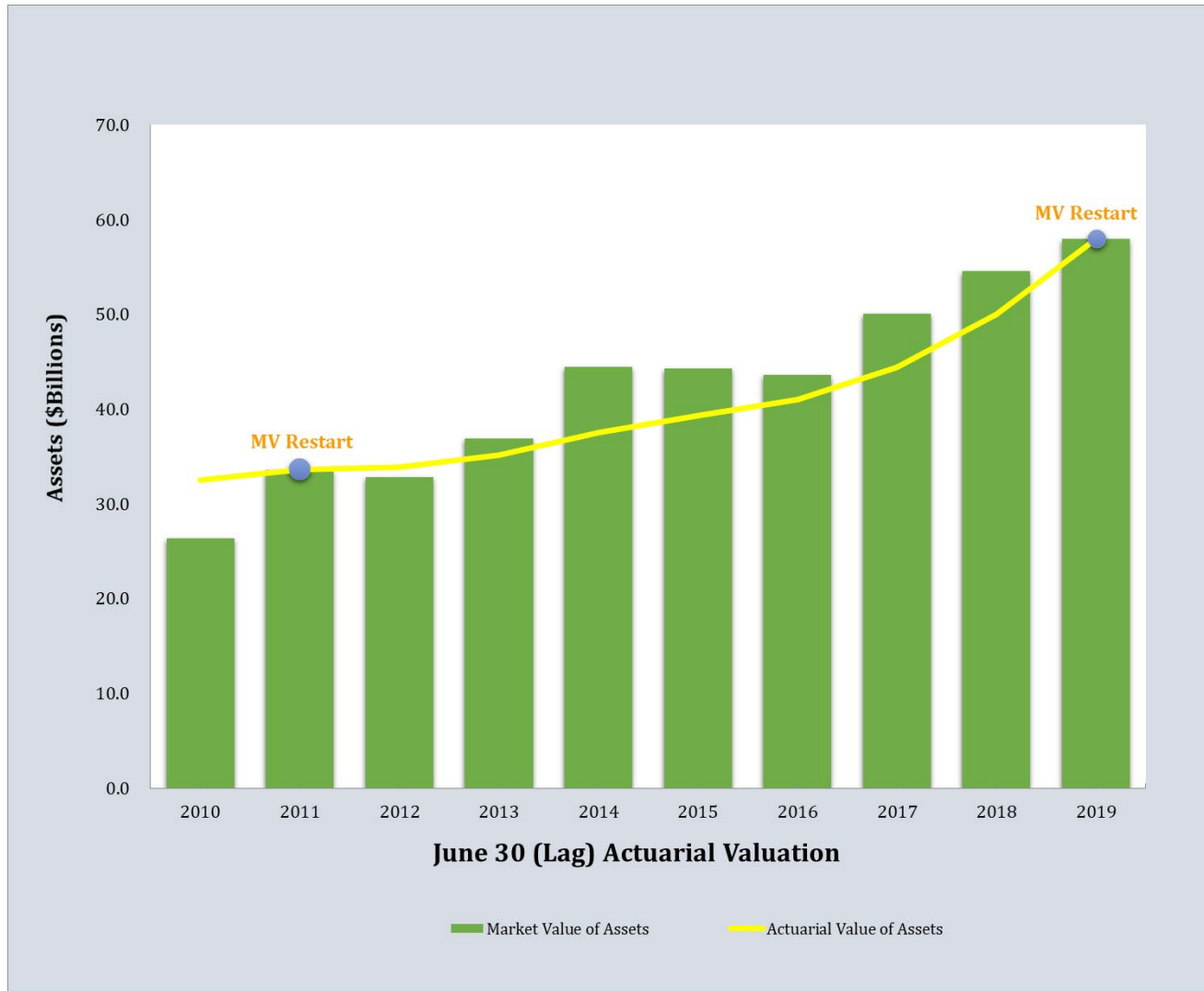
(\$ Thousands)		
Valuation Date	June 30, 2019 ¹	June 30, 2018
Fixed Fund		
Market Value of Assets (MVA)		
Beginning of Year (BOY)	\$ 48,172,801	\$ 43,920,339
End of Year (EOY)	\$ 51,949,650	\$ 48,172,801
1. Contributions		
a. Employee	\$ 216,875	\$ 194,921
b. Employer	3,696,686	3,889,710
c. Other	<u>62,495</u>	<u>59,957</u>
d. Total Contributions	\$ 3,976,056	\$ 4,144,588
2. Net Investment Income		
a. Investment Income	\$ 3,882,645	\$ 4,294,576
b. Investment Expenses	<u>(299,763)</u>	<u>(348,905)</u>
c. Total Net Investment Income	\$ 3,582,882	\$ 3,945,671
3. Cash Flow (Other)		
	\$ (3,782,089)	\$ (3,837,797)
4. Net Cash Flow (1.d. + 3.)		
	\$ 193,967	\$ 306,791
5. Average invested assets		
a. AVA @ BOY	N/A	\$ 38,206,322
b. 1/2 Net Cash Flow ((1.d. + 3.) / 2)	N/A	<u>153,396</u>
c. Total	N/A	\$ 38,359,718
6. Expected Rate of Return (AIR)		
	7.00%	7.00%
7. Expected Investment Return (EIR) (5.c. x 6.) ²		
	N/A	\$ 2,685,180
8. Unexpected Investment Return (UIR) (2.c. - 7.)		
	N/A	\$ 1,260,491
9. AVA @ EOY		
a. AVA @ BOY (prior to corridor limit) ²	N/A	\$ 38,206,322
b. Net Cash Flow (4.)	N/A	306,791
c. Expected Investment Return (7.)	N/A	2,685,180
d. Phase in of UIR ³		
20%/15% * UIR for prior year	N/A	189,074
20%/15% * UIR for second prior year	N/A	716,955
20%/15% * UIR for third prior year	N/A	(230,748)
20%/15% * UIR for fourth prior year	N/A	(134,530)
20%/20% * UIR for fifth prior year	N/A	1,307,944
0%/20% * UIR for sixth prior year	N/A	<u>605,486</u>
Total	N/A	\$ 2,454,181
e. Preliminary AVA (9.a. + 9.b. + 9.c. + 9.d.)	N/A	\$ 43,652,474
10. Corridor		
a. 80% of MVA	\$ 41,559,720	\$ 38,538,241
b. 120% of MVA	\$ 62,339,580	\$ 57,807,361
11. Final AVA of EOY (9e. bounded by 10)	\$ 51,949,650	\$ 43,652,474
12. Variable Assets		
	\$ 6,040,561	\$ 6,359,675
13. Total AVA @ EOY (11. + 12.)	\$ 57,990,211	\$ 50,012,149

¹ Calculations reflect the "Revised 2021 A&M," the actuarial assumptions and methods proposed in a memo dated July 23, 2021 and adopted by the Board at the September 20, 2021 Board meeting.

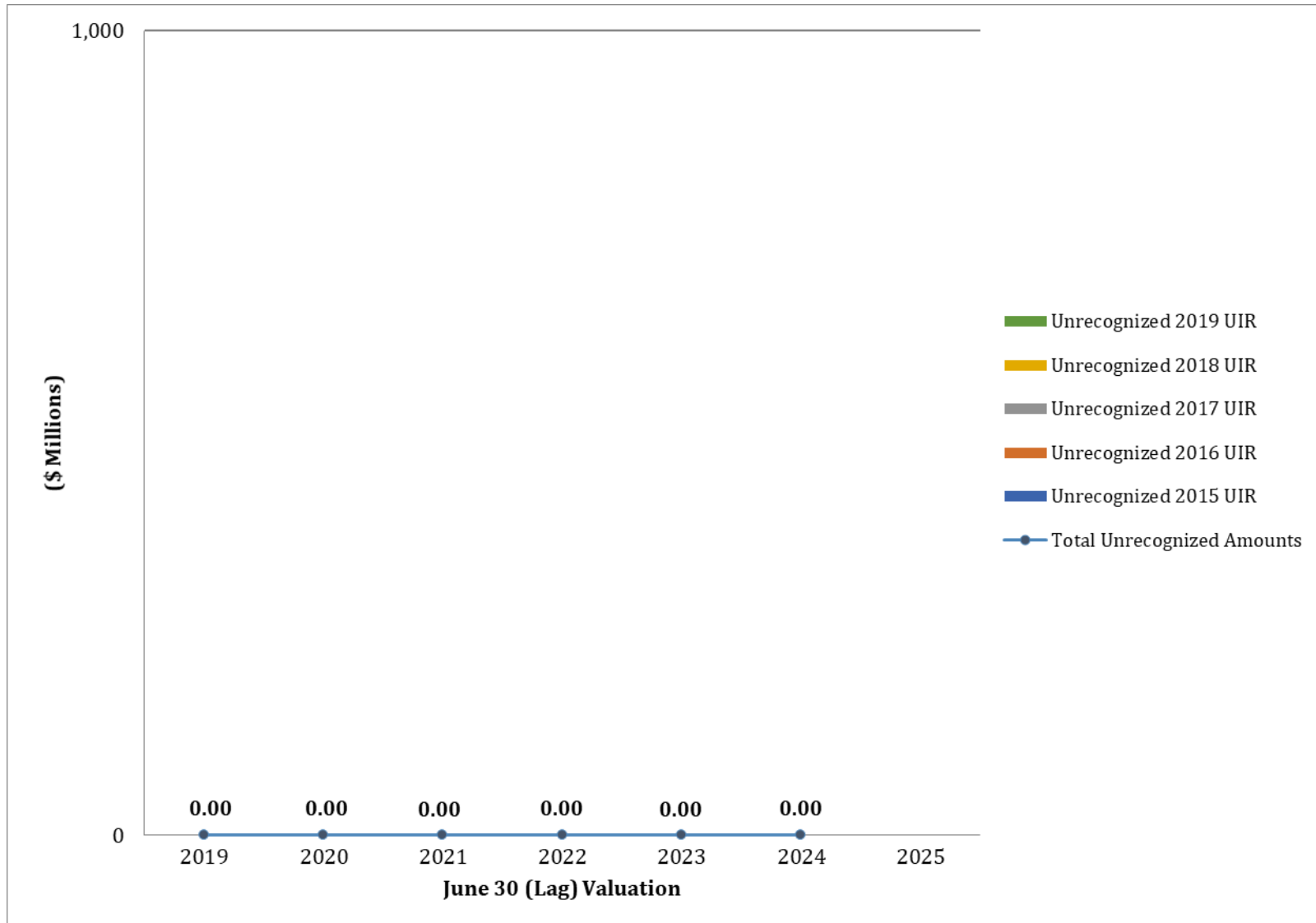
² Due to the "Revised 2021 A&M," AVA has been restarted by setting it equal to the MVA as of June 30, 2019 and Actual Investment Return rather than Expected Investment Return is used in the June 30, 2019 calculations.

³ Due to the "Revised 2021 A&M," the recognition of future asset performance has been changed from the previous six-year period, from 15% for the first four years and 20% for the last two years, to a five-year period at 20% per year.

Graph II-4
Historical Market and Actuarial Value of Assets



Graph II-5
Future Recognition of UIR as of June 30, 2019



As a result of the AVA restart as of June 30, 2019, all previous UIRs have been recognized.

SECTION III – CONTRIBUTION DEVELOPMENT AND HISTORY

Table III-1 Statutory Contributions

Table III-1 shows the components of the Fiscal Year 2021 and the Fiscal Year 2020 Statutory Contributions.

COMPONENTS OF CURRENT AND PRIOR FISCAL YEAR STATUTORY CONTRIBUTIONS		
Valuation Date	June 30, 2019 (Lag)	June 30, 2018 (Lag)
Fiscal Year	2021	2020
Normal Cost ¹	\$ 1,402,110,016	\$ 1,358,558,635
Amortization of Unfunded Accrued Liability		
-Initial UAL	2,011,976,344	1,953,375,091
-2011 (Gain)/Loss	157,298,501	157,298,501
-2012 (Gain)/Loss	92,094,332	92,094,332
-2013 (Gain)/Loss	244,357,693	244,357,693
-2014 (Gain)/Loss	117,417,036	117,417,036
-2014 Assumption Changes ²	224,142,498	224,142,498
-2015 (Gain)/Loss	86,869,581	86,869,581
-2016 (Gain)/Loss	(100,351,916)	(100,351,916)
-2017 (Gain)/Loss	(264,357,362)	(264,357,362)
-2017 ASAF Method Change	11,633,517	11,633,517
-2017 Assumption Changes ³	(107,961,163)	(107,961,163)
-2017 Method Changes ³	908,566	908,566
-2018 (Gain)/Loss	(73,585,040)	(73,585,040)
-2018 Method Change ⁴	(140,476,031)	(140,476,031)
-2019 (Gain)/Loss	(207,653,807)	N/A
-2019 Assumption Changes ⁵	(38,429,261)	N/A
-2019 Method Change ⁵	(316,142,629)	N/A
Total	1,697,740,859	2,201,365,303
Administrative Expenses	57,455,660	56,397,773
ASAF Credit ⁶	(25,700,000)	(25,500,000)
Other Credit ⁷	N/A	(20,450)
Total Contribution to the New York City Teachers' Retirement System	\$ 3,131,606,535	\$ 3,590,801,261

¹ Includes amounts necessary, if any, to provide for financing of the Excess Benefit Plan established by Chapter 623/04.

² Change in post retirement mortality assumptions including the change to the mortality improvement scale MP-2015.

³ 2019 A&M.

⁴ Change in method of characterizing interest credited on TDA Fixed Fund account balances.

⁵ Revised 2021 A&M.

⁶ Estimated contribution made by the Department of Education to the Annuity Savings Accumulation Fund (ASAF) of certain eligible members for Fiscal Year 2021.

⁷ Department of Education Pre-Payment credit for an excess received in 2016 due to the closing of Beginning With Children Charter School.

Table III-2
Schedule of Unfunded Accrued Liability Bases

The Initial Unfunded Accrued Liability (UAL) is being amortized over a closed 22-year period using Increasing Dollar Payments (IDP). Under IDP, amortization payments increase by 3.0% per year, consistent with the assumed rate of General Wage Increases. Increments to the UAL established after June 30, 2010 are generally amortized using Level Dollar Payments (LDP) as follows:

- Benefit Changes – Over the remaining working lifetimes of those impacted, unless the amortization period is determined by statute.
- Assumption and Method Changes – Over a closed 20-year period.
- Actuarial Gains and Losses – Over a closed 15-year period.

Under the One-Year Lag Methodology (OYLM), the number of payments is one fewer than the number of years in the amortization period (e.g. 14 payments over a closed 15-year amortization period).

Table III-2
Schedule of Unfunded Accrued Liability Bases (cont'd)

Table III-2 shows the Schedule of UAL Bases as of June 30, 2019.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM SCHEDULE OF UNFUNDED ACCRUED LIABILITY BASES						
Amortization Base	Date Established	Original Amount	Amortization Years	Amortization Payment	Payments Remaining	OYLM UAL June 30, 2019
Initial UAL	6/30/10	\$ 20,524,022,955	22	\$ 2,011,976,344	12	\$ 17,843,173,609
(Gain)/Loss	6/30/11	\$ 1,329,890,090	15	\$ 157,298,501	6	\$ 724,829,576
(Gain)/Loss	6/30/12	\$ 778,617,335	15	\$ 92,094,332	7	\$ 479,813,562
(Gain)/Loss	6/30/13	\$ 2,065,937,513	15	\$ 244,357,693	8	\$ 1,410,596,847
(Gain)/Loss	6/30/14	\$ 992,709,734	15	\$ 117,417,036	9	\$ 739,552,702
Assumption Change ¹	6/30/14	\$ 2,239,586,352	20	\$ 224,142,498	14	\$ 1,895,026,873
(Gain)/Loss	6/30/15	\$ 734,444,345	15	\$ 86,869,581	10	\$ 589,840,333
(Gain)/Loss	6/30/16	\$ (848,431,601)	15	\$ (100,351,916)	11	\$ (727,475,337)
(Gain)/Loss	6/30/17	\$ (2,235,025,973)	15	\$ (264,357,362)	12	\$ (2,029,863,946)
ASAF Method Change	6/30/17	\$ 116,239,745	20	\$ 11,633,517	17	\$ 109,802,536
Assumption Change ²	6/30/17	\$ (1,078,725,991)	20	\$ (107,961,163)	17	\$ (1,018,987,504)
Method Changes ²	6/30/17	\$ 9,078,212	20	\$ 908,566	17	\$ 8,575,474
(Gain)/Loss	6/30/18	\$ (622,129,323)	15	\$ (73,585,040)	13	\$ (594,541,036)
Method Change ³	6/30/18	\$ (1,403,608,000)	20	\$ (140,476,031)	18	\$ (1,366,057,256)
Gain/Loss	6/30/19	\$ (1,755,622,201)	15	\$ (207,653,807)	14	\$ (1,755,622,201)
Assumption Change ⁴	6/30/19	\$ (383,977,377)	20	\$ (38,429,261)	19	\$ (383,977,377)
Method Change ⁴	6/30/19	\$ (3,158,833,000)	20	\$ (316,142,629)	19	\$ (3,158,833,000)

¹ Change in post-retirement mortality assumptions including the change to the mortality improvement scale MP-2015.

² 2019 A&M.

³ Change in method of characterizing interest credited on TDA Fixed Fund account balances.

⁴ Revised 2021 A&M.

Graph III-3
Remaining UAL Amortizations as of June 30, 2019

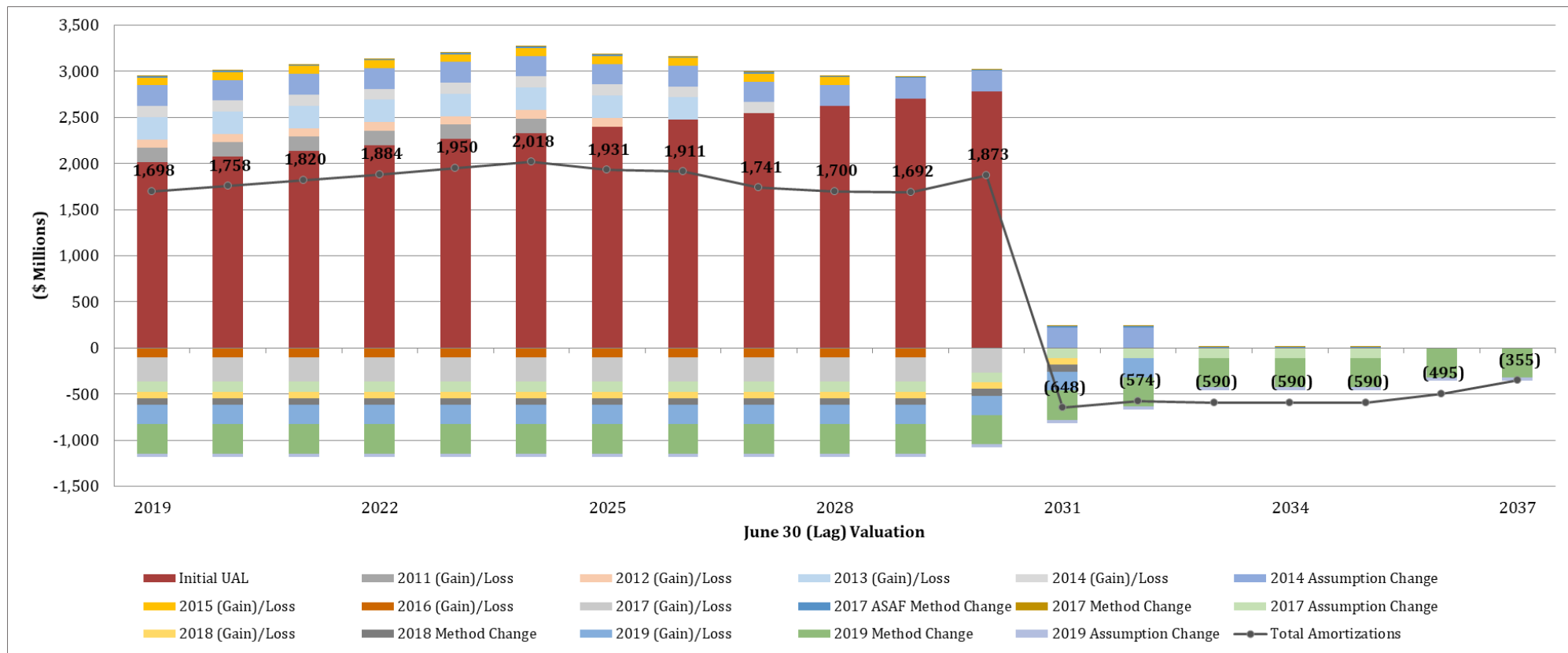


Table III-4
Reconciliation of Outstanding UAL Bases

June 30 (Lag) Valuation Date	Amounts (\$ Thousands) Remaining to be Amortized, as of									
	2010	2011	2012	2013	2014	2015	2016	2017 ¹	2018	2019
Unfunded Accrued Liability, June 30, 2010	\$ 20,524,023	\$ 21,960,705	\$ 21,902,884	\$ 21,793,164	\$ 21,626,476	\$ 21,397,353	\$ 21,099,902	\$ 18,947,775	\$ 18,440,722	\$ 17,843,174
2011 (Gain)/Loss		1,329,890	1,422,983	1,359,880	1,292,361	1,220,116	1,142,813	908,033	819,529	724,830
ERI		5,793	6,199	4,803	3,309	1,710	0	0	0	0
2012 (Gain)/Loss			778,617	833,121	796,176	756,645	714,347	580,057	531,631	479,814
2013 (Gain)/Loss				2,065,937	2,210,553	2,112,526	2,007,638	1,659,177	1,539,090	1,410,597
2014 (Gain)/Loss					992,710	1,062,200	1,015,096	851,185	797,256	739,553
2014 Assumption Change					2,239,586	2,396,357	2,332,248	2,046,963	1,973,564	1,895,027
2015 (Gain)/Loss						734,444	785,855	667,027	629,739	589,840
2016 (Gain)/Loss							(848,432)	(810,808)	(770,551)	(727,475)
2017 (Gain)/Loss								(2,235,026)	(2,135,914)	(2,029,864)
2017 ASAF Method Change								116,240	113,130	109,803
2017 Assumption Change								(1,078,726)	(1,049,867)	(1,018,988)
2017 Method Change								9,078	8,835	8,575
2018 (Gain)/Loss									(622,129)	(594,541)
2018 Method Change									(1,403,608)	(1,366,057)
2019 (Gain)/Loss										(1,755,622)
2019 Assumption Change										(383,977)
2019 Method Change										(3,158,833)
Sum of Outstanding Amortization Amounts	\$ 20,524,023	\$ 23,296,388	\$ 24,110,683	\$ 26,056,905	\$ 29,161,171	\$ 29,681,351	\$ 28,249,467	\$ 21,660,975	\$ 18,871,427	\$ 12,765,854

