



**Fiscal Year 2018**  
**Actuarial Valuation Report**  
for the  
**New York City**  
**Teachers' Retirement System**

*JUNE 30, 2016 (LAG) ACTUARIAL VALUATION*

prepared by the  
**New York City**  
**Office of the Actuary**

**2018**



## OFFICE OF THE ACTUARY

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SHERRY S. CHAN  
CHIEF ACTUARY

February 5, 2019

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

Re: Fiscal Year 2018 Actuarial Valuation Report (Report)

Dear Trustees:

This Report presents the results of the June 30, 2016 actuarial valuation of the benefits under both the New York City Teachers' Retirement System (TRS) Qualified Pension Plan and Group Life Insurance Plan (collectively, the Plan). This valuation, known as the June 30, 2016 (Lag) valuation, forms the basis for determining the actuarially-required contribution (Actuarial Contribution) of \$3,889,709,927 for Fiscal Year 2018 (i.e. for the period beginning July 1, 2017 and ending June 30, 2018). It is not intended, nor necessarily suitable, for other purposes. Calculations made for other purposes may differ significantly from those shown herein. This report does not present GASB results. The most recent GASB67 and GASB68 results published by the Office of the Actuary are for Fiscal Year 2018 in a Report dated September 28, 2018 which is available on the website of the Office of the Actuary ([www.nyc.gov/actuary](http://www.nyc.gov/actuary)).

Results of the June 30, 2015 (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, 2016 (Lag) and June 30, 2015 (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, 2016 and June 30, 2015.

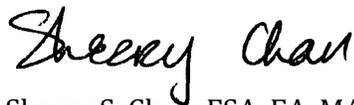
Consistent with Actuarial Standards of Practice, the Office of the Actuary has reviewed census data and financial information for consistency and reasonability but has not audited it. The accuracy of the results and calculations presented in this Report are dependent on the accuracy of this census data 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 methods and assumptions are shown in SECTION XI – ACTUARIAL ASSUMPTIONS AND METHODS. A cost associated with providing a guaranteed 8.25% return on the TDA Fixed Fund for non-UFT members is added to the Normal Cost beginning with the June 30, 2016 valuation. All other actuarial assumptions and methods are unchanged from the prior year.

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 (ERISA), 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. Dolores Capone - New York City Office of the Actuary  
Ms. Marlene Markoe-Boyd - New York City Office of the Actuary  
Ms. Valerie Budzik - New York City Teachers' Retirement System  
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## SECTION I – EXECUTIVE SUMMARY

This report presents the results of the June 30, 2016 (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 2018 (i.e. July 1, 2017 to June 30, 2018),
- 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 it has equaled the Actuarial Contribution in all 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. The actuary's scope of work did not include an analysis of the range of such deviations.

Additional risks may be present for the Plan and are 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, 2016 (Lag) actuarial valuation and, for comparative purposes, the June 30, 2015 (Lag) actuarial valuation.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM		
SUMMARY OF VALUATION RESULTS		
Valuation Date	June 30, 2016 (Lag)	June 30, 2015 (Lag)
Fiscal Year	2018	2017
<b>Funded Status</b>		
1. Accrued Liability	\$ 69,964,411,998	\$ 69,625,607,776
2. Actuarial Value of Assets (AVA) <sup>1</sup>	<u>41,015,087,000</u>	<u>39,290,072,000</u>
3. Unfunded Accrued Liability (AVA Basis) (1. - 2.)	\$ 28,949,324,998	\$ 30,335,535,776
4. Funded Ratio (AVA Basis) (2. / 1.)	58.6%	56.4%
5. Market Value of Assets (MVA) <sup>1</sup>	43,629,545,000	44,254,664,000
6. Unfunded Accrued Liability (MVA Basis) (1. - 5.)	\$ 26,334,866,998	\$ 25,370,943,776
7. Funded Ratio (MVA Basis) (5. / 1.)	62.4%	63.6%
<b>Contribution</b>		
1. Normal Cost	\$ 1,172,161,054	\$ 1,125,661,295
2. Unfunded Accrued Liability	2,663,071,096	2,709,794,564
3. Administrative Expenses	<u>54,477,777</u>	<u>52,943,611</u>
4. Actuarial Contribution (1. + 2. + 3.)	\$ 3,889,709,927	\$ 3,888,399,470
5. Statutory Contribution	\$ 3,889,709,927	\$ 3,888,399,470
<b>Participant Data</b>		
1. Active Members		
a. Number	118,201	114,652
b. Annual Salary	\$ 9,224,267,647	\$ 8,844,650,633
c. Average Salary	\$ 78,039	\$ 77,143
2. Active/Inactive Members <sup>2</sup>	7,401	7,347
3. Terminated Vested Members	14,393	13,482
4. Retirees and Beneficiaries		
a. Number	84,093	82,777
b. Total Annual Benefits	\$ 3,954,653,723	\$ 3,884,025,741
c. Average Benefit	\$ 47,027	\$ 46,922

<sup>1</sup> Actuarial Value of Assets and Market Value of Assets are rounded to the nearest thousand.