June 30 (Lag) Valuation Date	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1. Accrued Liability (AL)	\$ 55,138,366	\$ 57,702,731	\$ 58,783,399	\$ 61,988,933	\$ 67,309,977	\$ 69,625,608	\$ 69,964,412	\$ 69,552,380	\$ 72,205,318	\$ 73,938,547
2. Actuarial Value of Assets (AVA)	32,477,527	33,601,537	33,871,180	35,186,072	37,521,424	39,290,072	41,015,087	44,381,706	50,012,149	57,990,211
3. Due (To)/From TDA ²	(250,030)	(322,818)	(304,649)	(363,493)	(464,899)	(486,005)	(488,763)	(303,249)	(327,585)	(365,459)
4. Unfunded Accrued Liability (UAL) (1. - 2. - 3.)	22,910,869	24,424,012	25,216,868	27,166,354	30,253,452	30,821,541	29,438,088	25,473,924	22,520,754	16,313,795
5. PV 1-year Adjusted Employer Contribution ³	2,386,846	1,055,636	1,034,859	1,037,450	1,015,997	1,050,590	1,088,218	3,760,325	3,598,373	3,496,030
6. PV Future Administrative Expense Reimbursement	0	71,988	71,326	71,999	76,284	89,600	100,403	52,624	50,954	51,911
7. Adjusted UAL (4. - 5. - 6.)	\$ 20,524,023	\$ 23,296,388	\$ 24,110,683	\$ 26,056,905	\$ 29,161,171	\$ 29,681,351	\$ 28,249,467	\$ 21,660,975	\$ 18,871,427	\$ 12,765,854

¹ Beginning at June 30, 2017, amounts remaining to be amortized have been reduced by the prior valuation year's amortization payments. When considered with (3) below, this change has no effect.

² Represents difference between TDA assets and actuarial present value of benefits for members who elect to annuitize their TDA account.

³ Beginning at June 30, 2017, the PV 1-year Adjusted Employer Contribution includes amounts used to pay UAL bases and one year of administrative expenses. When considered with (1) above, this change has no effect.

Table III-5
Actuarial and Statutory Contribution History

Table III-5 compares the Statutory Contributions to the Actuarial Contributions for Fiscal Years 2012 through 2021.

(\$ Thousands)			
Fiscal Year Ended June 30	Actuarial Contribution Certified	Statutory Contribution Contributed	Percentage of Actuarial Contribution Contributed
2012	\$2,673,078	\$2,673,078	100.0%
2013	2,855,640	2,855,640	100.0%
2014	2,998,694	2,998,694	100.0%
2015	3,270,007	3,270,007	100.0%
2016	3,702,569	3,702,569	100.0%
2017	3,888,399	3,888,399	100.0%
2018	3,889,710	3,889,710	100.0%
2019	3,696,686	3,696,686	100.0%
2020	3,590,801	3,590,801	100.0%
2021	3,131,607	3,131,607	100.0%

Table III-6
City Rates: Contributions as a Percentage of Salary

Table III-6 shows the City Rates defined to be the contributions as a percentage of salary for the Fiscal Years 2012 through 2021.

CITY RATES (\$ Thousands)			
Fiscal Year Ended June 30	Actuarial Contribution ¹	Salary ² at Beginning of Fiscal Year	City Rate
2012	\$2,673,078	\$7,920,820	33.7%
2013	2,855,640	7,833,398	36.5%
2014	2,998,694	7,964,149	37.7%
2015	3,270,007	8,074,522	40.5%
2016	3,702,569	8,256,100	44.8%
2017	3,888,399	8,818,537	44.1%
2018	3,889,710	9,200,180	42.3%
2019	3,722,186	9,874,119	37.7%
2020 ³	3,616,322	10,439,259	34.6%
2021	3,157,307	10,950,176	28.8%

¹ Starting in Fiscal Year 2019, reflects the estimate of the contribution made by the Department of Education to the Annuity Savings Accumulation Fund (ASAF).

² Includes the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

³ Actuarial Contribution is amount before offsetting for ASAF and Pre-Payment Credits.

SECTION IV - RESULTS BY CONTRIBUTING ENTITY

**Table IV-1
Employer Contributions by Obligor**

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM							
EMPLOYER CONTRIBUTION BY OBLIGOR							
Valuation Date	June 30, 2019 (Lag)						
Fiscal Year	2021						
Obligor	Future Leaders	Harriet Tubman	Imagine Me Leadership	KIPP Academy	KIPP NYC	Opportunity	Renaissance
Contribution							
1. Normal Cost	\$ 300,244	\$ 384,602	\$ 103,649	\$ 609,912	\$ 692,833	\$ 661,762	\$ 809,862
2. Amortization of Unfunded Accrued Liability	46,256	(30,152)	15,419	(296,851)	265	48,459	602,367
3. Administrative Expenses	15,666	19,540	5,975	37,441	22,236	32,539	29,331
4. Actuarial Contribution (1. + 2. + 3.)	\$ 362,166	\$ 373,990	\$ 125,043	\$ 350,502	\$ 715,334	\$ 742,760	\$ 1,441,560
5. Statutory Contribution	\$ 362,166	\$ 373,990	\$ 125,043	\$ 350,502	\$ 715,334	\$ 742,760	\$ 1,441,560
Obligor	South Bronx Early College Academy	UFT	University Prep Charter HS	Voice	Wildcat		Charter School Subtotal
Contribution							
1. Normal Cost	\$ 192,824	\$ 329,297	\$ 529,615	\$ 467,114	\$ 392,625		\$ 5,474,339
2. Amortization of Unfunded Accrued Liability	(52,611)	254,779	168,534	21,198	55,447		833,110
3. Administrative Expenses	12,684	12,716	24,860	27,916	14,099		255,003
4. Actuarial Contribution (1. + 2. + 3.)	\$ 152,897	\$ 596,792	\$ 723,009	\$ 516,228	\$ 462,171		\$ 6,562,452
5. Statutory Contribution	\$ 152,897	\$ 596,792	\$ 723,009	\$ 516,228	\$ 462,171		\$ 6,562,452

Table IV-1
Employer Contributions by Obligor (cont'd)

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM						
EMPLOYER CONTRIBUTION BY OBLIGOR						
Valuation Date	June 30, 2019 (Lag)					
Fiscal Year	2021					
Obligor	Charter School Subtotal	CUNY: Senior Colleges	CUNY: Community Colleges / Others	CUNY Subtotal	Department of Education	Total
Contribution						
1. Normal Cost	\$ 5,474,339	\$ 38,500,031	\$ 23,760,905	\$ 62,260,936	\$ 1,334,374,741	\$ 1,402,110,016
2. Amortization of Unfunded Accrued Liability	833,110	49,503,748	19,281,562	68,785,310	1,628,122,439	1,697,740,859
3. Administrative Expenses	255,003	1,490,762	923,994	2,414,756	54,785,901	57,455,660
4. ASAF Credit	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>(25,700,000)</u>	<u>(25,700,000)</u>
5. Actuarial Contribution (1. + 2. + 3. + 4. + 5.)	\$ 6,562,452	\$ 89,494,541	\$ 43,966,461	\$ 133,461,002	\$ 2,991,583,081	\$ 3,131,606,535
6. Statutory Contribution	\$ 6,562,452	\$ 89,494,541	\$ 43,966,461	\$ 133,461,002	\$ 2,991,583,081	\$ 3,131,606,535

Table IV-2
Summary of Liability by Status and Obligor

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM							
SUMMARY OF LIABILITY BY STATUS AND OBLIGOR							
Valuation Date	June 30, 2019 (Lag)						
Fiscal Year	2021						
Obligor	Future Leaders	Harriet Tubman	Imagine Me Leadership	KIPP Academy	KIPP NYC	Opportunity	Renaissance
Accrued Liability							
1. Active Members	\$ 3,033,667	\$ 4,703,270	\$ 488,972	\$ 6,771,844	\$ 11,110,300	\$ 7,439,018	\$ 16,200,790
2. Active Off Payroll Members ¹	71,803	586,963	8,812	580,227	306,948	79,639	12,280
3. Terminated Vested Members	578,212	1,327,356	0	1,865,462	1,144,219	1,756,541	169,209
4. Retirees and Beneficiaries	1,617,292	265,856	0	556,678	0	1,838,479	5,860,174
5. Accrued Liability Pre-Adjustments (1. to 4.)	\$ 5,300,974	\$ 6,883,445	\$ 497,784	\$ 9,774,211	\$ 12,561,467	\$ 11,113,677	\$ 22,242,453
6. Actuarial Adjustments ²	0	0	0	0	0	0	0
7. Total Accrued Liability (AL) (5. + 6.)	\$ 5,300,974	\$ 6,883,445	\$ 497,784	\$ 9,774,211	\$ 12,561,467	\$ 11,113,677	\$ 22,242,453
Present Value of Benefits							
1. Active Members	\$ 10,083,836	\$ 11,987,537	\$ 2,706,915	\$ 22,678,017	\$ 19,331,531	\$ 19,349,391	\$ 25,013,432
2. Active Off Payroll Members ¹	71,803	586,963	8,812	580,227	306,948	79,639	12,280
3. Terminated Vested Members	578,212	1,327,356	0	1,865,462	1,144,219	1,756,541	169,209
4. Retirees and Beneficiaries	1,617,292	265,856	0	556,678	0	1,838,479	5,860,174
5. Present Value of Benefits (1. to 4.)	\$ 12,351,143	\$ 14,167,712	\$ 2,715,727	\$ 25,680,384	\$ 20,782,698	\$ 23,024,050	\$ 31,055,095
6. Actuarial Adjustments ²	0	0	0	0	0	0	0
7. Total Present Value of Benefits (5. + 6.)	\$ 12,351,143	\$ 14,167,712	\$ 2,715,727	\$ 25,680,384	\$ 20,782,698	\$ 23,024,050	\$ 31,055,095
Obligor	South Bronx Early College Academy	UFT	University Prep Charter HS	Voice	Wildcat	Charter School Subtotal	
Accrued Liability							
1. Active Members	\$ 787,605	\$ 5,290,548	\$ 8,048,852	\$ 4,116,041	\$ 6,796,790	\$ 74,787,697	
2. Active Off Payroll Members ¹	656,645	117,616	37,696	78,248	0	2,536,877	
3. Terminated Vested Members	0	2,248,962	469,419	386,816	473,783	10,419,979	
4. Retirees and Beneficiaries	0	2,506,697	598,473	0	1,768,151	15,011,800	
5. Accrued Liability Pre-Adjustments (1. to 4.)	\$ 1,444,250	\$ 10,163,823	\$ 9,154,440	\$ 4,581,105	\$ 9,038,724	\$ 102,756,353	
6. Actuarial Adjustments ²	0	0	0	0	0	0	
7. Total Accrued Liability (AL) (5. + 6.)	\$ 1,444,250	\$ 10,163,823	\$ 9,154,440	\$ 4,581,105	\$ 9,038,724	\$ 102,756,353	
Present Value of Benefits							
1. Active Members	\$ 5,814,648	\$ 10,126,732	\$ 17,401,395	\$ 16,336,981	\$ 10,745,490	\$ 171,575,905	
2. Active Off Payroll Members ¹	656,645	117,616	37,696	78,248	0	2,536,877	
3. Terminated Vested Members	0	2,248,962	469,419	386,816	473,783	10,419,979	
4. Retirees and Beneficiaries	0	2,506,697	598,473	0	1,768,151	15,011,800	
5. Present Value of Benefits (1. to 4.)	\$ 6,471,293	\$ 15,000,007	\$ 18,506,983	\$ 16,802,045	\$ 12,987,424	\$ 199,544,561	
6. Actuarial Adjustments ²	0	0	0	0	0	0	
7. Total Present Value of Benefits (5. + 6.)	\$ 6,471,293	\$ 15,000,007	\$ 18,506,983	\$ 16,802,045	\$ 12,987,424	\$ 199,544,561	

¹ Represents members no longer on payroll, but not otherwise classified.

² Includes actuarial loading adjustments.

Table IV-2
Summary of Liability by Status and Obligor (cont'd)

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM						
SUMMARY OF LIABILITY BY STATUS AND OBLIGOR						
Valuation Date	June 30, 2019 (Lag)					
Fiscal Year	2021					
Obligor	Charter School Subtotal	CUNY: Senior Colleges	CUNY: Community Colleges / Others	CUNY Subtotal	Department of Education	Total
Accrued Liability						
1. Active Members	\$ 74,787,697	\$ 554,787,416	\$ 284,056,563	\$ 838,843,979	\$ 27,798,047,252	\$ 28,711,678,928
2. Active Off Payroll Members ¹	2,536,877	24,567,383	21,059,241	45,626,624	271,951,972	320,115,473
3. Terminated Vested Members	10,419,979	17,182,977	9,006,245	26,189,222	1,122,876,145	1,159,485,346
4. Retirees and Beneficiaries	<u>15,011,800</u>	<u>989,067,671</u>	<u>333,800,650</u>	<u>1,322,868,321</u>	<u>42,403,386,676</u>	<u>43,741,266,797</u>
5. Accrued Liability Pre-Adjustments (1. to 4.)	\$ 102,756,353	\$ 1,585,605,447	\$ 647,922,699	\$ 2,233,528,146	\$ 71,596,262,045	\$ 73,932,546,544
6. Actuarial Adjustments ²	<u>0</u>	<u>81,454</u>	<u>43,717</u>	<u>125,171</u>	<u>5,874,829</u>	<u>6,000,000</u>
7. Total Accrued Liability (AL) (5. + 6.)	\$ 102,756,353	\$ 1,585,686,901	\$ 647,966,416	\$ 2,233,653,317	\$ 71,602,136,874	\$ 73,938,546,544
Present Value of Benefits						
1. Active Members	\$ 171,575,905	\$ 987,767,237	\$ 573,049,592	\$ 1,560,816,829	\$ 45,207,263,741	\$ 46,939,656,475
2. Active Off Payroll Members ¹	2,536,877	24,567,383	21,059,241	45,626,624	271,951,972	320,115,473
3. Terminated Vested Members	10,419,979	17,182,977	9,006,245	26,189,222	1,122,876,145	1,159,485,346
4. Retirees and Beneficiaries	<u>15,011,800</u>	<u>989,067,671</u>	<u>333,800,650</u>	<u>1,322,868,321</u>	<u>42,403,386,676</u>	<u>43,741,266,797</u>
5. Present Value of Benefits (1. to 4.)	\$ 199,544,561	\$ 2,018,585,268	\$ 936,915,728	\$ 2,955,500,996	\$ 89,005,478,534	\$ 92,160,524,091
6. Actuarial Adjustments ²	<u>0</u>	<u>81,454</u>	<u>43,717</u>	<u>125,171</u>	<u>5,874,829</u>	<u>6,000,000</u>
7. Total Present Value of Benefits (5. + 6.)	\$ 199,544,561	\$ 2,018,666,722	\$ 936,959,445	\$ 2,955,626,167	\$ 89,011,353,363	\$ 92,166,524,091

¹ Represents members no longer on payroll, but not otherwise classified.

² Includes actuarial loading adjustments.

Table IV-3
Participant Data by Obligor

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM							
PARTICIPANT DATA BY OBLIGOR							
Valuation Date	June 30, 2019 (Lag)						
Fiscal Year	2021						
Obligor	Future Leaders	Harriet Tubman	Imagine Me Leadership	KIPP Academy	KIPP NYC	Opportunity	Renaissance
Participant Data							
1. Active Members							
a. Number	36	56	18	80	37	70	58
b. Annual Salary ¹	\$ 2,973,006	\$ 3,708,139	\$ 1,133,689	\$ 7,105,456	\$ 4,219,849	\$ 6,175,092	\$ 5,566,328
c. Average Salary	\$ 82,584	\$ 66,217	\$ 62,983	\$ 88,818	\$ 114,050	\$ 88,216	\$ 95,971
2. Active Off Payroll Members ²	7	28	3	19	9	6	1
3. Terminated Vested Members	9	7	0	30	31	17	3
4. Retirees and Beneficiaries							
a. Number	2	1	0	1	0	3	11
b. Total Annual Benefits	\$ 147,508	\$ 24,803	\$ 0	\$ 56,983	\$ 0	\$ 156,289	\$ 502,722
c. Average Annual Benefit	\$ 73,754	\$ 24,803	\$ 0	\$ 56,983	\$ 0	\$ 52,096	\$ 45,702
Obligor	South Bronx Early College Academy	UFT	University Prep Charter HS	Voice	Wildcat	Charter School Subtotal	
Participant Data							
1. Active Members							
a. Number	34	26	48	64	26		553
b. Annual Salary ¹	\$ 2,407,298	\$ 2,413,190	\$ 4,717,892	\$ 5,297,780	\$ 2,675,526		\$ 48,393,245
c. Average Salary	\$ 70,803	\$ 92,815	\$ 98,289	\$ 82,778	\$ 102,905		\$ 87,510
2. Active Off Payroll Members ²	29	2	4	9	0		117
3. Terminated Vested Members	0	21	7	7	4		136
4. Retirees and Beneficiaries							
a. Number	0	4	1	0	4		27
b. Total Annual Benefits	\$ 0	\$ 189,357	\$ 48,400	\$ 0	\$ 155,553		\$ 1,281,615
c. Average Annual Benefit	\$ 0	\$ 47,339	\$ 48,400	\$ 0	\$ 38,888		\$ 47,467

¹ Salaries shown reflect the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

² Represents members no longer on payroll, but not otherwise classified.

Table IV-3
Participant Data by Obligor (cont'd)

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM						
PARTICIPANT DATA BY OBLIGOR						
Valuation Date	June 30, 2019 (Lag)					
Fiscal Year	2021					
Obligor	Charter School Subtotal	CUNY: Senior Colleges	CUNY: Community Colleges / Others	CUNY Subtotal	Department of Education	Total
Participant Data						
1. Active Members						
a. Number	553	4,078	2,405	6,483	116,300	123,336
b. Annual Salary ¹	\$ 48,393,245	\$ 282,912,362	\$ 175,352,608	\$ 458,264,970	\$ 10,397,096,844	\$ 10,903,755,059
c. Average Salary	\$ 87,510	\$ 69,375	\$ 72,912	\$ 70,687	\$ 89,399	\$ 88,407
2. Active Off Payroll Members ²	117	904	779	1,683	6,374	8,174
3. Terminated Vested Members	136	160	121	281	12,993	13,410
4. Retirees and Beneficiaries						
a. Number	27	2,021	755	2,776	85,704	88,507
b. Total Annual Benefits	\$ 1,281,615	\$ 123,550,965	\$ 37,296,214	\$ 160,847,179	\$ 4,208,487,157	\$ 4,370,615,951
c. Average Annual Benefit	\$ 47,467	\$ 61,134	\$ 49,399	\$ 57,942	\$ 49,105	\$ 49,382

¹ Salaries shown reflect the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

² Represents members no longer on payroll, but not otherwise classified.

SECTION V - (GAIN)/LOSS ANALYSIS

Table V-1
Development of Experience (Gain)/Loss

Table V-1 develops the asset and liability (Gain)/Loss between the June 30, 2018 (Lag) actuarial valuation and the June 30, 2019 (Lag) actuarial valuation.

DEVELOPMENT OF EXPERIENCE (GAIN) / LOSS		
June 30, 2019		
(\$ Thousands)		
1.	Expected Accrued Liability (AL)	
	a. AL at June 30, 2018	\$ 72,205,318
	b. Total Normal Cost and Administrative Expenses at June 30, 2018	1,521,723
	c. Interest on 1.a. and 1.b. to June 30, 2019	5,160,893
	d. Fiscal Year 2019 Benefit Payments	(4,487,680)
	e. Interest on 1.d. to June 30, 2019	<u>(154,412)</u>
	f. Expected AL at June 30, 2019	\$ 74,245,842
2.	Actual AL at June 30, 2019 before Revised 2021 A&M	\$ 74,317,556
3.	Expected Total Actuarial Value of Assets (AVA) ¹	
	a. Total AVA at June 30, 2018	\$ 49,684,564
	b. Interest on 3.a. to June 30, 2019	3,477,919
	c. Total Contributions Paid in Fiscal Year 2019	3,976,404
	d. Interest on 3.c. to June 30, 2019	136,820
	e. Fiscal Year 2019 Benefit Payments	(4,487,680)
	f. Interest on 3.e. to June 30, 2019	<u>(154,412)</u>
	g. Expected Total AVA at June 30, 2019	\$ 52,633,615
4.	Actual Total AVA at June 30, 2019 before Revised 2021 A&M ²	\$ 54,460,951
5.	Accrued Liability (Gain) / Loss (2. - 1.f.)	\$ 71,714
6.	Actuarial Asset (Gain) / Loss (3.g. - 4.)	\$ (1,827,336)
7.	Total Actuarial (Gain) / Loss (5. + 6.)	\$ (1,755,622)

¹ Includes amount due from TDA of \$(327,585,000).

² Includes amount due from TDA of \$(370,427,000).

SECTION VI – SCHEDULE OF FUNDING PROGRESS

A schedule of funding progress is provided below. This schedule of funding progress was previously required by GASB25, which has been superseded by GASB67, and is provided for historical context. These liability and asset measures are used to develop the Actuarial Contribution and are not suitable for other purposes including, but not limited to, settlement of plan obligations. For more information, see SECTION II – MARKET AND ACTUARIAL VALUES OF ASSETS.

Table VI-1
Schedule of Funding Progress

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM (\$ Thousands)						
June 30 (Lag) Valuation Date	(1) Actuarial Value of Assets (AVA)	(2) Accrued Liability (AL)	(3) Unfunded AL (UAL) (2) - (1)	(4) Funded Ratio (1) / (2)	(5) Covered Payroll	(6) UAL as a % of Covered Payroll (3) / (5)
2010	\$32,477,527	\$55,138,366	\$22,660,839	58.9%	\$7,979,671	284.0%
2011	33,601,537	57,702,731	24,101,194	58.2%	7,888,204	305.5%
2012	33,871,180	58,783,399	24,912,219	57.6%	8,013,395	310.9%
2013	35,186,072	61,988,933	26,802,861	56.8%	8,128,378	329.7%
2014	37,521,424	67,309,977	29,788,553	55.7%	8,274,686	360.0%
2015	39,290,072	69,625,608	30,335,536	56.4%	8,844,651	343.0%
2016	41,015,087	69,964,412	28,949,325	58.6%	9,224,268	313.8%
2017	44,381,706	69,552,380	25,170,674	63.8%	9,848,899	255.6%
2018	50,012,149	72,205,318	22,193,169	69.3%	10,404,404	213.3%
2019	57,990,211	73,938,547	15,948,336	78.4%	10,903,755	146.3%

Salaries reflect the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

SECTION VII - RISK AND UNCERTAINTY

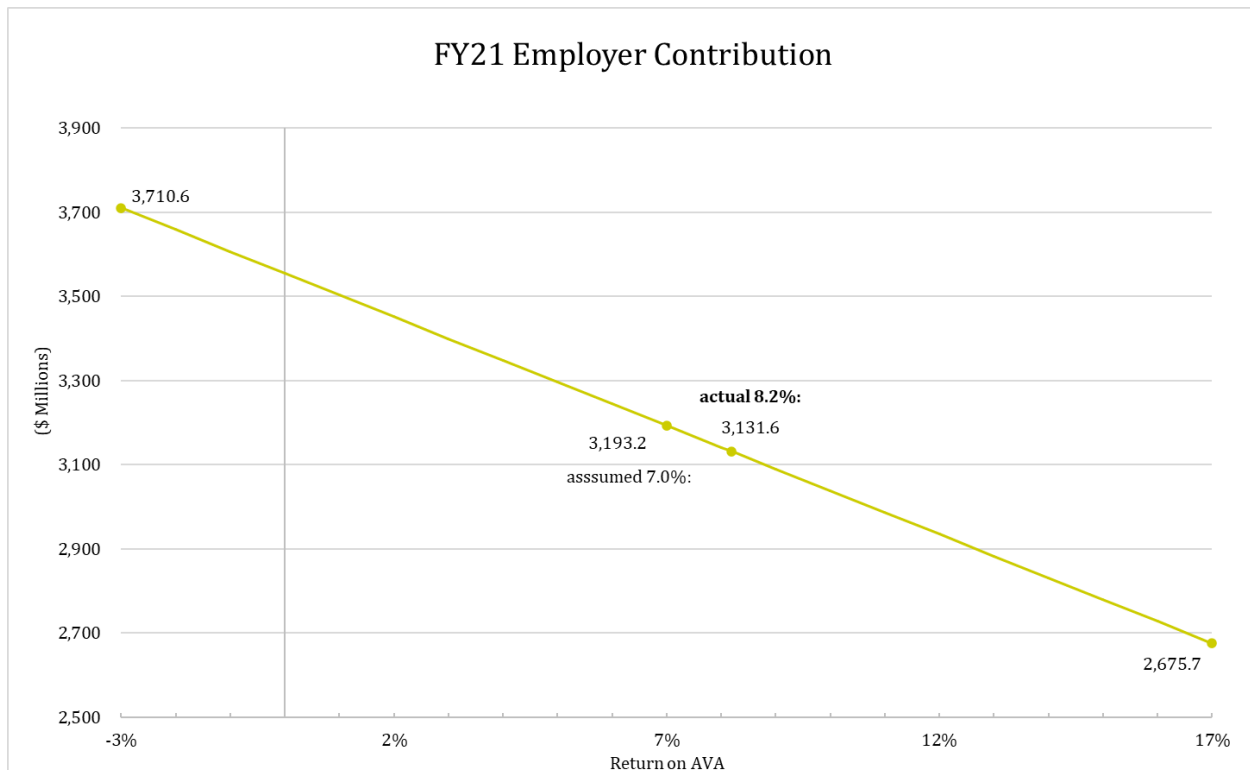
The funded status of TRS depends highly on the realization of the actuarial assumptions used, as well as certain demographic characteristics of the Plan and other exogenous factors. Risks faced by the Plan are described in this Section. These risks have been separated, based on the Actuary's professional judgement, into high, medium, and other risks.

High Risk Types

Investment Risk: The Risk of Not Realizing Expected Returns

The most substantial risk for most pension systems, TRS included, is the risk of investment returns being less than assumed. Generally speaking, as risk-free investment return rates have fallen in recent decades, more aggressive asset allocations have been taken to achieve long-term rates of return commensurate with the actuarial assumption of 7.0%.

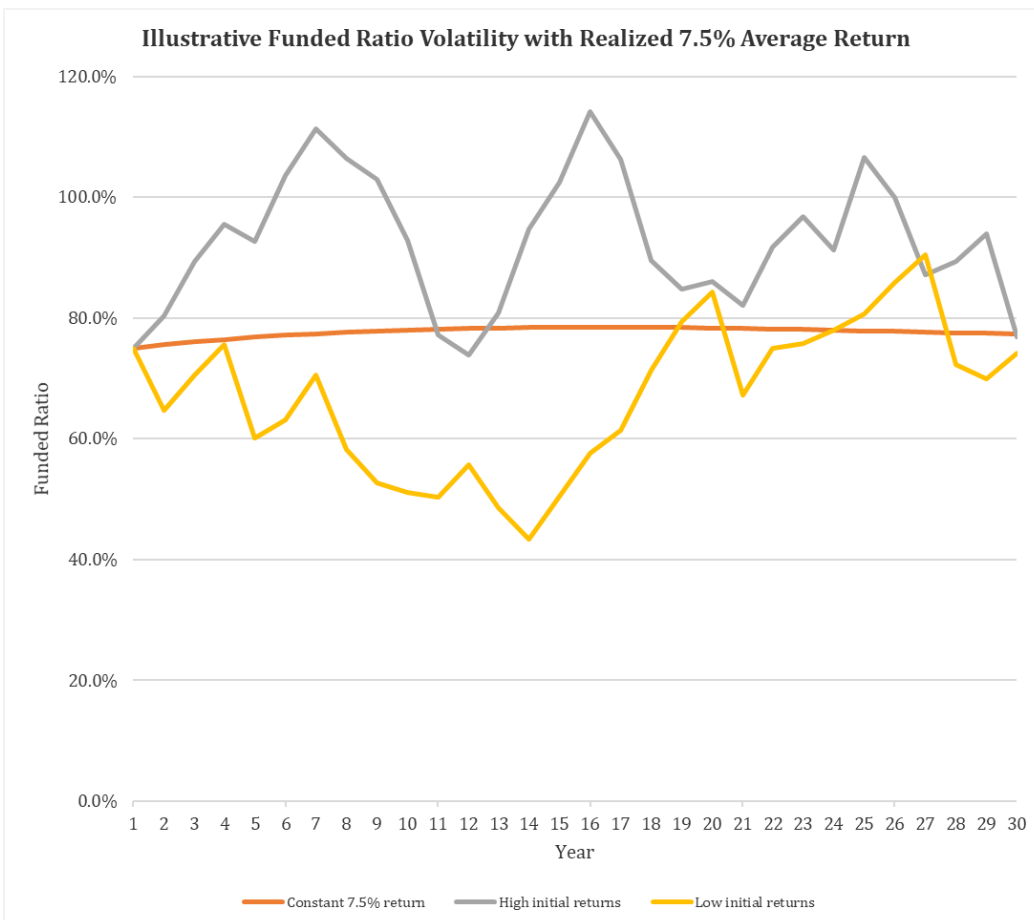
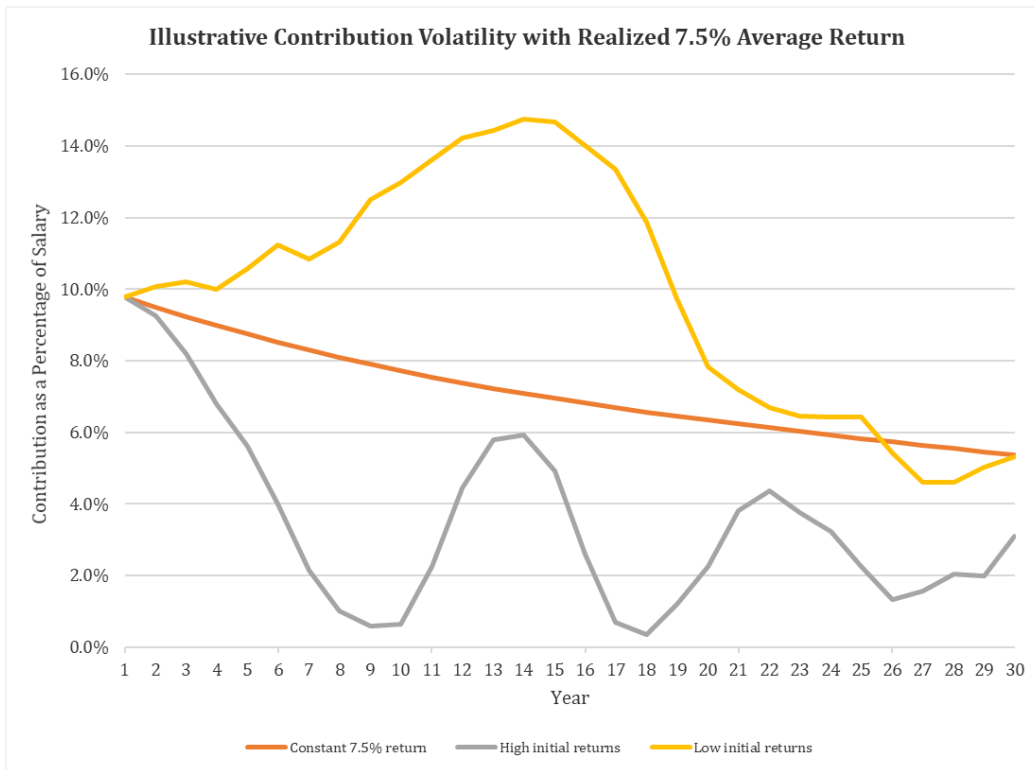
The graph below illustrates the potential FY21 employer contributions if the annual investment return had differed from the actual rate, by up to 10%.



Investment Risk: The Risk of Volatile Realized Returns

Even when long-term investment returns meet actuarial assumptions, investment return volatility can contribute substantially to contribution and funded status volatility. While not yet available specifically for the Plan at this time, recent research demonstrates this volatility based on a sample public plan with typical characteristics, a typical contribution policy, and a long-term return assumption of 7.5%, which can be realized in different patterns.¹

¹ Yin, Yimeng; Boyd, Don. Pension Simulation Project. *The Nelson A. Rockefeller Institute of Government*.

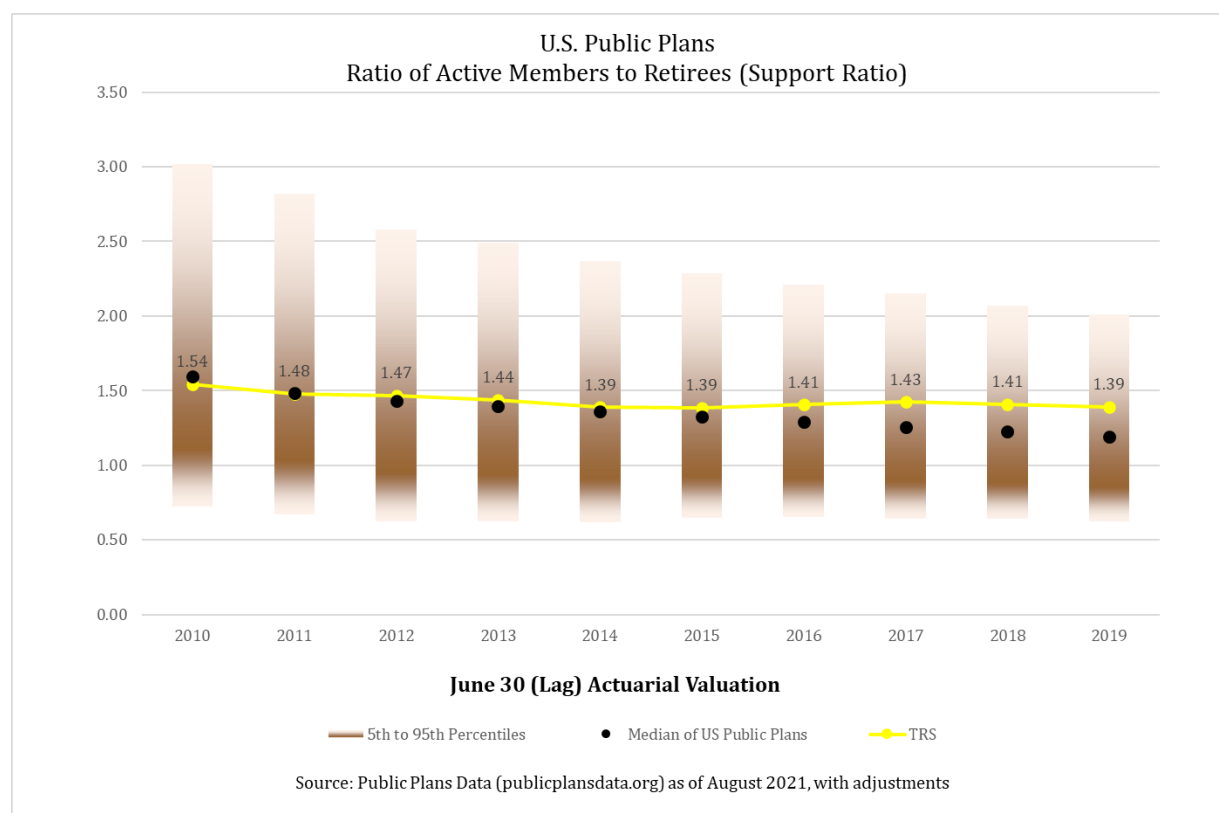


Maturity Risk: The Risk of Demographic Imbalance

In this subsection, the maturity of the Plan is examined with several metrics.

Ratio of Active Members to Retirees (Support Ratio)

A plan's Support Ratio (i.e. the ratio of active members to retirees) is an indicator of the Plan's maturity level. In a plan's early years, the ratio is very high as the plan contains mostly active members. As it matures, more active members transition to retirement, leading to a decrease in the Support Ratio over time that can result in a ratio near or below one. For TRS, this ratio has remained relatively stable in recent years, meaning that about the same number of active workers exist to support pensioner payments.

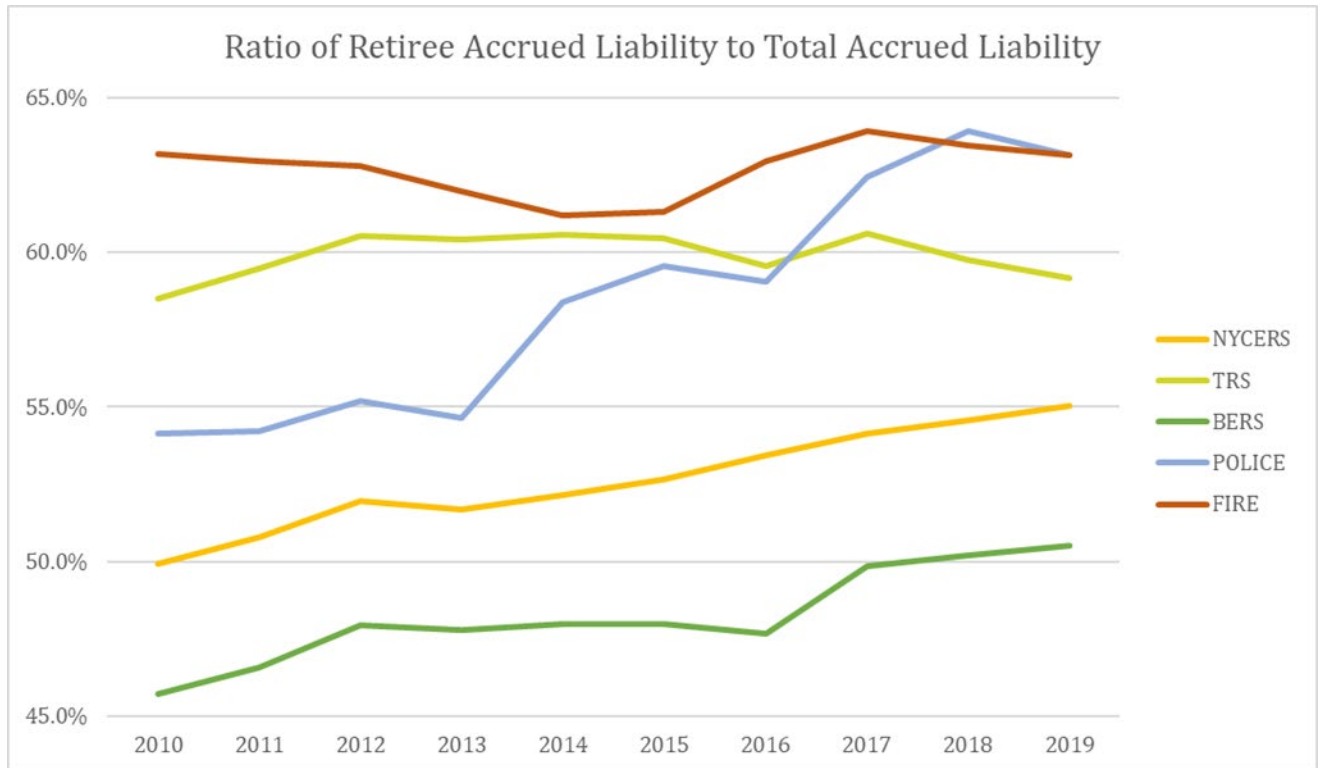


The chart above shows U.S. public pension plan Support Ratios in comparison to the Plan's. The median Support Ratio amongst U.S. public pensions has declined from 1.60 in the 2010 valuation year to 1.19 in the 2019 valuation year. Over that same period, the Plan's Support Ratio declined from 1.54 to 1.39, meaning fewer active workers exist to support guaranteed pensioner payments.

Because the Plan's Support Ratio is above the median in recent years, TRS' contributions for active members form a larger proportion of the total actuarial contribution than other pension funds in the U.S. with average maturity.