<sup>2</sup> Represents members no longer on payroll, but not otherwise classified.

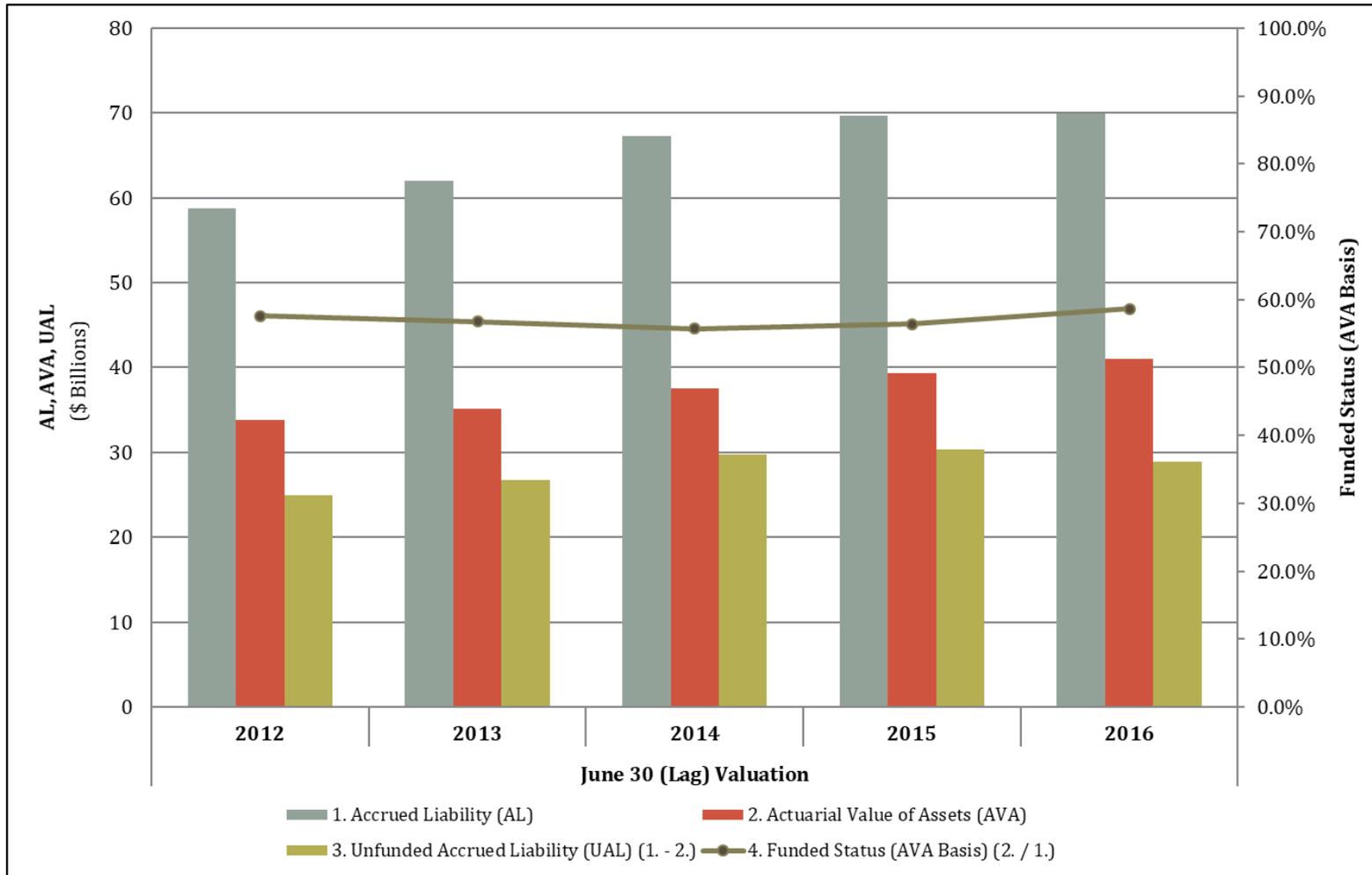
**Table I-2**  
**Actuarial Liabilities**