Ratio of Retiree Accrued Liability to Total Accrued Liability

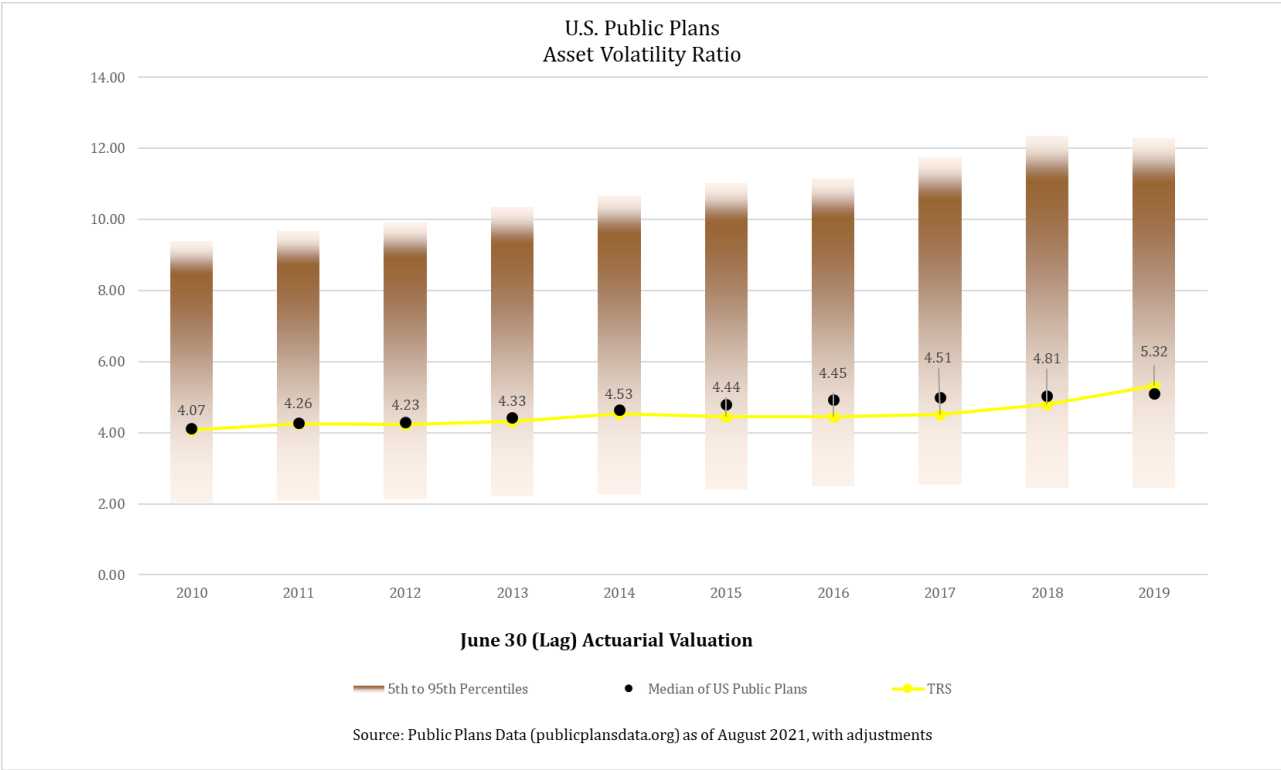
We can also consider the ratio of the Plan's retiree liability to its total liability. A new pension plan begins with this ratio at zero; as the plan matures, the ratio increases. Mature plans often have ratios above 60%. This measure is shown in the graph below for TRS; the other New York City Retirement Systems¹ are included for comparison purposes. The ratio for TRS has been between 59-62% for the past few years, indicating that TRS is becoming a mature retirement system.



Asset Volatility Ratio

Another way to look at plan maturity is the Asset Volatility Ratio (AVR), or ratio of assets to payroll. This ratio tends to rise as plans mature because assets generally need to accumulate to provide for benefit payments. The chart below compares the AVR (on an AVA basis) for TRS to the population of public pension systems.

¹ New York City Employees' Retirement System (NYCERS); Board of Education Retirement System (BERS); Police Pension Fund (POLICE); Fire Pension Fund (FIRE)



As a plan approaches maturity, AVRs tend to increase, and the plan’s actuarially-determined contribution becomes more sensitive to investment losses. For example, the same percentage of investment losses in more mature plans with a larger asset base can increase contributions as a percentage of payroll more than in less mature plans, leading to additional volatility. Therefore, mature plans may wish to consider more conservative investment strategies. Typical AVRs for a mature retirement system are between 5 and 6. As shown in the tables above, for TRS, these ratios are close to the average.

Medium Risk Types

Interest Rate Risk: The Risk of Reduction in the Long-Term Rate of Return

The Accrued Liability for the Plan depends heavily on the actuarial assumption used for future investment returns. While the returns themselves can produce substantial volatility, as detailed in the Investment Risk subsection above, the long-term rate of return assumption of 7.0% is highly dependent on the allocation of Plan assets.

If market conditions or the allocation of Plan assets no longer support a long-term rate of return assumption of 7.0%, the Actuarial Interest Rate (AIR) may have to be reduced, which can significantly increase the Accrued Liability, Unfunded Accrued Liability, Normal Cost, and resulting contribution of the Plan. The sensitivity of the Accrued Liability, the Unfunded Accrued Liability, Funded Ratio, and Normal Cost of the Plan are shown below:

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM	
SENSITIVITY ANALYSIS AS OF JUNE 30, 2019	
Valuation Date	June 30, 2019
Results at 7.0%	
1. Accrued Liability	\$ 73,938,546,544
2. Actuarial Value of Assets (AVA)	57,990,211,000
3. Unfunded Accrued Liability (AVA Basis) (1.-2.)	15,948,335,544
4. Funded Ratio (2./1.)	78.4%
5. Normal Cost	1,402,110,016
Results at 6.0%	
1. Accrued Liability	\$ 82,072,845,812
2. Actuarial Value of Assets (AVA)	57,990,211,000
3. Unfunded Accrued Liability (AVA Basis) (1.-2.)	24,082,634,812
4. Funded Ratio (2./1.)	70.7%
5. Normal Cost	2,148,524,489
Sensitivity Analysis for 1.0% Reduction in Interest Rate	
1. Increase in Accrued Liability	11.0%
2. Increase in Unfunded Accrued Liability (AVA Basis)	51.0%
3. Decrease in Funded Ratio	7.7%
4. Increase in Normal Cost	53.2%

Longevity Risk: The Risk of Higher than Assumed Mortality Improvement

TRS faces risk in its assumption of future mortality rates. Actuarial experience studies were used to develop the base mortality rates assumed in the valuation; Society of Actuaries mortality improvement scale MP-2020 was subsequently applied to these base rates.¹

This scale MP-2020 is an assumption regarding the *improvement* of future mortality rates as compared to mortality when the experience studies were completed. The scale was developed using large amounts of historical data from the Social Security Administration. Risk therefore exists such that the mortality improvement inherent in the Plan population is higher than the improvement seen in the population provided by the Social Security Administration. When mortality improvement is higher than assumed, plan participants will live longer than expected, and the plan will pay more pension benefits than had been previously funded.

Furthermore, while the scale uses recent experience to develop short-term mortality improvement rates, an actuarial assumption is applied to long-term mortality improvement rates based on expert opinion. A rate of 1.0% is assumed, which the Society of Actuaries characterizes as “neither overly optimistic nor too pessimistic with respect to future longevity improvements.”² Risk to the Plan exists, however, if Plan mortality experience shows higher levels of long-term mortality improvement; expert opinion can in some cases be flawed, particularly when past experience is not indicative or predictive of future experience.

In a letter dated June 28, 2019, Buck analyzed historical Plan experience and noted “it appears that historical mortality improvement in NYC pensioners has kept pace with, and in some cases may have exceeded slightly, the mortality improvement trends in historical Social Security Administration graduated rates that are based on a broad U.S. population” and that “continued use of MP-20xx mortality improvement scales seems reasonable.” It may be prudent in future years, after longer trends can be observed, to quantify the effect of changing the ultimate mortality improvement rate to be higher than 1.0%.

Litigation Risk: The Risk of Legal Claims and Lawsuits

It is not uncommon for New York City to be a defendant in legal claims and lawsuits.³ In its most recent claims report, the Comptroller reports that in FY2020, NYC settled 13,741 claims and lawsuits for \$1.0 billion. On occasion, these settlements involve NYCERS. The 1996 case *Gulino v. Board of Education* awards damages to plaintiffs that in some cases include counterfactual service and salary in NYCERS. It remains a continuing risk that litigation may expand the scope of pension benefits beyond what is intended or codified in statute.

¹ Retirement Plans Experience Committee. “Mortality Improvement Scale MP-2020 Report,” “Mortality Improvement Scale MP-2018 Report,” and “Mortality Improvement Scale MP-2014 Report.” *Society of Actuaries*.

² Retirement Plans Experience Committee. “Mortality Improvement Scale BB Report” 5.5 Selection of 1.0% Long-Term Rate of Mortality Improvement. *Society of Actuaries*.

³ <https://comptroller.nyc.gov/reports/annual-claims-report>

Other Risk Types

Credit/Solvency Risk: The Risk of Potential Insolvency of Contributing Entities

All public pension systems face credit risk in the event their sponsoring entities become unable to pay their debts and obligations. Credit rating agencies currently consider New York City bonds to be of high quality, and the Actuary believes the City faces low credit risk as a main contributing entity to TRS.

In addition, TRS is a multiple-employer plan with several contributing entities. TRS faces risk if contributing entities become insolvent while still carrying Unfunded Accrued Liability. Existing law and precedent transfer these amounts to other employers, creating imbalanced funding responsibility in the event of default. For example, in the final June 30, 2016 (Lag) actuarial valuation for FY18, the Department of Education assumed responsibility for unfunded liabilities associated with the Beginning with Children Charter School, which closed in 2016.

Inflation Risk: The Risk of Higher than Assumed Inflation

TRS faces risk if inflation is higher than expected. Inflation is a key driver of the salary increase assumptions (affecting active members) and COLA assumptions (affecting both active members and pensioners/beneficiaries). A quantitative analysis is not available at this time. Notably, however, the pensioner COLA is limited to half of CPI on the first \$18,000 of annual benefits, which limits the risk exposure to inflation.

Contribution Risk: The Risk that Future Contributions Are Less Than the Actuarially-Determined Contributions

Public pension systems can suffer from contribution risk when sponsoring governmental entities fail to make contributions as determined by the actuary under their funding policies. A 2018 study¹ which used data from 50 states and 230 retirement systems, found that since 2007 the shortfall between actual contributions to state pension plans and minimum actuarial funding standards was \$200 billion.²

The New York City Retirement Systems and Pension Funds face low contribution risk. City benefits are constitutionally protected, and participating employers have historically contributed to the actuarial contribution as certified by the Actuary. The Actuary believes the City will continue to do so in future years. See Table III-5 ACTUARIAL AND STATUTORY CONTRIBUTION HISTORY.

Contribution risk may also increase in future years if the actuarial contribution determined for the Plan grows to be a larger part of the City budget. The five New York City Retirement Systems and Pension Funds currently require contributions of over 10% of the City's annual budget, and contribution risk may increase if this contribution rate becomes untenable.

¹ The Pew Charitable Trusts. *"The State Pension Funding Gap: 2018."*

² Accounting standards changed in 2014. From 2007 to 2013, the shortfall is calculated between the actuarial recommended contribution and actual employer contributions. From 2014 to 2018, the shortfall represents the gap between the net amortization benchmark and employer contributions.

Agency/Political Risk: The Risk of Stakeholder Influences

With assumed long-term asset returns and gradual amortization of unfunded liabilities, the funded status of the Plan is expected to improve over time. Many public pension systems suffer from agency risk, wherein different stakeholders or agents want to influence the cost calculations in directions favorable to their interests. Agents may also downplay other risks (e.g. investment risk) to advance specific agendas. These situations create cases where promises for future funding can be disregarded for political expediency or other priorities. In other cases, certain plan provisions or administrative practices intended to provide occasional clarity or relief become commonplace or intentionally sought for the benefit of members at the expense of taxpayers.

Intergenerational Equity Risk: The Risk of Inequity in the Actuarially-Determined Contributions

Intergenerational inequity could exist for certain stakeholders (e.g. public taxpayers). If, for example, liabilities are valued using overly conservative assumptions, aggressive funding patterns may occur, thus causing current taxpayers to shoulder a disproportionately high share of the funding burden, as compared to past and future taxpayers. The reverse can also be true if aggressive or unrealistic assumptions are used. As the Plan is ongoing, taxpayers across all generations should be expected to offer similar funding contributions over the lifetime of the Plan.

Additionally, in future years of higher or lower funded status, changes in the statute may take place that can improve or diminish plan provisions. If so, intergenerational equity risk could increase as taxpayers and plan members at that time may receive preferential or less preferential treatment over the taxpayers and plan members prior to and subsequent to them.

SECTION VIII - SUMMARY OF PLAN PROVISIONS

A. Covered Employment

Membership in TRS is open to eligible teachers and administrative personnel employed by the Department of Education and certain employees of New York City Charter Schools and the City University of New York. Membership in TRS may be voluntary or mandated.

B. Tier Membership

Tier membership is based on the date that the member joined TRS. The tier status of earlier membership in TRS or another New York City or New York State public employee retirement system is reflected, but only if the service associated with that membership is purchased and included in Credited Service.

Tier 1: Prior to July 1, 1973

Tier 2: July 1, 1973 through July 26, 1976

Tier 4: July 27, 1976 through March 31, 2012

Tier 6: April 1, 2012

Tier 4 members who joined TRS before September 1, 1983 may elect a Tier 3 benefit. Unless otherwise noted, Tier 1 and Tier 2 provisions are hereafter omitted for brevity.¹ For more information about plan provisions, see the applicable Summary Plan Descriptions at www.trsnyc.org. In the event of a conflict between this summary and applicable law, the applicable laws will govern.

C. Basic Member Contributions (BMC)

Basic Member Contributions earn 5% interest per year, compounded annually.

Tier 4: The contribution rate is 3% of Salary. Tier 4 members contribute BMC for the first 10 years of Credited Service except members of the Chapter 504 55/27 plan contribute BMC for the first 27 years of Credited Service.

¹ Less than 0.3% of active members as of June 30, 2019 are members of Tier 1 and Tier 2.

Tier 6: BMC are made for all years of Credited Service according to the following schedule:

Lookback Wages	BMC Contribution Rate
Less than \$45,000	3.00%
\$45,001 up to \$55,000	3.50%
\$55,001 up to \$75,000	4.50%
\$75,001 up to \$100,000	5.75%
Greater than \$100,000	6.00%

The lookback wages used for determining the Tier 6 BMC contribution rate for a plan year are the actual wages earned two plan years prior to the plan year. A projected salary is used during the first three years of Credited Service. The BMC contribution rate was limited to 3% from April 1, 2012 through March 31, 2013.

D. Additional Member Contributions (AMC)

Additional Member Contributions earn 5% interest per year, compounded annually.

Tier 4: Members of the Basic 62/5 plan do not make AMC. For other Tier 4 members, the AMC contribution rate is 1.85% of Salary and are made in accordance with the following schedule:

Plan Description	AMC Contribution Rate	Years Required
Chapter 19 55/25	1.85%	25
Chapter 19 55/27	1.85%	27
Chapter 504 55/27 plan	1.85%	All years

Tier 6: Members of the 63/10 plan do not make AMC.

E. Credited Service

Credited Service is comprised of Membership Service, Part-time Service, Prior Service, Amman Service, Transferred Service, and Military Service:

- **Membership Service:** Service earned while a member of TRS.
- **Part-time Service:** Service that is prorated based on the number of hours or days worked in the year.
- **Prior Service:** Any creditable service earned as an employee of New York City or New York State before joining TRS that was not transferred to TRS.
- **Amman Service:** Creditable service earned as a regular substitute teacher and/or for per diem employment during a leave of absence or after separating from service.

- **Transferred Service:** Service earned as a member of another public retirement system in the City or State of New York.
- **Military Service:** Service for qualified time served in one of the armed forces of the United States.

Prior Service, Amman Service, Transferred Service, and Military Service must be purchased to count as Credited Service. Payments made for purchasing Military Service are considered Employer contributions.

F. Salary

Salary is based on the annual wages earned in covered employment including overtime pay. Some limitations apply for the Salary used to determine Final Average Salary (FAS).

Tier 4: Wages greater than 110% of the average of the previous two years are excluded for purposes of determining FAS.

Tier 6: Wages greater than 110% of the average of the previous four years are excluded for purposes of determining FAS. In addition, the following payments are also excluded from wages for purposes of determining FAS:

1. Wages greater than the annual salary paid to the Governor of the State of New York;
2. Lump sum payments for deferred compensation, sick leave, accumulated vacation, or other credits for time not worked;
3. Overtime greater than the overtime ceiling of \$15,000, effective April 1, 2012 and indexed annually by the Consumer Price Index (CPI-U);
4. Any form of termination pay;
5. Any additional compensation paid in anticipation of retirement; and
6. In the case of employees who receive wages from three or more employers in a twelve-month period, the wages paid by the third and each successive employer.

G. Final Average Salary (FAS)

Service retirement, early retirement, disability retirement, and vested retirement benefits are based on Final Average Salary (FAS).

Tier 4: FAS is the highest average Salary earned in any three consecutive years of Credited Service or in the final 36 months of Credited Service if greater.

Tier 6: FAS is the highest average Salary earned in any five consecutive years of Credited Service or in the final 60 months of Credited Service if greater.

H. Service Retirement

1. Eligibility: The eligibility requirements for an unreduced service retirement benefit are summarized in the table below:

Tier	Plan Description	Minimum Age	Minimum Service
4	Basic 62/5 Plan	Earlier of Age 55 with 30 years of Service And Age 62 with 5 years of Service	
4	Chapter 19 55/25	55	25
4	Chapter 19 55/27	55	27
4	Chapter 504 55/27 plan	55	27
6	Basic 63/10 Plan	63	10

2. Benefits:

- a. Tier 4 Plans:

- i. Less than 20 years of Credited Service: 1/60 times FAS times Credited Service;
- ii. 20 or more years of Credited Service: Sum of 2.0% times FAS times Credited Service up to 30 years plus 1.5% times FAS times Credited Service in excess of 30 years.

- b. Basic Tier 6 63/10 Plan:

- i. Less than 20 years of Credited Service: 1/60 times FAS times Credited Service;
- ii. 20 or more years of Credited Service: Sum of 35% times FAS plus 2.0% times FAS times Credited Service in excess of 20 years.

- c. Annuity Savings Accumulation Fund (ASAF):

- i. Annuitized value of the ASAF balance, if any, is added to the benefit.

I. Early Retirement

1. Eligibility: The eligibility requirements for early retirement plans are summarized in the table below:

Tier	Plan Description	Minimum Age	Minimum Service
4	All Tier 4 plans except the Chapter 504 55/27 plan	55	5
4	Chapter 504 55/27	55	10
6	Basic 63/10 plan	55	10

2. Benefits:

The service retirement benefit is reduced for early retirement based on the age at commencement.

a. Tier 4 Basic 62/5 Plan:

The service retirement benefit is reduced by 0.50% for each of the first 24 months that the age at commencement precedes age 62, and reduced 0.25% for each of the next 60 months that the age of commencement precedes age 60:

Age	Early Retirement Factor
61	0.94
60	0.88
59	0.85
58	0.82
57	0.79
56	0.76
55	0.73

Tier 4 members with Tier 3 rights may elect early retirement based on the provisions of the Tier 3 Basic 62/5 Plan.

b. Tier 6 Basic 63/10 Plan:

The service retirement benefit is reduced by 13/2400 for each month (i.e. 6.5% per year) that the age of commencement precedes age 63.

c. Annuity Savings Accumulation Fund (ASAF):

The annuitized value of the ASAF balance, if any, is added to the benefit.

J. Disability Retirement

1. Accidental Disability (ADR)

- a. Eligibility: No age or service requirement. Requires Medical Board determination that the active member is physically or mentally incapacitated due to an accident in the performance of duties and that the accident is not due to willful negligence of the member.
- b. Benefits: Greater of $1/60$ times FAS times Credited Service or $2/3$ times FAS. The member may elect a service retirement benefit, if eligible.

2. Ordinary Disability (ODR)

- a. Eligibility: 10 years of Credited Service. Requires Medical Board determination that the member is physically or mentally incapacitated while an active member.
- b. Benefits: Greater of $1/60$ times FAS times Credited Service or $1/3$ times FAS. The member may elect a service retirement benefit, if eligible.

3. Annuity Savings Accumulation Fund (ASAF)

The annuitized value of the ASAF balance, if any, is added to the benefit.

K. Death Benefits

1. Accidental Death Benefits

- a. Eligibility: No age or service requirement. Death due to the performance of duties while an active member.
- b. Benefits: A monthly pension is payable to the beneficiary equal to 50% of $1/12$ of annual wages earned during the year prior to death. The benefit is equal to 50% of $1/12$ of the annual wage rate if the member had less than one year of Credited Service.

2. Ordinary Death Benefits

- a. Eligibility:
 - i. Active members: No age or service requirement. Death during active employment while not in the performance of duties.
 - ii. Terminated vested members: Death after termination of employment and prior to benefit commencement.

iii. Retired Members: Death after benefit commencement.

b. Death benefit:

- i. Active members: Refund of BMC and the employee portion of AMC with interest plus a salary-based death benefit. The salary-based death benefit is equal to one year's wages times completed years of Credited Service up to 3 years. The salary-based portion of the death benefit is reduced 5% for each year the member remains in service beyond age 60 (to a maximum reduction of 50% at age 70).
- ii. Terminated vested members with 10 or more years of Credited Service: Refund of BMC and the employee portion of AMC, if any, with interest plus one half of the salary-based death benefit that would have been payable had the member died on the last day of active service as described above.
- iii. Terminated vested members with less than 10 years of Credited Service: Refund of BMC and the employee portion of AMC, if any, with interest.
- iv. Retirees: The active salary-based death benefit that would have been payable had the member died on the last day of active service times the Adjustment Factor described in the table below:

Year of Death	Adjustment Factor
1 st year after retirement	50%
2 nd year after retirement	25%
3 rd year or later after retirement	10% times the benefit in effect at age 60 or at retirement if earlier

c. Form of Payment: Lump sum.

L. Vested Retirement After Termination

1. Eligibility:

- a. Tier 4 Chapter 504 55/27 plan: 10 years of Credited Service.
- b. All other Tier 4 plans: 5 years of Credited Service.
- c. Tier 6 plan: 10 years of Credited Service.

2. Benefits:

a. Tier 4 plans:

A vested member may elect a service retirement benefit payable at age 62 or an early retirement benefit payable as early as age 55. The eligibility and benefit provisions for a benefit that commences prior to age 62 are the same as those for early retirement except that benefits are unreduced at age 55 if the member has earned the minimum service required for a Service Retirement benefit shown in subsection H above.

b. Tier 6 Plan:

The service retirement benefit is payable at age 63, but in no cases can the vested benefit be less than the annuity equivalent of the BMC.

3. Annuity Savings Accumulation Fund (ASAF)

The annuitized value of the ASAF balance, if any, is added to the benefit.

M. Forms of Payment

1. Normal Form of Payment: Single Life Annuity.
2. Optional Forms of Payment: Joint and Survivor Annuities, Certain and Life Annuities, and Pop-up Annuities.

N. Cost of Living Adjustments (COLA)

Annuity payments are increased annually on September 1st, but only after a pensioner has attained the applicable eligibility threshold. Some beneficiaries are not eligible for COLA increases. The COLA increase is equal to a base benefit times a COLA percentage. The COLA increase for a spouse receiving a joint & survivor annuity is one half of the COLA increase that would have been applicable to the member had he or she survived.

1. Eligibility Thresholds:

- a. Service Retirement and Vested Retirement: The earlier of (i) and (ii):
 - i. Attainment of age 62 and 5 years since commencement
 - ii. Attainment of age 55 and 10 years since commencement

- b. Disability Retirement: 5 years since commencement
 - c. Beneficiaries of an Accidental Death benefit: 5 years since commencement
2. Eligible beneficiaries: Spouses receiving a joint & survivor annuity. All others are non-eligible.
 3. Base Benefit: The lesser of \$18,000 and the maximum retirement allowance plus the sum of prior years' COLA increases.
 4. COLA percentage: 50% of the Consumer Price Index (CPI-U) based upon the 12 months ending March 31 prior to each September 1 effective date, rounded to the next highest 0.1%. Such percentage shall not be less than 1.0% nor greater than 3.0%.

O. Refund of BMC and AMC

Refunded with interest under some circumstances. Only the employee portion of AMC are refunded.

1. Employee Portion of AMC: 50% for all plans that require AMC.
2. Non-vested termination: BMC and employee portion of AMC are refunded with interest.
3. Vested termination: A member may elect a refund of BMC and the employee portion of AMC with interest in lieu of a pension benefit, but only if he or she has less than 10 years of Credited Service.
4. Ordinary death: BMC and the employee portion of AMC are refunded with interest.
5. Accidental death: The employee portion of AMC are refunded with interest.
6. Disability retirement: The employee portion of AMC are refunded with interest.
7. Service retirement: The employee portion of AMC are refunded with interest if the member retires on or after age 62.

P. Service and Early Retirement for Tier 4 Members with Tier 3 Rights

1. Eligibility: Age 55 and 5 years of Credited Service.
2. Benefits: These members may elect a Tier 3 benefit instead of a Tier 4 benefit. The benefit formula for Tier 3 is the same as the benefit formula for the Tier 4 Basic 62/5 plan except:

- a. Credited Service under the Tier 3 benefit formula is capped at 30 years,
 - b. The Tier 3 benefit formula includes an offset starting at age 62 equal to 50% of the Primary Social Security benefit, and
 - c. The early retirement factors used to reduce benefits for early commencement are smaller and thus reduce benefits more for Tier 3 than the corresponding factors used under the Basic Tier 4 62/5 plan.
3. Cost of Living Adjustments: Tier 3 retirement benefits may be adjusted annually by Escalation. A Tier 3 retirement benefit cannot be less than the initial benefit payable at the commencement date.
- a. Full Escalation: Applicable for benefits commencing on or after age 65. Equal to the lesser of 3% and the Consumer Price Index (CPI-U) for positive increases in the CPI-U, and the greater of -3% and the Consumer Price Index (CPI-U) for negative increases in the CPI-U.
 - b. Partial Escalation: Applicable for benefits commencing after age 62 and prior to age 65. Equal to full escalation reduced by 1/36 times the number of months that the age at commencement precedes age 65.

Q. Loans

A member may borrow up to 75% of the accumulated BMC with interest. A member's unpaid loan balance will reduce his or her retirement benefit.

R. Tax-deferred Annuity Program (TDA)

Members may elect to make voluntary employee contributions to the TRS TDA. A member's contributions to a TDA account are capped by the dollar limitations under §402(g)(1) of the Internal Revenue Code (IRC) on the exclusion for elective deferrals described in §402(g)(3), and the dollar limitation under §414(v)(2)(B)(i) of the IRC for catch-up contributions for members who have attained aged 50.

A member may withdraw his or her TDA account balance as a lump sum or convert the total accumulated balance into an annuity upon retirement.

S. Changes Since the Prior Valuation

None.

SECTION IX - CHAPTER AMENDMENTS

The June 30, 2019 (Lag) actuarial valuation results reflect the following Chapter amendments from the prior five years.

- **Chapter 266 of the Laws of 2018** (Chapter 266/18) extends the deadline to file a Notice of Participation in the World Trade Center Rescue, Recovery, and Cleanup Operations to September 11, 2022.
- **Chapter 41 of the Laws of 2016** (Chapter 41/16) provides up to three years of service credit to members of public retirement systems of the State of New York for military service. Chapter 41/16 removes the requirement that such military service occur during specified periods of hostility.
- **Chapter 438 of the Laws of 2016** (Chapter 438/16), enacted on November 14, 2016, amended Retirement and Social Security Law Section 43 to eliminate restrictions upon transferring between public retirement systems.
- **Chapter 510 of the Laws of 2015** (Chapter 510/15), clarifies for Tier 6 the definition of multiple employers for the purpose of exclusion of wages and changes the plan year for contributions from April 1 - March 31 to January 1 - December 31.
- **Chapter 427 of the Laws of 2014** (Chapter 427/14), amended Military Law Section 243-d, effective November 4, 2014, to provide non-contributory retirement service credit for members of the New York City Retirement Systems called to active military duty on or after September 11, 2001 and prior to January 1, 2006 who did not receive his or her full salary from a participating employer and is otherwise eligible to receive retirement service credit for such service.

SECTION X - SUBSEQUENT EVENTS

The following legislation was adopted after the June 30, 2019 valuation date and could have a significant impact on future years' valuations:

Effective March 1, 2020, **Chapter 89 of the Laws of 2020** (Chapter 89/20) provides death benefits to statutory beneficiaries of members whose death was a result of or was attributed to COVID-19. **Chapter 78 of the Laws of 2021** (Chapter 78/21) amends Chapter 89/20 by extending the eligibility window of these death benefits through December 31, 2022.

Chapter 424 of the Laws of 2021 (Chapter 424/21) expands eligibility of certain public service employees for participation in the World Trade Center Rescue, Recovery, or Clean-up Operations.

Chapter 525 of the Laws of 2021 (Chapter 525/21), enacted on October 29, 2021, mandates certain Paraprofessionals into TRS and renders certain other titles ineligible to join TRS.

SECTION XI - ACTUARIAL ASSUMPTIONS AND METHODS

The Actuary issued a Report titled, "Proposed Changes to Actuarial Assumptions and Methods (Revised 2021 A&M)" dated July 23, 2021. The actuarial assumptions and methods described in that report were adopted by the Board of Trustees at the September 20, 2021 Board meeting and are referred to as the "Revised 2021 A&M."

The Actuary reset the Actuarial Value of Assets (AVA) to the market value as of June 30, 2019. Beginning with the June 30, 2020 (Lag) actuarial valuation, the Actuarial Asset Valuation Method (AAVM) recognizes investment returns greater or less than expected over a period of five years. In accordance with this AAVM, Unexpected Investment Returns (UIR) are phased into the AVA at rates of 20% per year.

The post-commencement mortality improvement table was changed from the MP-2018 to MP-2020. The MP-2020 table was also applied to the base mortality rates for active members and terminated members prior to commencement.

The assumption for the amount of the basic member contribution balance elected by active members as a loan upon benefit commencement was changed from 75% of BMC for Tier 1 and 2 active members only to 25% of BMC for all active members.

The actuarial assumptions and a description of the actuarial methods follow.

Table XI-1
Active Retirement Rates

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM					
PROBABILITIES OF SERVICE RETIREMENT					
Age	Reduced Service Retirement	Unreduced Service Retirement Probabilities For Members Who Did Not Elect an Improved Retirement Program		Unreduced Service Retirement Probabilities For Members Who Elected an Improved Retirement Program	
		Year 1	Ultimate	Year 1	Ultimate
55	2.50%	18.00%	0.00%	37.50%	0.00%
56	2.50%	18.00%	20.00%	37.50%	22.00%
57	2.50%	18.00%	20.00%	37.50%	22.00%
58	2.50%	18.00%	20.00%	37.50%	22.00%
59	3.75%	18.00%	20.00%	37.50%	22.00%
60	5.00%	18.00%	20.00%	37.50%	22.00%
61	6.25%	18.00%	20.00%	37.50%	22.00%
62	7.50% ¹	27.00%/18.00% ²	20.00%	50.00%	33.00%
63	0.00%	18.00%/27.00% ³	20.00%	37.50%	22.00%
64	0.00%	18.00%	20.00%	37.50%	22.00%
65	0.00%	27.00%	20.00%	50.00%	33.00%
66	0.00%	18.00%	20.00%	37.50%	22.00%
67	0.00%	18.00%	20.00%	37.50%	22.00%
68	0.00%	18.00%	20.00%	37.50%	22.00%
69	0.00%	18.00%	20.00%	37.50%	22.00%
70	0.00%	20.00%	20.00%	37.50%	22.00%
71	0.00%	20.00%	20.00%	37.50%	22.00%
72	0.00%	20.00%	20.00%	37.50%	22.00%
73	0.00%	20.00%	20.00%	37.50%	22.00%
74	0.00%	20.00%	20.00%	37.50%	22.00%
75	0.00%	20.00%	20.00%	37.50%	22.00%
76	0.00%	20.00%	20.00%	37.50%	22.00%
77	0.00%	20.00%	20.00%	37.50%	22.00%
78	0.00%	20.00%	20.00%	37.50%	22.00%
79	0.00%	20.00%	20.00%	37.50%	22.00%
80+	N/A	100.00%	100.00%	100.00%	100.00%

¹ 7.50% only applies to Tier 6 members; 0.00% otherwise.

² 27.00% for Tier 1, 2, & 4 members and 18.00% for Tier 6 members.

³ 18.00% for Tier 1, 2, & 4 members and 27.00% for Tier 6 members.

Table XI-2
Active Termination Rates

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM	
PROBABILITIES OF TERMINATION	
Years of Service	Probability of Termination
0	9.00%
1	8.00%
2	7.00%
3	6.00%
4	5.00%
5	4.00%
6	3.50%
7	3.05%
8	2.65%
9	2.30%
10	2.00%
11	1.75%
12	1.55%
13	1.40%
14	1.30%
15	1.25%
16	1.20%
17	1.15%
18	1.10%
19	1.05%
20	1.00%
21	0.90%
22	0.80%
23	0.70%
24	0.60%
25+	0.50%

Table XI-3
Active Disability Rates

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM				
PROBABILITIES OF DISABILITY RETIREMENT				
Age	Ordinary Disability		Accidental Disability	
	Males	Females	Males	Females
15	0.01%	0.01%	0.00%	0.00%
16	0.01%	0.01%	0.00%	0.00%
17	0.01%	0.01%	0.00%	0.00%
18	0.01%	0.01%	0.00%	0.00%
19	0.01%	0.01%	0.00%	0.00%
20	0.01%	0.01%	0.00%	0.00%
21	0.01%	0.01%	0.00%	0.00%
22	0.01%	0.01%	0.00%	0.00%
23	0.01%	0.01%	0.00%	0.00%
24	0.01%	0.01%	0.00%	0.00%
25	0.01%	0.01%	0.00%	0.00%
26	0.01%	0.01%	0.00%	0.00%
27	0.01%	0.01%	0.00%	0.00%
28	0.01%	0.01%	0.00%	0.00%
29	0.01%	0.01%	0.00%	0.00%
30	0.01%	0.01%	0.00%	0.00%
31	0.02%	0.01%	0.00%	0.00%
32	0.03%	0.02%	0.00%	0.00%
33	0.04%	0.03%	0.01%	0.00%
34	0.05%	0.04%	0.01%	0.00%
35	0.06%	0.05%	0.01%	0.01%
36	0.07%	0.06%	0.01%	0.01%
37	0.08%	0.07%	0.01%	0.01%
38	0.08%	0.08%	0.02%	0.01%
39	0.09%	0.09%	0.02%	0.01%
40	0.10%	0.10%	0.02%	0.01%
41	0.11%	0.11%	0.02%	0.01%
42	0.12%	0.12%	0.02%	0.01%
43	0.13%	0.13%	0.02%	0.02%
44	0.14%	0.14%	0.02%	0.02%
45	0.15%	0.15%	0.03%	0.02%
46	0.15%	0.16%	0.03%	0.02%
47	0.15%	0.17%	0.03%	0.02%
48	0.15%	0.18%	0.03%	0.03%
49	0.15%	0.19%	0.03%	0.03%
50	0.15%	0.20%	0.03%	0.03%
51	0.15%	0.20%	0.03%	0.03%
52	0.15%	0.20%	0.03%	0.03%
53	0.15%	0.20%	0.03%	0.03%
54	0.15%	0.20%	0.03%	0.03%
55	0.15%	0.20%	0.04%	0.04%
56	0.15%	0.20%	0.04%	0.04%
57	0.15%	0.20%	0.04%	0.04%
58	0.15%	0.20%	0.04%	0.04%
59	0.15%	0.20%	0.04%	0.04%
60	0.15%	0.20%	0.04%	0.04%
61	0.15%	0.20%	0.04%	0.04%
62	0.15%	0.20%	0.04%	0.04%
63	0.15%	0.20%	0.04%	0.04%
64	0.15%	0.20%	0.04%	0.04%
65	0.15%	0.20%	0.04%	0.04%
66	0.15%	0.20%	0.04%	0.04%
67	0.15%	0.20%	0.04%	0.04%
68	0.15%	0.20%	0.04%	0.04%
69	0.15%	0.20%	0.04%	0.04%
70	0.15%	0.20%	0.04%	0.04%
71	0.15%	0.20%	0.04%	0.04%
72	0.15%	0.20%	0.04%	0.04%
73	0.15%	0.20%	0.04%	0.04%
74	0.15%	0.20%	0.04%	0.04%
75	0.15%	0.20%	0.04%	0.04%
76	0.15%	0.20%	0.04%	0.04%
77	0.15%	0.20%	0.04%	0.04%
78	0.15%	0.20%	0.04%	0.04%
79	0.15%	0.20%	0.04%	0.04%
80+	N/A	N/A	N/A	N/A

Table XI-4
Active Mortality Rates

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM			
PROBABILITIES OF MORTALITY FOR ACTIVE MEMBERS BASE TABLE			
Age	Ordinary Death		Accidental Death
	Males	Females	
15	0.040%	0.025%	0.000%
16	0.040%	0.025%	0.000%
17	0.040%	0.025%	0.000%
18	0.040%	0.025%	0.000%
19	0.040%	0.025%	0.000%
20	0.040%	0.025%	0.000%
21	0.040%	0.025%	0.000%
22	0.040%	0.025%	0.000%
23	0.040%	0.025%	0.000%
24	0.040%	0.025%	0.000%
25	0.040%	0.025%	0.000%
26	0.040%	0.025%	0.000%
27	0.040%	0.025%	0.000%
28	0.040%	0.025%	0.000%
29	0.040%	0.025%	0.000%
30	0.040%	0.025%	0.000%
31	0.042%	0.026%	0.000%
32	0.044%	0.028%	0.000%
33	0.046%	0.029%	0.000%
34	0.048%	0.030%	0.000%
35	0.050%	0.031%	0.000%
36	0.052%	0.033%	0.000%
37	0.054%	0.034%	0.000%
38	0.056%	0.035%	0.000%
39	0.058%	0.036%	0.000%
40	0.060%	0.038%	0.000%
41	0.070%	0.044%	0.000%
42	0.080%	0.050%	0.000%
43	0.090%	0.056%	0.000%
44	0.100%	0.063%	0.000%
45	0.110%	0.069%	0.000%
46	0.120%	0.075%	0.000%
47	0.130%	0.081%	0.000%
48	0.140%	0.088%	0.000%
49	0.150%	0.094%	0.000%
50	0.160%	0.100%	0.000%
51	0.170%	0.106%	0.000%
52	0.180%	0.113%	0.000%
53	0.190%	0.119%	0.000%
54	0.200%	0.125%	0.000%
55	0.210%	0.131%	0.000%
56	0.220%	0.138%	0.000%
57	0.230%	0.144%	0.000%
58	0.240%	0.150%	0.000%
59	0.250%	0.156%	0.000%
60	0.260%	0.163%	0.000%
61	0.270%	0.169%	0.000%
62	0.280%	0.175%	0.000%
63	0.290%	0.181%	0.000%
64	0.300%	0.188%	0.000%
65	0.320%	0.200%	0.000%
66	0.350%	0.219%	0.000%
67	0.390%	0.244%	0.000%
68	0.440%	0.275%	0.000%
69	0.500%	0.313%	0.000%
70	0.540%	0.350%	0.000%
71	0.600%	0.388%	0.000%
72	0.650%	0.425%	0.000%
73	0.700%	0.463%	0.000%
74	0.750%	0.525%	0.000%
75	0.800%	0.588%	0.000%
76	0.890%	0.650%	0.000%
77	0.980%	0.713%	0.000%
78	1.070%	0.775%	0.000%
79	1.160%	0.925%	0.000%
80+	N/A	N/A	N/A

Table XI-5
Service Retiree Mortality

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM					
PROBABILITIES OF MORTALITY FOR SERVICE RETIREES					
BASE TABLE					
Age	Males	Females	Age	Males	Females
15	0.0108%	0.0105%	68	1.3827%	0.8399%
16	0.0146%	0.0128%	69	1.5070%	0.8992%
17	0.0197%	0.0140%	70	1.6306%	0.9855%
18	0.0222%	0.0145%	71	1.7953%	1.1072%
19	0.0235%	0.0151%	72	1.9579%	1.2311%
20	0.0246%	0.0153%	73	2.1191%	1.3549%
21	0.0263%	0.0162%	74	2.2784%	1.4775%
22	0.0278%	0.0171%	75	2.4370%	1.5961%
23	0.0295%	0.0181%	76	2.7233%	1.8356%
24	0.0309%	0.0193%	77	3.0074%	2.0765%
25	0.0320%	0.0206%	78	3.2885%	2.3162%
26	0.0335%	0.0220%	79	3.5677%	2.5533%
27	0.0347%	0.0234%	80	3.8824%	2.7842%
28	0.0364%	0.0249%	81	4.4474%	3.3221%
29	0.0386%	0.0267%	82	5.0193%	3.8708%
30	0.0418%	0.0286%	83	5.5977%	4.4089%
31	0.0476%	0.0348%	84	6.1798%	5.0027%
32	0.0532%	0.0401%	85	6.7676%	5.5878%
33	0.0583%	0.0449%	86	7.7139%	6.2981%
34	0.0629%	0.0489%	87	8.6843%	6.9333%
35	0.0673%	0.0527%	88	9.6857%	7.5758%
36	0.0698%	0.0557%	89	10.7135%	8.5620%
37	0.0720%	0.0591%	90	11.7744%	9.6778%
38	0.0745%	0.0626%	91	13.6049%	10.8390%
39	0.0782%	0.0672%	92	15.5105%	11.9717%
40	0.0837%	0.0726%	93	17.4679%	13.1425%
41	0.0941%	0.0775%	94	19.5105%	15.1670%
42	0.1051%	0.0838%	95	21.6689%	17.3761%
43	0.1167%	0.0918%	96	23.7343%	19.5275%
44	0.1294%	0.1013%	97	25.7571%	21.6213%
45	0.1432%	0.1132%	98	27.8633%	23.3643%
46	0.1582%	0.1271%	99	29.8272%	23.8705%
47	0.1744%	0.1429%	100	31.5152%	23.9898%
48	0.1918%	0.1597%	101	33.0771%	24.9134%
49	0.2102%	0.1774%	102	34.4234%	26.0067%
50	0.2317%	0.1950%	103	35.6398%	27.2992%
51	0.2657%	0.2130%	104	36.6357%	28.7614%
52	0.3011%	0.2304%	105	37.3430%	30.3385%
53	0.3373%	0.2472%	106	37.7004%	31.9944%
54	0.3744%	0.2638%	107	37.8599%	33.6898%
55	0.4112%	0.2806%	108	38.0314%	35.3785%
56	0.4578%	0.3034%	109	38.1998%	37.0129%
57	0.5025%	0.3264%	110	50.0000%	50.0000%
58	0.5448%	0.3498%	111	50.0000%	50.0000%
59	0.5843%	0.3732%	112	50.0000%	50.0000%
60	0.6211%	0.3973%	113	50.0000%	50.0000%
61	0.7018%	0.4321%	114	50.0000%	50.0000%
62	0.7804%	0.4686%	115	50.0000%	50.0000%
63	0.8588%	0.5072%	116	50.0000%	50.0000%
64	0.9371%	0.5479%	117	50.0000%	50.0000%
65	0.9994%	0.5912%	118	50.0000%	50.0000%
66	1.1295%	0.6619%	119	50.0000%	50.0000%
67	1.2569%	0.7367%	120	100.0000%	100.0000%

Table XI-6
Disabled Retiree Mortality

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM					
PROBABILITIES OF MORTALITY FOR DISABLED RETIREES					
BASE TABLE					
Age	Males	Females	Age	Males	Females
15	0.3819%	0.3483%	68	2.8007%	2.0012%
16	0.5167%	0.4712%	69	2.8946%	2.0043%
17	0.6964%	0.5141%	70	3.0268%	2.0073%
18	0.7863%	0.5351%	71	3.1148%	2.0103%
19	0.8312%	0.5569%	72	3.2684%	2.1811%
20	0.8353%	0.5649%	73	3.3926%	2.3760%
21	0.8659%	0.5961%	74	3.5875%	2.5968%
22	0.8978%	0.6295%	75	3.7271%	2.8417%
23	0.9464%	0.6597%	76	3.9657%	3.0808%
24	0.9977%	0.6908%	77	4.2691%	3.3373%
25	1.0424%	0.7150%	78	4.5349%	3.6085%
26	1.0960%	0.7387%	79	4.8252%	3.8944%
27	1.1348%	0.7520%	80	5.1378%	4.1909%
28	1.1774%	0.7625%	81	5.6917%	4.6921%
29	1.2163%	0.7686%	82	6.2841%	5.1536%
30	1.2878%	0.7763%	83	6.8835%	5.5061%
31	1.3554%	0.9885%	84	7.7954%	6.1180%
32	1.3755%	1.1922%	85	8.8286%	6.7342%
33	1.3953%	1.3874%	86	9.9032%	7.3088%
34	1.4153%	1.3942%	87	10.8837%	8.2536%
35	1.4357%	1.4012%	88	11.9567%	9.3264%
36	1.4563%	1.4082%	89	13.8059%	10.3734%
37	1.4772%	1.4152%	90	15.7270%	11.4459%
38	1.4985%	1.4223%	91	17.7012%	12.6271%
39	1.5200%	1.4294%	92	19.6428%	14.1350%
40	1.5418%	1.4366%	93	21.9234%	15.4424%
41	1.5640%	1.4436%	94	24.0761%	16.9560%
42	1.5865%	1.4509%	95	26.0577%	18.4261%
43	1.6093%	1.4581%	96	28.3614%	20.1727%
44	1.6324%	1.4654%	97	30.3483%	21.6213%
45	1.6559%	1.5299%	98	31.8739%	23.3643%
46	1.6797%	1.6016%	99	33.6652%	23.8705%
47	1.7038%	1.6623%	100	35.0392%	23.9898%
48	1.7283%	1.7238%	101	36.0496%	24.9134%
49	1.7531%	1.7485%	102	37.0460%	26.0067%
50	1.7783%	1.7736%	103	37.7767%	27.2992%
51	1.8039%	1.7991%	104	38.1460%	28.7614%
52	1.9408%	1.8530%	105	38.3076%	30.3385%
53	2.0713%	1.8909%	106	38.4698%	31.9944%
54	2.2040%	1.9173%	107	38.6325%	33.6898%
55	2.3207%	1.9622%	108	38.8076%	35.3785%
56	2.4304%	1.9652%	109	38.9794%	37.0129%
57	2.4937%	1.9681%	110	50.0000%	50.0000%
58	2.5070%	1.9711%	111	50.0000%	50.0000%
59	2.5245%	1.9741%	112	50.0000%	50.0000%
60	2.5362%	1.9770%	113	50.0000%	50.0000%
61	2.5394%	1.9801%	114	50.0000%	50.0000%
62	2.5426%	1.9831%	115	50.0000%	50.0000%
63	2.5480%	1.9861%	116	50.0000%	50.0000%
64	2.5797%	1.9891%	117	50.0000%	50.0000%
65	2.6258%	1.9921%	118	50.0000%	50.0000%
66	2.6510%	1.9951%	119	50.0000%	50.0000%
67	2.7083%	1.9982%	120	100.0000%	100.0000%

Table XI-7
Beneficiary Mortality

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM					
PROBABILITIES OF MORTALITY FOR BENEFICIARIES					
BASE TABLE					
Age	Males	Females	Age	Males	Females
15	0.0105%	0.0092%	68	1.8256%	1.3605%
16	0.0142%	0.0112%	69	1.9386%	1.4332%
17	0.0191%	0.0122%	70	2.0542%	1.5007%
18	0.0222%	0.0133%	71	2.2359%	1.6745%
19	0.0240%	0.0143%	72	2.4230%	1.8463%
20	0.0251%	0.0145%	73	2.6165%	2.0157%
21	0.0268%	0.0153%	74	2.8157%	2.1838%
22	0.0284%	0.0161%	75	3.0220%	2.3492%
23	0.0301%	0.0171%	76	3.4928%	2.6652%
24	0.0315%	0.0183%	77	3.9787%	2.9831%
25	0.0327%	0.0195%	78	4.4792%	3.3011%
26	0.0342%	0.0208%	79	4.9963%	3.6207%
27	0.0354%	0.0221%	80	5.5282%	3.9391%
28	0.0371%	0.0236%	81	6.1051%	4.4386%
29	0.0394%	0.0252%	82	6.6894%	4.9473%
30	0.0427%	0.0270%	83	7.2805%	5.4665%
31	0.0495%	0.0330%	84	7.8749%	5.9942%
32	0.0562%	0.0384%	85	8.4753%	6.5354%
33	0.0625%	0.0431%	86	9.6136%	7.4659%
34	0.0682%	0.0471%	87	10.8005%	8.3995%
35	0.0743%	0.0511%	88	12.0443%	9.3428%
36	0.0780%	0.0542%	89	13.3397%	10.2918%
37	0.0818%	0.0579%	90	14.6958%	11.2477%
38	0.0861%	0.0618%	91	16.4185%	12.8868%
39	0.0917%	0.0666%	92	18.1416%	14.4887%
40	0.0997%	0.0719%	93	19.8574%	16.0801%
41	0.1394%	0.0775%	94	21.6187%	17.5854%
42	0.1774%	0.0859%	95	23.5884%	19.0626%
43	0.2143%	0.0968%	96	25.4266%	20.2474%
44	0.2507%	0.1111%	97	27.2119%	21.2937%
45	0.2875%	0.1287%	98	29.0202%	22.0663%
46	0.3207%	0.1501%	99	30.6654%	22.5443%
47	0.3534%	0.1748%	100	32.1584%	22.6473%
48	0.3849%	0.2022%	101	33.7521%	23.5294%
49	0.4150%	0.2319%	102	35.1259%	24.5619%
50	0.4431%	0.2633%	103	36.3671%	25.7825%
51	0.5156%	0.2999%	104	37.3834%	27.1635%
52	0.5928%	0.3376%	105	38.1051%	28.6530%
53	0.6740%	0.3762%	106	38.4698%	30.2169%
54	0.7583%	0.4151%	107	38.6325%	31.8182%
55	0.8440%	0.4540%	108	38.8076%	33.4131%
56	0.9048%	0.5132%	109	38.9794%	34.9566%
57	0.9604%	0.5735%	110	50.0000%	50.0000%
58	1.0101%	0.6353%	111	50.0000%	50.0000%
59	1.0536%	0.6981%	112	50.0000%	50.0000%
60	1.0919%	0.7631%	113	50.0000%	50.0000%
61	1.1835%	0.8329%	114	50.0000%	50.0000%
62	1.2676%	0.8908%	115	50.0000%	50.0000%
63	1.3473%	0.9493%	116	50.0000%	50.0000%
64	1.4238%	1.0146%	117	50.0000%	50.0000%
65	1.4985%	1.0876%	118	50.0000%	50.0000%
66	1.6059%	1.1681%	119	50.0000%	50.0000%
67	1.7146%	1.2609%	120	100.0000%	100.0000%

Table XI-8
Salary Scale

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM		
ANNUAL RATES OF MERIT AND SALARY INCREASE		
Years of Service	Merit Increase	Salary Increase ¹
0	10.00%	13.00%
1	8.00%	11.00%
2	6.00%	9.00%
3	5.00%	8.00%
4	6.00%	9.00%
5	5.00%	8.00%
6	5.00%	8.00%
7	4.00%	7.00%
8	2.00%	5.00%
9	5.00%	8.00%
10	1.00%	4.00%
11	1.00%	4.00%
12	3.00%	6.00%
13	1.00%	4.00%
14	5.00%	8.00%
15	1.00%	4.00%
16	1.00%	4.00%
17	2.00%	5.00%
18	1.00%	4.00%
19	9.00%	12.00%
20	1.00%	4.00%
21	5.00%	8.00%
22+	1.00%	4.00%

¹Salary Increase is the General Wage Increase of 3.00% plus the Merit Increase.

Additional Assumptions and Methods

1. **Mortality Assumption:** Improvement scales are applied to actives, terminated vesteds, and pensioners using mortality improvement scale MP-2020. The base tables for pensioners are also multiplied by adjustment factors to convert them from lives-weighted to amounts-weighted tables to account for socioeconomic effects on mortality. The adjustment factors used are as follows:

	Adjustment Factor	
	Male	Female
Service Retiree	0.908	0.944
Disabled Retiree	0.940	0.962
Beneficiary	0.890	0.951

2. **Marital Assumption:** All active members are assumed to be married, males are assumed to be four years older than their female spouses and females are assumed to be two years younger than their males spouses.
3. **Credited Service:** Calculated in whole year increments for valuation purposes. For CUNY participants, since updated service is not provided on the census data, estimated service is used to calculate liabilities.
4. **Loans:** Except for Death Benefits, it is assumed that eligible members take a loan at retirement equal to 25% of their member contribution balances.
5. **Actuarial Interest Rate (AIR):** 7.0% per annum, net of investment expenses.
6. **COLA:** Based on an assumed long-term Consumer Price Index inflation rate of 2.5% per year, 1.5% per year for Auto COLA, and 2.5% per year for Escalation.
7. **Actuarial Asset Valuation Method (AAVM):**

The Actuary reset the Actuarial Value of Assets to market value as of June 30, 2019.

Beginning with the June 30, 2020 (Lag) actuarial valuation, the AAVM recognizes investment returns greater or less than expected over a period of five years.

In accordance with this AAVM, the Unexpected Investment Returns (UIR) are phased into the Actuarial Value of Assets (AVA) over five-year period at 20% per year.

The AVA is further constrained to be within a corridor of 80% to 120% of the MVA.

Beginning with the June 30, 2018 (Lag) actuarial valuation, the method used to determine the Actuarial Value of Assets was calculated by re-characterizing interest credited on TDA Fixed Fund account balances as investment income instead of as a cash disbursement.

For more information, see SECTION II – MARKET AND ACTUARIAL VALUES OF ASSETS.

8. **Actuarial Cost Method:** The Entry Age Normal (EAN) cost method of funding is used by the Actuary to calculate the Employer Contribution.

Under this method, the Present Value (PV) of Future Benefits (PVFB) of each individual included in the actuarial valuation is allocated on a level basis over the earnings (or service) of the individual between entry age and the assumed exit age(s). The employer portion of this PVFB allocated to a valuation year is the Normal Cost. The portion of this PVFB not provided for at a valuation date by the PV of Future Normal Costs or future member contributions is the Accrued Liability (AL).

The excess, if any, of the AL over the Actuarial Value of Assets (AVA) is the Unfunded Accrued Liability (UAL).

Under this method, actuarial gains and losses, as they occur, reduce and increase the UAL, respectively, and are explicitly identified and amortized. Increases or decreases in obligations due to benefit changes, actuarial assumption changes, and actuarial method changes are also explicitly identified and amortized.

The explicit UALs that are developed under EAN each year are financed over fixed periods. For more information see Page 12.

Under EAN, the Normal Cost as a percentage of pay remains constant by individual and changes gradually over time for the entire plan as the characteristics of the group changes (e.g. more Tier 6 active members decrease the average Normal Cost as a percentage of pay).

9. **Allowances for Administrative Expenses:** The Employer Contribution for a fiscal year is increased by the interest-adjusted amount of administrative expenses paid from TRS during the second prior fiscal year.
10. **WTC Disability and Death Benefits:** Obligations attributable to the WTC Disability Benefits Law and to the WTC Death Benefits Law are determined through the use of explicit assumptions in the Revised 2021 A&M, and through estimation techniques for post-retirement reclassifications.
11. **One-Year Lag Methodology (OYLM):** One-Year Lag Methodology uses a June 30, XX-2 valuation date to determine Fiscal Year XX employer contributions.

This methodology requires adjustments to certain components used to determine the Fiscal Year XX employer contributions as follows:

a. Normal Cost

The normal cost as of June 30, XX-2 is rolled forward with the assumed AIR of 7.0% to derive the normal cost as of December 31, XX-1.

b. UAL Payments

For determining the UAL payments for Fiscal Year XX, and to be consistent with the OYLM, the UAL as of June 30, XX-2 is adjusted by the discounted value of employer normal cost and UAL payments paid during Fiscal Year XX-1 and the discounted value of Administrative Expenses reimbursed during Fiscal Years XX-1 and XX.

12. **Excess Benefit Plan:** The valuation includes liabilities and costs, if any, associated with benefits in excess of the Internal Revenue Code Section 415 limitation.

13. **Term Cost for TDA Fixed Fund:** A cost is added to each year's Normal Cost for providing a guaranteed 8.25% return on the TDA Fixed Fund for non-UFT members.

SECTION XII - SUMMARY OF DEMOGRAPHIC DATA

The June 30, 2019 (Lag) and June 30, 2018 (Lag) actuarial valuations are based upon census data as of those dates submitted by the Plan's administrative staff and the employers' payroll facilities. Financial information was provided by the Office of the Comptroller as of June 30, 2019 and June 30, 2018.

Consistent with Actuarial Standards of Practice, the Office of the Actuary has reviewed census data and financial information for consistency and reasonability but has not audited it. The accuracy of the results and calculations contained in this Report are dependent on the accuracy of this census data and financial information. To the extent any such data or information provided is materially inaccurate or incomplete, the results contained herein will require revision.

Table XII-1
Status Reconciliation

CHANGES IN THE NUMBER OF ACTIVES AND PENSIONERS DURING THE FISCAL YEAR CLASSIFIED BY STATUS										
Status	(1) Active Members	(2) Active Off Payroll	(3) Deferred Vested	(4) Service Pension	(5) Ordinary Disability	(6) Accidental Disability	(7) Accidental Death	(8) Other Beneficiary	(9) Pensioners Subtotal (4) to (8)	(10) Grand Total (1) + (2) + (3) + (9)
1. Number at June 30, 2018	121,764	9,416	16,433	78,364	2,640	757	0	4,534	86,295	233,908
New Entrants	7,357	328	22	0	0	0	0	0	0	7,707
Rehires	2,170	(1,799)	(299)	0	0	0	0	0	0	72
Leaving Active Payroll	(4,013)	4,013	0	0	0	0	0	0	0	0
Vested Termination	(623)	(445)	1,068	0	0	0	0	0	0	0
Non-Vested Termination / Cashout	(437)	(2,645)	(3,125)	0	0	0	0	0	0	(6,207)
Accidental Death (from Active)	0	0	0	0	0	0	0	0	0	0
Ordinary Death (from Active)	(90)	(27)	(29)	0	0	0	0	0	0	(146)
Service Retirement	(2,698)	(527)	(630)	3,855	0	0	0	0	3,855	0
Ordinary Disability Retirement	(82)	(120)	(30)	0	232	0	0	0	232	0
Accidental Disability Retirement	(12)	(20)	0	0	0	32	0	0	32	0
Reclassifications	0	0	0	0	(3)	3	0	0	0	0
Death with Beneficiary	0	0	0	(607)	(76)	(3)	0	686	0	0
Death without Beneficiary	0	0	0	(1,625)	(65)	(15)	0	(400)	(2,105)	(2,105)
On/(Off) Pension Payroll	0	0	0	61	0	2	0	135	198	198
Net Change	1,572	(1,242)	(3,023)	1,684	88	19	0	421	2,212	(481)
2. Number at June 30, 2019	123,336	8,174	13,410	80,048	2,728	776	0	4,955	88,507	233,427

Graph XII-2
Headcount Summary by Status

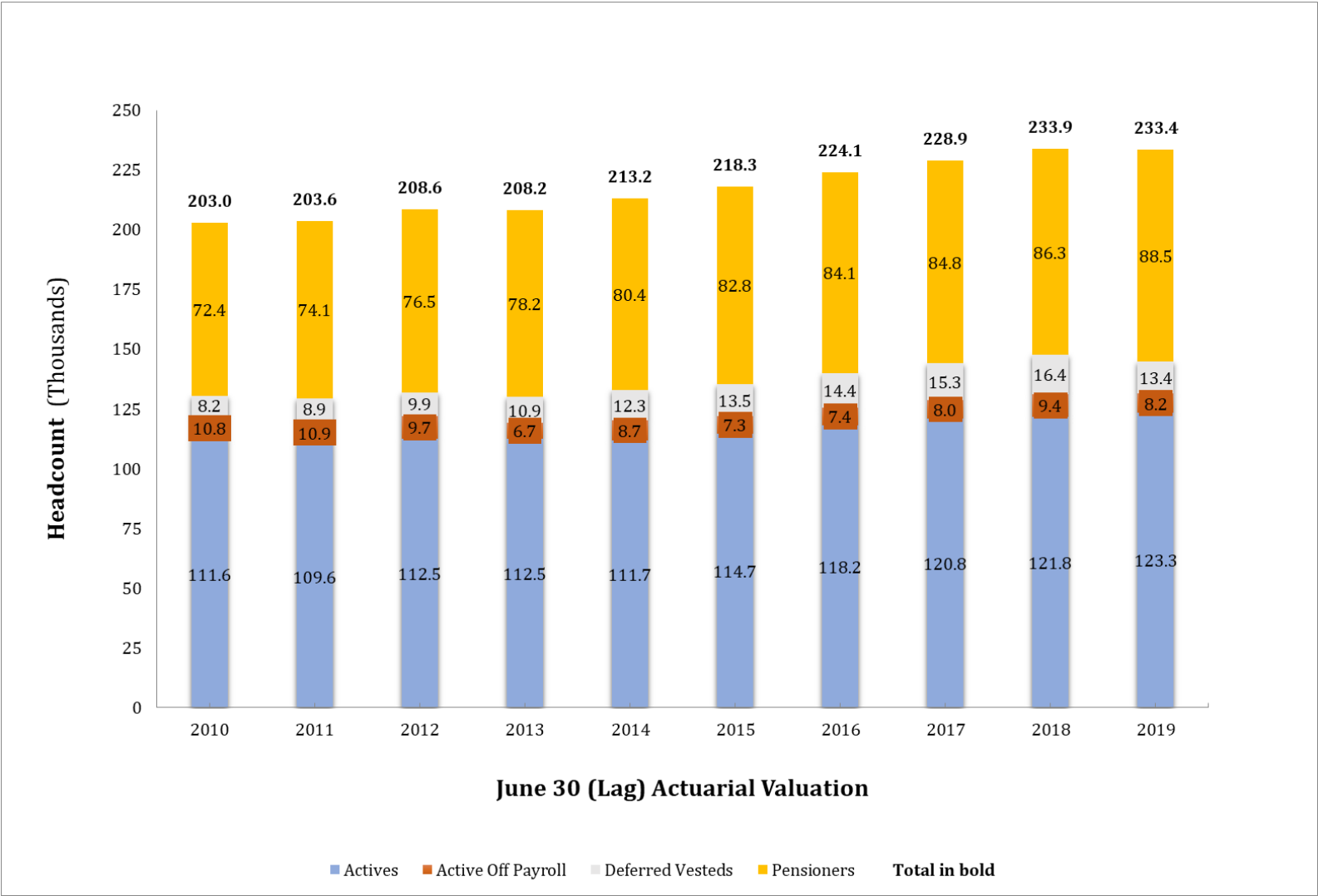


Table XII-3
Summary of Active Membership

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM		
ACTIVE MEMBERS INCLUDED IN THE JUNE 30, 2019 (LAG) AND THE JUNE 30, 2018 (LAG) ACTUARIAL VALUATIONS		
	June 30, 2019 (Lag)	June 30, 2018 (Lag)
Number		
Males	27,566	27,369
Females	95,770	94,395
Total	123,336	121,764
Annual Salary ¹		
Males	\$ 2,586,864,706	\$ 2,478,047,028
Females	8,316,890,353	7,926,356,656
Total	\$ 10,903,755,059	\$ 10,404,403,684
Average Salary ¹		
Males	\$ 93,843	\$ 90,542
Females	86,842	83,970
Total Average	\$ 88,407	\$ 85,447
Average Age		
Males	44.2	44.0
Females	44.0	43.9
Total Average	44.1	43.9
Average Past Service		
Males	11.9	11.6
Females	11.8	11.6
Total Average	11.8	11.6

¹Salaries reflect the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

Graph XII-4
Active Membership by Tier

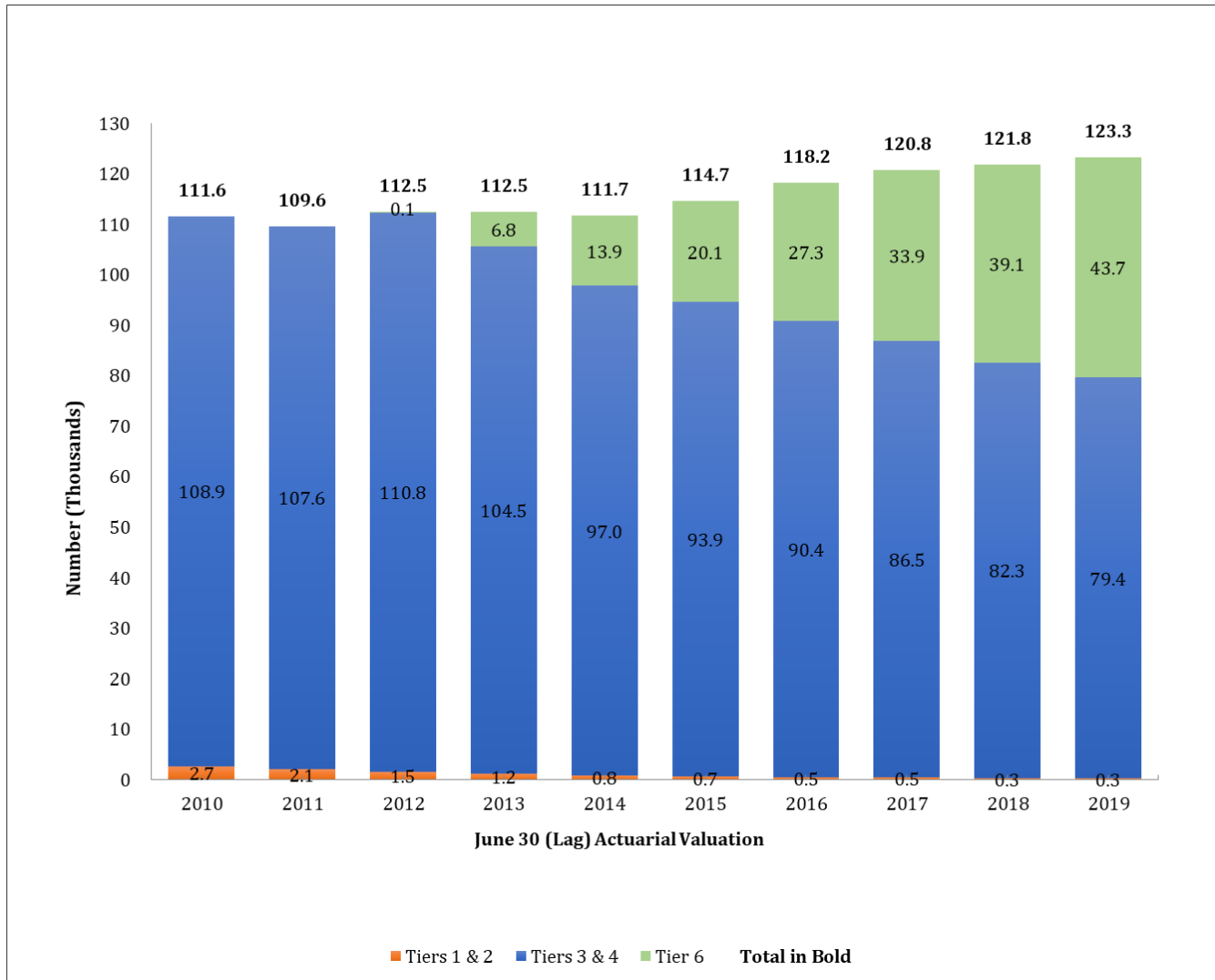


Table XII-5
Historical Active Member Salary Data

June 30 (Lag) Actuarial Valuation	Number	Annual Salary	Average Annual Salary	Percentage Increase/ (Decrease) In Avg. Salary
2010	111,647	\$7,979,671,378	71,472	0.9%
2011	109,636	7,888,203,642	71,949	0.7%
2012	112,460	8,013,395,184	71,256	(1.0%)
2013	112,481	8,128,378,071	72,264	1.4%
2014	111,726	8,274,685,657	74,062	2.5%
2015	114,652	8,844,650,633	77,143	4.2%
2016	118,201	9,224,267,647	78,039	1.2%
2017	120,826	9,848,899,232	81,513	4.5%
2018	121,764	10,404,403,684	85,447	4.8%
2019	123,336	10,903,755,059	88,407	3.5%

Salaries reflect the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

Table XII-6
Detailed Active Membership and Salaries as of June 30, 2019

AGE \ SVC	Male Total									
	UNDER 5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & UP	ALL YEARS
<i>NUMBER:</i>										
UNDER 20	2	0	0	0	0	0	0	0	0	2
20 TO 24	265	1	0	0	0	0	0	0	0	266
25 TO 29	2,082	364	0	0	0	0	0	0	0	2,446
30 TO 34	1,880	1,736	302	1	0	0	0	0	0	3,919
35 TO 39	1,050	1,256	1,589	343	3	0	0	0	0	4,241
40 TO 44	597	692	1,120	1,410	198	3	0	0	0	4,020
45 TO 49	421	514	658	1,151	814	142	3	0	0	3,703
50 TO 54	299	353	457	759	683	582	121	6	0	3,260
55 TO 59	203	271	388	515	458	402	328	27	0	2,592
60 TO 64	108	216	265	375	308	269	148	79	14	1,782
65 TO 69	50	111	148	211	150	91	72	34	27	894
70 & UP	21	66	65	89	64	36	26	21	53	441
TOTAL	6,978	5,580	4,992	4,854	2,678	1,525	698	167	94	27,566

<i>SALARIES (IN THOUSANDS):</i>										
UNDER 20	52	0	0	0	0	0	0	0	0	52
20 TO 24	13,963	40	0	0	0	0	0	0	0	14,004
25 TO 29	132,760	26,712	0	0	0	0	0	0	0	159,471
30 TO 34	125,825	147,852	31,140	127	0	0	0	0	0	304,944
35 TO 39	74,689	107,510	164,500	39,335	421	0	0	0	0	386,456
40 TO 44	42,205	58,331	113,108	163,366	24,896	407	0	0	0	402,313
45 TO 49	29,887	40,294	65,449	131,062	104,447	18,946	322	0	0	390,408
50 TO 54	21,717	25,346	42,535	83,429	84,736	76,981	15,538	876	0	351,159
55 TO 59	13,277	18,974	33,212	53,391	53,215	52,711	43,911	3,422	0	272,113
60 TO 64	6,713	13,421	22,170	38,673	34,979	33,891	19,428	10,701	1,775	181,751
65 TO 69	2,664	6,660	10,986	20,592	16,610	10,718	9,342	4,269	3,944	85,785
70 & UP	782	2,742	3,830	7,537	6,438	3,845	3,613	2,647	6,973	38,409
TOTAL *	464,535	447,882	486,931	537,512	325,743	197,499	92,155	21,916	12,692	2,586,865

<i>AVERAGE SALARIES: **</i>										
UNDER 20	26,119	0	0	0	0	0	0	0	0	26,119
20 TO 24	52,692	40,315	0	0	0	0	0	0	0	52,645
25 TO 29	63,765	73,384	0	0	0	0	0	0	0	65,197
30 TO 34	66,928	85,168	103,114	126,868	0	0	0	0	0	77,812
35 TO 39	71,133	85,597	103,525	114,680	140,372	0	0	0	0	91,124
40 TO 44	70,696	84,293	100,989	115,862	125,737	135,629	0	0	0	100,078
45 TO 49	70,991	78,394	99,466	113,868	128,314	133,423	107,388	0	0	105,430
50 TO 54	72,633	71,803	93,075	109,920	124,065	132,269	128,417	145,940	0	107,717
55 TO 59	65,404	70,015	85,598	103,672	116,190	131,123	133,874	126,750	0	104,982
60 TO 64	62,157	62,134	83,659	103,127	113,568	125,988	131,272	135,458	126,805	101,993
65 TO 69	53,287	59,997	74,230	97,592	110,735	117,784	129,751	125,564	146,056	95,957
70 & UP	37,222	41,547	58,928	84,689	100,602	106,801	138,980	126,064	131,569	87,094
TOTAL	66,571	80,266	97,542	110,736	121,637	129,508	132,027	131,231	135,021	93,843

Note: Age is nearest birthday. Service is nearest year.

* Total may not add up due to rounding.

** Average based on unrounded salary.

Table XII-6
Detailed Active Membership and Salaries as of June 30, 2019 (cont'd)

AGE \ SVC	Female Total									
	UNDER 5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & UP	ALL YEARS
<i>NUMBER:</i>										
UNDER 20	0	0	0	0	0	0	0	0	0	0
20 TO 24	1,015	3	0	0	0	0	0	0	0	1,018
25 TO 29	7,966	1,495	2	0	0	0	0	0	0	9,463
30 TO 34	6,037	6,406	1,087	0	0	0	0	0	0	13,530
35 TO 39	3,239	3,810	5,518	1,404	5	0	0	0	0	13,976
40 TO 44	2,224	2,181	3,622	4,733	763	1	0	0	0	13,524
45 TO 49	1,763	1,683	2,286	3,584	2,814	475	10	0	0	12,615
50 TO 54	1,275	1,421	1,800	2,420	2,276	1,762	441	10	0	11,405
55 TO 59	798	1,023	1,522	1,958	1,866	1,227	1,002	117	0	9,513
60 TO 64	308	564	1,016	1,540	1,680	894	527	208	28	6,765
65 TO 69	99	226	366	633	698	440	272	113	75	2,922
70 & UP	17	93	127	182	193	135	120	52	120	1,039
TOTAL	24,741	18,905	17,346	16,454	10,295	4,934	2,372	500	223	95,770

<i>SALARIES (IN THOUSANDS):</i>										
UNDER 20	0	0	0	0	0	0	0	0	0	0
20 TO 24	55,626	146	0	0	0	0	0	0	0	55,771
25 TO 29	519,145	114,262	196	0	0	0	0	0	0	633,603
30 TO 34	404,449	546,009	106,781	0	0	0	0	0	0	1,057,238
35 TO 39	217,005	319,753	548,665	151,102	417	0	0	0	0	1,236,942
40 TO 44	143,513	171,716	346,579	514,069	86,606	101	0	0	0	1,262,583
45 TO 49	109,712	120,253	202,860	377,075	336,613	58,618	1,114	0	0	1,206,246
50 TO 54	74,191	91,421	139,382	235,630	255,986	216,050	52,378	1,087	0	1,066,126
55 TO 59	45,819	61,988	110,256	177,425	186,471	141,023	124,531	14,722	0	862,236
60 TO 64	17,471	33,465	71,517	134,658	157,834	92,143	59,049	27,327	3,321	596,785
65 TO 69	5,259	12,038	25,908	55,060	62,178	42,538	28,761	13,599	10,238	255,578
70 & UP	901	3,905	8,661	13,468	15,313	12,435	10,416	5,154	13,528	83,781
TOTAL *	1,593,091	1,474,955	1,560,805	1,658,488	1,101,417	562,909	276,249	61,889	27,087	8,316,890

<i>AVERAGE SALARIES: **</i>										
UNDER 20	0	0	0	0	0	0	0	0	0	0
20 TO 24	54,804	48,602	0	0	0	0	0	0	0	54,785
25 TO 29	65,170	76,430	98,080	0	0	0	0	0	0	66,956
30 TO 34	66,995	85,234	98,234	0	0	0	0	0	0	78,140
35 TO 39	66,998	83,925	99,432	107,623	83,388	0	0	0	0	88,505
40 TO 44	64,529	78,733	95,687	108,614	113,508	100,817	0	0	0	93,359
45 TO 49	62,230	71,452	88,740	105,211	119,621	123,407	111,368	0	0	95,620
50 TO 54	58,189	64,335	77,435	97,368	112,472	122,617	118,772	108,716	0	93,479
55 TO 59	57,418	60,595	72,442	90,616	99,931	114,933	124,283	125,826	0	90,638
60 TO 64	56,723	59,335	70,390	87,440	93,949	103,069	112,048	131,381	118,594	88,217
65 TO 69	53,121	53,264	70,788	86,982	89,080	96,678	105,737	120,346	136,506	87,467
70 & UP	52,974	41,985	68,198	74,002	79,340	92,112	86,803	99,110	112,735	80,636
TOTAL	64,391	78,019	89,981	100,795	106,986	114,088	116,463	123,778	121,465	86,842

Note: Age is nearest birthday. Service is nearest year.

* Total may not add up due to rounding.

** Average based on unrounded salary.

Table XII-6
Detailed Active Membership and Salaries as of June 30, 2019 (cont'd)

AGE \ SVC	Total									
	UNDER 5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & UP	ALL YEARS
<i>NUMBER:</i>										
UNDER 20	2	0	0	0	0	0	0	0	0	2
20 TO 24	1,280	4	0	0	0	0	0	0	0	1,284
25 TO 29	10,048	1,859	2	0	0	0	0	0	0	11,909
30 TO 34	7,917	8,142	1,389	1	0	0	0	0	0	17,449
35 TO 39	4,289	5,066	7,107	1,747	8	0	0	0	0	18,217
40 TO 44	2,821	2,873	4,742	6,143	961	4	0	0	0	17,544
45 TO 49	2,184	2,197	2,944	4,735	3,628	617	13	0	0	16,318
50 TO 54	1,574	1,774	2,257	3,179	2,959	2,344	562	16	0	14,665
55 TO 59	1,001	1,294	1,910	2,473	2,324	1,629	1,330	144	0	12,105
60 TO 64	416	780	1,281	1,915	1,988	1,163	675	287	42	8,547
65 TO 69	149	337	514	844	848	531	344	147	102	3,816
70 & UP	38	159	192	271	257	171	146	73	173	1,480
TOTAL	31,719	24,485	22,338	21,308	12,973	6,459	3,070	667	317	123,336

<i>SALARIES (IN THOUSANDS):</i>										
UNDER 20	52	0	0	0	0	0	0	0	0	52
20 TO 24	69,589	186	0	0	0	0	0	0	0	69,775
25 TO 29	651,904	140,974	196	0	0	0	0	0	0	793,075
30 TO 34	530,274	693,860	137,921	127	0	0	0	0	0	1,362,182
35 TO 39	291,695	427,263	713,165	190,437	838	0	0	0	0	1,623,398
40 TO 44	185,718	230,047	459,687	677,434	111,502	508	0	0	0	1,664,896
45 TO 49	139,600	160,548	268,309	508,137	441,060	77,564	1,436	0	0	1,596,654
50 TO 54	95,909	116,767	181,917	319,059	340,722	293,031	67,917	1,963	0	1,417,284
55 TO 59	59,096	80,962	143,469	230,816	239,686	193,734	168,442	18,144	0	1,134,349
60 TO 64	24,184	46,886	93,686	173,331	192,813	126,034	78,477	38,028	5,096	778,536
65 TO 69	7,923	18,697	36,894	75,652	78,788	53,256	38,103	17,868	14,181	341,363
70 & UP	1,682	6,647	12,491	21,006	21,751	16,280	14,030	7,801	20,501	122,189
TOTAL *	2,057,626	1,922,838	2,047,736	2,196,000	1,427,160	760,408	368,404	83,804	39,779	10,903,755

<i>AVERAGE SALARIES: **</i>										
UNDER 20	26,119	0	0	0	0	0	0	0	0	26,119
20 TO 24	54,366	46,530	0	0	0	0	0	0	0	54,342
25 TO 29	64,879	75,833	98,080	0	0	0	0	0	0	66,595
30 TO 34	66,979	85,220	99,295	126,868	0	0	0	0	0	78,066
35 TO 39	68,010	84,339	100,347	109,008	104,757	0	0	0	0	89,114
40 TO 44	65,834	80,072	96,939	110,277	116,027	126,926	0	0	0	94,898
45 TO 49	63,919	73,076	91,138	107,315	121,571	125,712	110,450	0	0	97,846
50 TO 54	60,933	65,821	80,601	100,365	115,148	125,013	120,848	122,675	0	96,644
55 TO 59	59,037	62,567	75,114	93,335	103,135	118,928	126,648	126,000	0	93,709
60 TO 64	58,134	60,110	73,135	90,512	96,989	108,370	116,263	132,503	121,331	91,089
65 TO 69	53,177	55,482	71,779	89,635	92,910	100,295	110,763	121,552	139,034	89,456
70 & UP	44,269	41,803	65,060	77,512	84,634	95,205	96,095	106,864	118,505	82,560
TOTAL	64,870	78,531	91,671	103,060	110,010	117,728	120,001	125,644	125,485	88,407

Note: Age is nearest birthday. Service is nearest year.

* Total may not add up due to rounding.

** Average based on unrounded salary.

Table XII-7
Detailed Reconciliation of Active Membership

TOTAL ACTIVE MEMBERS AS OF JUNE 30, 2019							TOTAL ACTIVE MEMBERS AS OF JUNE 30, 2018				
TIER	GENDER	NUMBER	SALARY	AVG SAL	AVG AGE	AVG SVC	NUMBER	SALARY	AVG SAL	AVG AGE	AVG SVC
I	M	64	8,512,985	133,015	76.3	45.4	72	9,174,927	127,430	75.4	42.0
I	F	124	15,183,101	122,444	73.4	43.5	155	18,247,033	117,723	72.2	39.5
		188	23,696,086	126,043	74.4	44.1	227	27,421,960	120,802	73.2	40.3
II	M	16	2,127,902	132,994	70.4	35.7	23	2,825,017	122,827	69.7	34.0
II	F	74	9,366,719	126,577	68.3	36.2	85	9,917,295	116,674	67.4	32.8
		90	11,494,621	127,718	68.7	36.1	108	12,742,312	117,984	67.9	33.0
IV	M	17,877	1,895,643,547	106,038	48.5	16.3	18,575	1,877,576,713	101,081	48.0	15.6
IV	F	61,527	5,962,172,232	96,903	48.6	16.4	63,722	5,906,583,325	92,693	48.1	15.7
		79,404	7,857,815,779	98,960	48.6	16.4	82,297	7,784,160,038	94,586	48.1	15.7
VI	M	9,609	680,580,272	70,827	35.8	3.3	8,699	588,470,371	67,648	35.1	2.8
VI	F	34,045	2,330,168,301	68,444	35.5	3.3	30,433	1,991,609,003	65,442	34.8	2.8
		43,654	3,010,748,573	68,968	35.6	3.3	39,132	2,580,079,374	65,933	34.9	2.8
ALL TIERS		123,336	10,903,755,059	88,407	44.1	11.8	121,764	10,404,403,684	85,447	43.9	11.6

MEMBERS WITH SAME GENDER AND TIER IN BOTH VALUATION YEARS						
I	M	60	8,153,260	135,888	76.5	45.1
I	F	118	14,709,174	124,654	73.4	43.4
		178	22,862,434	128,441	74.4	44.0
II	M	14	1,870,233	133,588	71.0	37.1
II	F	69	8,657,414	125,470	68.5	37.0
		83	10,527,647	126,839	68.9	37.0
IV	M	17,448	1,860,895,378	106,654	48.6	16.5
IV	F	59,835	5,822,362,986	97,307	48.8	16.6
		77,283	7,683,258,364	99,417	48.7	16.6
VI	M	7,762	565,254,191	72,823	36.1	3.8
VI	F	27,825	1,955,365,211	70,274	35.8	3.8
		35,587	2,520,619,402	70,830	35.9	3.8
ALL TIERS		113,131	10,237,267,847	90,490	44.7	12.6

MEMBERS WITH SAME GENDER AND TIER IN BOTH VALUATION YEARS						
I	M	60	7,744,260	129,071	75.5	42.2
I	F	118	14,051,184	119,078	72.4	40.4
		178	21,795,444	122,446	73.4	41.0
II	M	14	1,818,732	129,909	70.0	34.4
II	F	69	8,324,518	120,645	67.5	33.9
		83	10,143,250	122,208	67.9	34.0
IV	M	17,448	1,767,115,437	101,279	47.6	15.4
IV	F	59,835	5,548,918,118	92,737	47.8	15.5
		77,283	7,316,033,555	94,665	47.7	15.5
VI	M	7,762	524,461,358	67,568	35.1	2.8
VI	F	27,825	1,818,178,516	65,343	34.8	2.8
		35,587	2,342,639,874	65,829	34.9	2.8
ALL TIERS		113,131	9,690,612,123	85,658	43.7	11.6

ADDITIONS DURING THE YEAR *						
I	M	4	359,725	89,931	73.0	48.8
I	F	6	473,927	78,988	73.8	44.8
		10	833,652	83,365	73.5	46.4
II	M	2	257,669	128,835	66.5	25.5
II	F	5	709,305	141,861	65.4	25.6
		7	966,974	138,139	65.7	25.6
IV	M	429	34,748,169	80,998	46.6	10.7
IV	F	1,692	139,809,246	82,630	44.4	10.4
		2,121	174,557,415	82,300	44.8	10.5
VI	M	1,847	115,326,081	62,440	34.3	1.0
VI	F	6,220	374,803,090	60,258	34.1	1.0
		8,067	490,129,171	60,757	34.2	1.0
ALL TIERS		10,205	666,487,212	65,310	36.5	3.0

SEPARATIONS FROM MEMBERSHIP DURING THE YEAR *						
I	M	12	1,430,667	119,222	75.1	41.3
I	F	37	4,195,849	113,401	71.5	36.5
		49	5,626,516	114,827	72.4	37.7
II	M	9	1,006,285	111,809	69.1	33.6
II	F	16	1,592,777	99,549	67.0	27.7
		25	2,599,062	103,962	67.8	29.8
IV	M	1,127	110,461,276	98,014	54.0	18.6
IV	F	3,887	357,665,207	92,016	53.3	18.9
		5,014	468,126,483	93,364	53.5	18.8
VI	M	937	64,009,013	68,313	35.3	2.7
VI	F	2,608	173,430,487	66,499	34.8	2.8
		3,545	237,439,500	66,979	35.0	2.8
ALL TIERS		8,633	713,791,561	82,682	46.0	12.4

Note: Age is nearest birthday. Service is nearest year.

* Separations and additions do not include members who joined after June 30, 2018 and are no longer members on June 30, 2019. Members are included in separations and additions if the tier or gender has changed.

Table XII-8
Summary of Non-Pensioner Membership as of June 30, 2019

STATUS	TIER 1		TIER 2		TIER 4		TIER 6		ALL TIERS	
	NUMBER	SALARY ¹	NUMBER	SALARY ¹	NUMBER	SALARY ¹	NUMBER	SALARY ¹	NUMBER	SALARY ¹
<i>MALES:</i>										
ACTIVES	64	8,512,985	16	2,127,902	17,877	1,895,643,547	9,609	680,580,272	27,566	2,586,864,706
ACTIVE OFF PAYROLL	2	158,834	2	329,872	801	42,623,895	907	55,517,189	1,712	98,629,790
VESTED	7	269,863	1	18,331	2,821	202,985,746	1	25,927	2,830	203,299,867
ALL STATUS	73	8,941,682	19	2,476,105	21,499	2,141,253,188	10,517	736,123,388	32,108	2,888,794,363
<i>FEMALES:</i>										
ACTIVES	124	15,183,101	74	9,366,719	61,527	5,962,172,232	34,045	2,330,168,301	95,770	8,316,890,353
ACTIVE OFF PAYROLL	1	112,366	0	0	3,502	247,401,534	2,959	187,842,059	6,462	435,355,959
VESTED	24	746,662	24	891,799	10,532	679,685,273	0	0	10,580	681,323,734
ALL STATUS	149	16,042,129	98	10,258,518	75,561	6,889,259,039	37,004	2,518,010,360	112,812	9,433,570,046
<i>TOTAL:</i>										
ACTIVES	188	23,696,086	90	11,494,621	79,404	7,857,815,779	43,654	3,010,748,573	123,336	10,903,755,059
ACTIVE OFF PAYROLL	3	271,200	2	329,872	4,303	290,025,429	3,866	243,359,248	8,174	533,985,749
VESTED	31	1,016,525	25	910,130	13,353	882,671,019	1	25,927	13,410	884,623,601
ALL STATUS	222	24,983,811	117	12,734,623	97,060	9,030,512,227	47,521	3,254,133,748	144,920	12,322,364,409

¹ Salary shown for Active Off Payroll and Vested members is the salary when last on payroll and has been assumed to be \$10,000 where unavailable.

Table XII-9
Summary of Pensioner Membership

Group	June 30, 2019 (Lag)					June 30, 2018 (Lag)				
	Number	Annual Amounts Payable				Number	Annual Amounts Payable			
		Fixed	Variable	Supplement	Total		Fixed	Variable	Supplement	Total
Service Pensioners	80,048	\$ 3,367,278,257	\$ 562,935,446	\$ 164,198,349	\$ 4,094,412,052	78,364	\$ 3,250,114,740	\$ 569,353,093	\$ 160,186,959	\$ 3,979,654,792
Ordinary Disability Pensioners	2,728	56,107,447	3,427,042	4,526,738	64,061,227	2,640	53,650,002	3,593,988	4,362,164	61,606,154
Accidental Disability Pensioners	776	28,565,427	2,468,029	2,476,848	33,510,304	757	27,707,490	2,534,618	2,458,016	32,700,124
Accidental Death Pensioners	0	0	0	0	0	0	0	0	0	0
Other Beneficiaries	4,955	126,907,956	38,875,833	12,848,579	178,632,368	4,534	113,650,909	37,007,657	9,657,282	160,315,848
Total	88,507	\$ 3,578,859,087	\$ 607,706,350	\$ 184,050,514	\$ 4,370,615,951	86,295	\$ 3,445,123,141	\$ 612,489,356	\$ 176,664,421	\$ 4,234,276,918

Table XII-10
Distribution of Pension Benefits by Cause and Age as of June 30, 2019

AGE	MALE			FEMALE			TOTAL		
	NUMBER	BENEFITS	AVERAGE	NUMBER	BENEFITS	AVERAGE	NUMBER	BENEFITS	AVERAGE
<i>SERVICE RETIREMENT:</i>									
UNDER 30	0	0	0	0	0	0	0	0	0
30 TO 34	0	0	0	0	0	0	0	0	0
35 TO 39	0	0	0	0	0	0	0	0	0
40 TO 44	0	0	0	0	0	0	0	0	0
45 TO 49	0	0	0	0	0	0	0	0	0
50 TO 54	0	0	0	0	0	0	0	0	0
55 TO 59	650	35,399,235	54,460	1,935	103,215,872	53,342	2,585	138,615,107	53,623
60 TO 64	1,694	89,311,986	52,723	5,546	272,209,923	49,082	7,240	361,521,909	49,934
65 TO 69	3,201	167,131,347	52,212	11,369	552,577,805	48,604	14,570	719,709,152	49,397
70 TO 74	6,845	441,910,373	64,560	14,672	782,503,023	53,333	21,517	1,224,413,396	56,904
75 TO 79	4,510	279,434,172	61,959	10,187	491,451,124	48,243	14,697	770,885,296	52,452
80 TO 84	2,680	156,811,910	58,512	6,222	261,205,397	41,981	8,902	418,017,307	46,958
85 TO 89	1,658	96,894,094	58,440	4,192	169,330,420	40,394	5,850	266,224,514	45,508
90 & UP	1,107	59,564,756	53,807	3,580	135,460,615	37,838	4,687	195,025,371	41,610
TOTAL	22,345	1,326,457,873	59,363	57,703	2,767,954,179	47,969	80,048	4,094,412,052	51,149
<i>ORDINARY DISABILITY:</i>									
UNDER 30	0	0	0	0	0	0	0	0	0
30 TO 34	0	0	0	0	0	0	0	0	0
35 TO 39	1	10,097	10,097	5	114,870	22,974	6	124,967	20,828
40 TO 44	7	169,892	24,270	35	864,623	24,704	42	1,034,515	24,631
45 TO 49	24	661,241	27,552	91	2,350,807	25,833	115	3,012,048	26,192
50 TO 54	38	1,028,091	27,055	146	3,864,582	26,470	184	4,892,673	26,591
55 TO 59	58	1,714,811	29,566	312	7,931,126	25,420	370	9,645,937	26,070
60 TO 64	84	2,079,393	24,755	389	9,049,964	23,265	473	11,129,357	23,529
65 TO 69	106	2,608,099	24,605	442	9,905,035	22,410	548	12,513,134	22,834
70 TO 74	130	3,519,305	27,072	349	7,886,787	22,598	479	11,406,092	23,812
75 TO 79	69	1,807,082	26,190	204	3,896,609	19,101	273	5,703,691	20,893
80 TO 84	27	620,061	22,965	105	1,838,407	17,509	132	2,458,468	18,625
85 TO 89	10	262,713	26,271	48	781,051	16,272	58	1,043,764	17,996
90 & UP	10	311,705	31,171	38	784,876	20,655	48	1,096,581	22,845
TOTAL	564	14,792,490	26,228	2,164	49,268,737	22,767	2,728	64,061,227	23,483
<i>ACCIDENTAL DISABILITY:</i>									
UNDER 30	0	0	0	0	0	0	0	0	0
30 TO 34	0	0	0	0	0	0	0	0	0
35 TO 39	2	97,809	48,905	3	98,281	32,760	5	196,090	39,218
40 TO 44	5	259,267	51,853	8	326,352	40,794	13	585,619	45,048
45 TO 49	5	234,279	46,856	17	749,238	44,073	22	983,517	44,705
50 TO 54	4	223,043	55,761	23	1,120,808	48,731	27	1,343,851	49,772
55 TO 59	12	487,609	40,634	55	2,286,266	41,568	67	2,773,875	41,401
60 TO 64	19	1,062,060	55,898	83	3,241,739	39,057	102	4,303,799	42,194
65 TO 69	26	1,398,245	53,779	119	4,799,318	40,330	145	6,197,563	42,742
70 TO 74	69	3,241,219	46,974	130	5,586,771	42,975	199	8,827,990	44,362
75 TO 79	34	1,701,009	50,030	62	2,702,900	43,595	96	4,403,909	45,874
80 TO 84	13	668,643	51,434	36	1,158,649	32,185	49	1,827,292	37,292
85 TO 89	9	340,479	37,831	24	919,202	38,300	33	1,259,681	38,172
90 & UP	7	313,886	44,841	11	493,232	44,839	18	807,118	44,840
TOTAL	205	10,027,548	48,915	571	23,482,756	41,126	776	33,510,304	43,183

Table XII-10
Distribution of Pension Benefits by Cause and Age as of June 30, 2019 (cont'd)

AGE	MALE			FEMALE			TOTAL		
	NUMBER	BENEFITS	AVERAGE	NUMBER	BENEFITS	AVERAGE	NUMBER	BENEFITS	AVERAGE
<i>ACCIDENTAL DEATH:</i>									
UNDER 30	0	0	0	0	0	0	0	0	0
30 TO 34	0	0	0	0	0	0	0	0	0
35 TO 39	0	0	0	0	0	0	0	0	0
40 TO 44	0	0	0	0	0	0	0	0	0
45 TO 49	0	0	0	0	0	0	0	0	0
50 TO 54	0	0	0	0	0	0	0	0	0
55 TO 59	0	0	0	0	0	0	0	0	0
60 TO 64	0	0	0	0	0	0	0	0	0
65 TO 69	0	0	0	0	0	0	0	0	0
70 TO 74	0	0	0	0	0	0	0	0	0
75 TO 79	0	0	0	0	0	0	0	0	0
80 TO 84	0	0	0	0	0	0	0	0	0
85 TO 89	0	0	0	0	0	0	0	0	0
90 & UP	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0
<i>OTHER BENEFICIARIES:</i>									
UNDER 30	4	108,881	27,220	16	434,823	27,176	20	543,704	27,185
30 TO 34	8	165,730	20,716	6	183,671	30,612	14	349,401	24,957
35 TO 39	11	302,478	27,498	21	552,675	26,318	32	855,153	26,724
40 TO 44	20	452,347	22,617	23	520,593	22,634	43	972,940	22,627
45 TO 49	22	677,552	30,798	28	511,259	18,259	50	1,188,811	23,776
50 TO 54	29	513,532	17,708	44	736,148	16,731	73	1,249,680	17,119
55 TO 59	46	955,610	20,774	95	2,351,018	24,748	141	3,306,628	23,451
60 TO 64	73	1,829,131	25,057	136	4,089,304	30,068	209	5,918,435	28,318
65 TO 69	124	3,827,051	30,863	259	9,851,077	38,035	383	13,678,128	35,713
70 TO 74	238	8,343,981	35,059	475	21,049,017	44,314	713	29,392,998	41,224
75 TO 79	228	8,165,717	35,815	624	26,905,948	43,119	852	35,071,665	41,164
80 TO 84	202	5,890,834	29,163	537	22,674,205	42,224	739	28,565,039	38,654
85 TO 89	182	5,382,291	29,573	549	22,014,831	40,100	731	27,397,122	37,479
90 & UP	311	8,227,201	26,454	644	21,915,463	34,030	955	30,142,664	31,563
TOTAL	1,498	44,842,336	29,935	3,457	133,790,032	38,701	4,955	178,632,368	36,051
<i>ALL PENSIONERS AND BENEFICIARIES:</i>									
UNDER 30	4	108,881	27,220	16	434,823	27,176	20	543,704	27,185
30 TO 34	8	165,730	20,716	6	183,671	30,612	14	349,401	24,957
35 TO 39	14	410,384	29,313	29	765,826	26,408	43	1,176,210	27,354
40 TO 44	32	881,506	27,547	66	1,711,568	25,933	98	2,593,074	26,460
45 TO 49	51	1,573,072	30,845	136	3,611,304	26,554	187	5,184,376	27,724
50 TO 54	71	1,764,666	24,854	213	5,721,538	26,862	284	7,486,204	26,360
55 TO 59	766	38,557,265	50,336	2,397	115,784,282	48,304	3,163	154,341,547	48,796
60 TO 64	1,870	94,282,570	50,418	6,154	288,590,930	46,895	8,024	382,873,500	47,716
65 TO 69	3,457	174,964,742	50,612	12,189	577,133,235	47,349	15,646	752,097,977	48,070
70 TO 74	7,282	457,014,878	62,760	15,626	817,025,598	52,286	22,908	1,274,040,476	55,616
75 TO 79	4,841	291,107,980	60,134	11,077	524,956,581	47,392	15,918	816,064,561	51,267
80 TO 84	2,922	163,991,448	56,123	6,900	286,876,658	41,576	9,822	450,868,106	45,904
85 TO 89	1,859	102,879,577	55,341	4,813	193,045,504	40,109	6,672	295,925,081	44,353
90 & UP	1,435	68,417,548	47,678	4,273	158,654,186	37,129	5,708	227,071,734	39,781
TOTAL	24,612	1,396,120,247	56,725	63,895	2,974,495,704	46,553	88,507	4,370,615,951	49,382

Graph XII-11
Pensioner Average Benefits

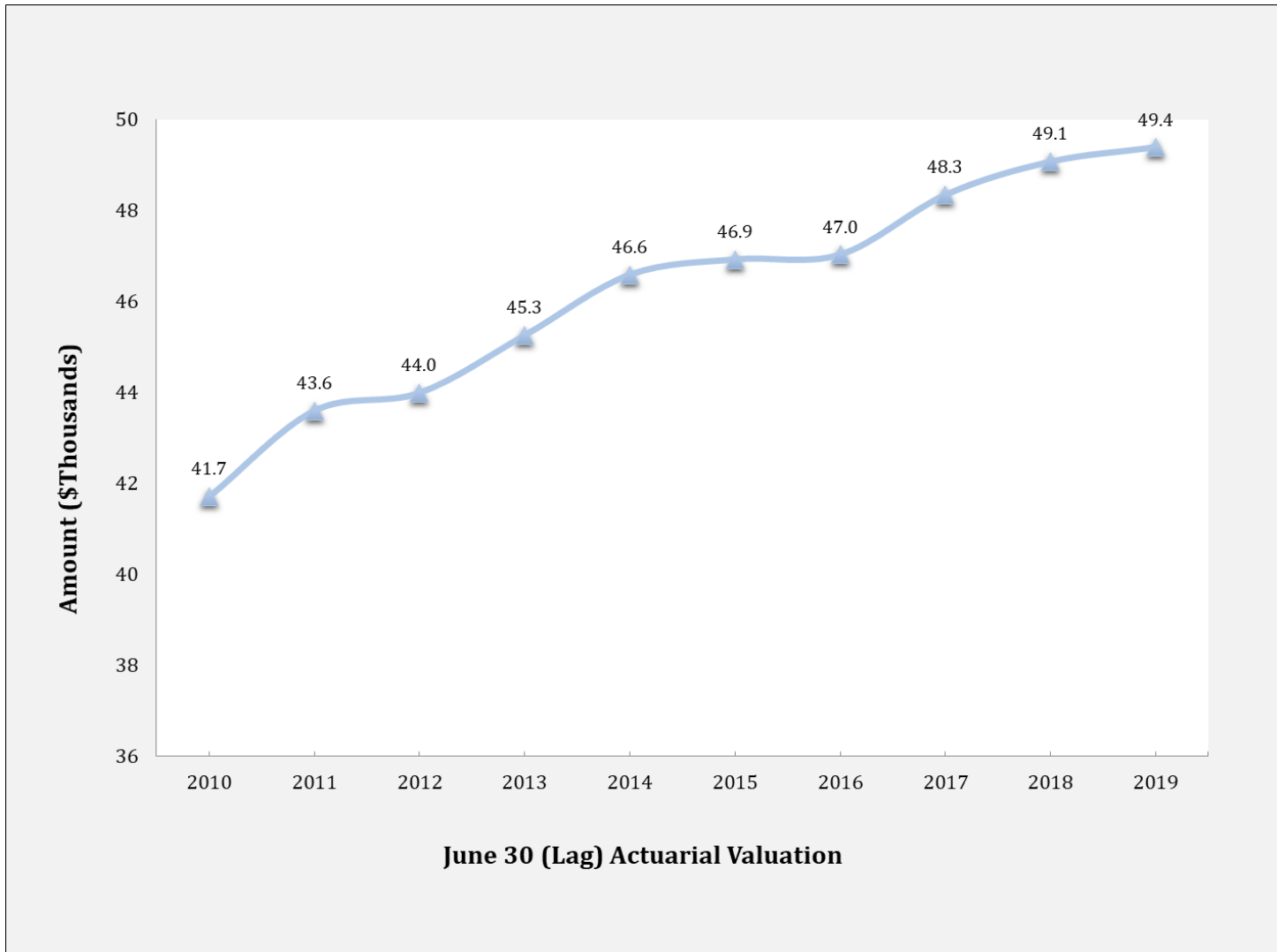


Table XII-12
Reconciliation of Pensioner and Beneficiary Data

SCHEDULE OF PENSIONERS AND BENEFICIARIES ADDED TO AND REMOVED FROM THE ROLLS								
June 30 (Lag) Actuarial Valuation	Added to Rolls		Removed from Rolls		End of Year Rolls		% Increase in Annual Allowances	Average Annual Allowances
	Number	Annual Allowances ¹	Number	Annual Allowances	Number	Annual Allowances ²		
2010	3,534	\$207,981,284	2,003	\$64,538,942	72,356	\$3,017,755,611	5.0%	\$41,707
2011	3,849	278,652,149	2,141	67,488,320	74,064	3,228,919,440	7.0%	43,596
2012	4,684	200,786,572	2,209	62,805,438	76,539	3,366,900,574	4.3%	43,989
2013	4,078	248,087,233	2,440	77,107,240	78,177	3,537,880,567	5.1%	45,255
2014	4,356	275,947,759	2,114	67,585,789	80,419	3,746,242,537	5.9%	46,584
2015	4,728	219,769,491	2,370	81,986,287	82,777	3,884,025,741	3.7%	46,922
2016	3,808	157,518,432	2,492	86,890,450	84,093	3,954,653,723	1.8%	47,027
2017	3,519	254,567,439	2,842	111,573,800	84,770	4,097,647,362	3.6%	48,338
2018	4,107	240,586,776	2,582	103,957,220	86,295	4,234,276,918	3.3%	49,067
2019	4,921	249,898,766	2,709	113,559,733	88,507	4,370,615,951	3.2%	49,382

¹ Amounts shown include changes due to benefit finalization, changes in benefit type (e.g. Service to Accident Disability), COLA increases and other changes.

² Allowances shown are those used in the actuarial valuation as of the Year End date and are not adjusted for anticipated changes due to the finalization of benefit calculations or contract settlements.

APPENDIX: ACRONYMS AND ABBREVIATIONS

Revised 2021 A&M	Actuarial Assumptions and Methods proposed by the Actuary and adopted by the Board of Trustees during Fiscal Year 2021
2019 A&M	Actuarial Assumptions and Methods proposed by the Actuary and adopted by the Board of Trustees during Fiscal Year 2019
AAVM	Actuarial Asset Valuation Method
ACCNYS	Administrative Code of the City of New York
AIR	Actuarial Interest Rate
AL	Accrued Liability
AMC	Additional Member Contributions
ASAF	Annuity Savings Accumulation Fund
AVA	Actuarial Value of Assets
AVR	Asset Volatility Ratio
BMC	Basic Member Contributions
COLA	Cost-of-Living Adjustment
EAN	Entry Age Normal cost method
EIR	Expected Investment Return
FAS	Final Average Salary
FS	Final Salary
GASB	Governmental Accounting Standards Board
GASB25	Governmental Accounting Standards Board Statement No. 25
GASB67	Governmental Accounting Standards Board Statement No. 67
GASB68	Governmental Accounting Standards Board Statement No. 68
IRC	Internal Revenue Code
MVA	Market Value of Assets
OYLM	One-Year Lag Methodology
PV	Present Value
PVFB	Present Value of Future Benefits
PVFNC	Present Value of Future Normal Costs
PVFS	Present Value of Future Salary
TDA	Tax-Deferred Annuity Program
TRS	New York City Teachers' Retirement System
UAL	Unfunded Accrued Liability
UIR	Unexpected Investment Return
WTC	World Trade Center