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM		
ACTUARIAL LIABILITIES BY STATUS		
Valuation Date	June 30, 2016 (Lag)	June 30, 2015 (Lag)
Fiscal Year	2018	2017
<b>Accrued Liability</b>		
1. Active Members	\$ 23,738,166,660	\$ 22,901,438,948
2. Active/Inactive Members <sup>1</sup>	535,870,232	598,796,540
3. Terminated Vested Members	972,023,664	895,638,040
4. Retirees and Beneficiaries	<u>41,651,524,250</u>	<u>42,095,109,031</u>
5. Accrued Liability Pre-Adjustments (1. to 4.)	\$ 66,897,584,806	\$ 66,490,982,559
6. Actuarial Adjustments <sup>2</sup>	<u>3,066,827,192</u>	<u>3,134,625,217</u>
7. Total Accrued Liability (AL) (5. + 6.)	\$ 69,964,411,998	\$ 69,625,607,776
<b>Present Value of Benefits</b>		
1. Active Members	\$ 39,535,995,292	\$ 38,057,453,779
2. Active/Inactive Members <sup>1</sup>	535,870,232	598,796,540
3. Terminated Vested Members	972,023,664	895,638,040
4. Retirees and Beneficiaries	<u>41,651,524,250</u>	<u>42,095,109,031</u>
5. Present Value of Benefits (1. to 4.)	\$ 82,695,413,438	\$ 81,646,997,390
6. Actuarial Adjustments <sup>2</sup>	<u>3,066,827,192</u>	<u>3,134,625,217</u>
7. Total Present Value of Benefits (5. + 6.)	\$ 85,762,240,630	\$ 84,781,622,607

<sup>1</sup> Represents members no longer on payroll, but not otherwise classified.

<sup>2</sup> 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. Beginning with the June 30, 2012 (Lag) actuarial valuation, the AAVM recognizes investment returns greater or less than expected over a period of six years. In accordance with this AAVM, actual Unexpected Investment Returns (UIR) are phased into the AVA at rates of 15%, 15%, 15%, 15%, 20%, and 20% per year (i.e. UIR is recognized at cumulative rates of 15%, 30%, 45%, 60%, 80%, and 100% over a period of six years).

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 AVA, where EIR equals the sum of beginning-of-fiscal-year AVA plus one-half of net cash flow, multiplied by the expected rate of return.

Beginning with the June 30, 2014 (Lag) actuarial valuation, the AVA is further constrained to be within a corridor of 80% to 120% of the market value.

**Table II-1**  
**Statement of Plan Net Assets as of June 30, 2016 and June 30, 2015**

(\$ Thousands)		
	June 30, 2016	June 30, 2015
<b>ASSETS</b>		
Cash	\$ 5,157	\$ 22,674
Receivables		
Investment Securities Sold	\$ 1,772,521	\$ 2,766,976
Member Loans	275,704	257,043
Accrued Interest and Dividends	151,330	145,968
Total Receivables	\$ 2,199,555	\$ 3,169,987
<b>INVESTMENTS AT FAIR VALUE</b>		
Pooled NYC Pension Fund Assets (Fixed-Return Fund)		
Short-Term Investments		
Commercial Paper	\$ 1,070,574	\$ 1,557,628
Short-term Investment Fund	1,025,446	1,240,601
U.S. Treasury Bills & Agencies	0	24,960
Discount Notes	83,294	980,831
Debt Securities		
U.S. Government	5,924,318	6,932,469
Corporate & Other	8,730,691	8,003,971
Equity Securities		
	22,284,584	21,988,143
Alternative Investments		
	6,872,850	6,002,260
Collective Trust Funds		
Fixed Income	1,691,577	1,656,668
International Equity	11,507,149	11,615,671
Mortgage Debt Security	485,191	406,054
Treasury Inflation Protected Securities	2,399,270	1,393,516
Collateral from securities lending (Fixed Return Fund)		
	1,774,456	1,663,710
Diversified Equity Fund		
Short-Term Investments	29,570	33,499
Equity securities	2,206,416	2,798,742
Debt Securities	50,541	62,026
Corporate Bonds	0	0
Bond Fund		
Short-Term Investments	432	673
Debt Securities	24,393	35,113
Corporate Bonds	0	0
International Equity Fund		
Short-Term Investments	75	124
International equity	8,012	10,669
Inflation Protection Fund		
Short-Term Investments	12	10
Equity securities	3,960	4,791
Socially Responsive Equity Fund		
Short-Term Investments	24	461
Equity securities	7,650	7,576
International equity	158	233
Collateral from securities lending (Variable Return Fund)	84,226	200,212
<b>TOTAL INVESTMENTS</b>		
	\$ 66,264,869	\$ 66,620,611
TDA Investment in Pooled NYC Pension Fund		
	0	0
<b>OTHER ASSETS</b>		
	49,873	27,855
<b>TOTAL ASSETS</b>		
	\$ 68,519,454	\$ 69,841,127
<b>LIABILITIES</b>		
Accounts Payable	\$ 417,408	\$ 391,945
Payable for Investment Securities Purchased	2,308,523	4,616,284
Accrued Benefits Payable	12,563	14,979
Due to TDA Program's Fixed Return Fund	20,292,733	18,699,332
Security Lending	1,858,682	1,863,923
<b>TOTAL LIABILITIES</b>		
	\$ 24,889,909	\$ 25,586,463
<b>PLAN ASSETS HELD IN TRUST FOR PENSION BENEFITS</b>		
	\$ 43,629,545	\$ 44,254,664

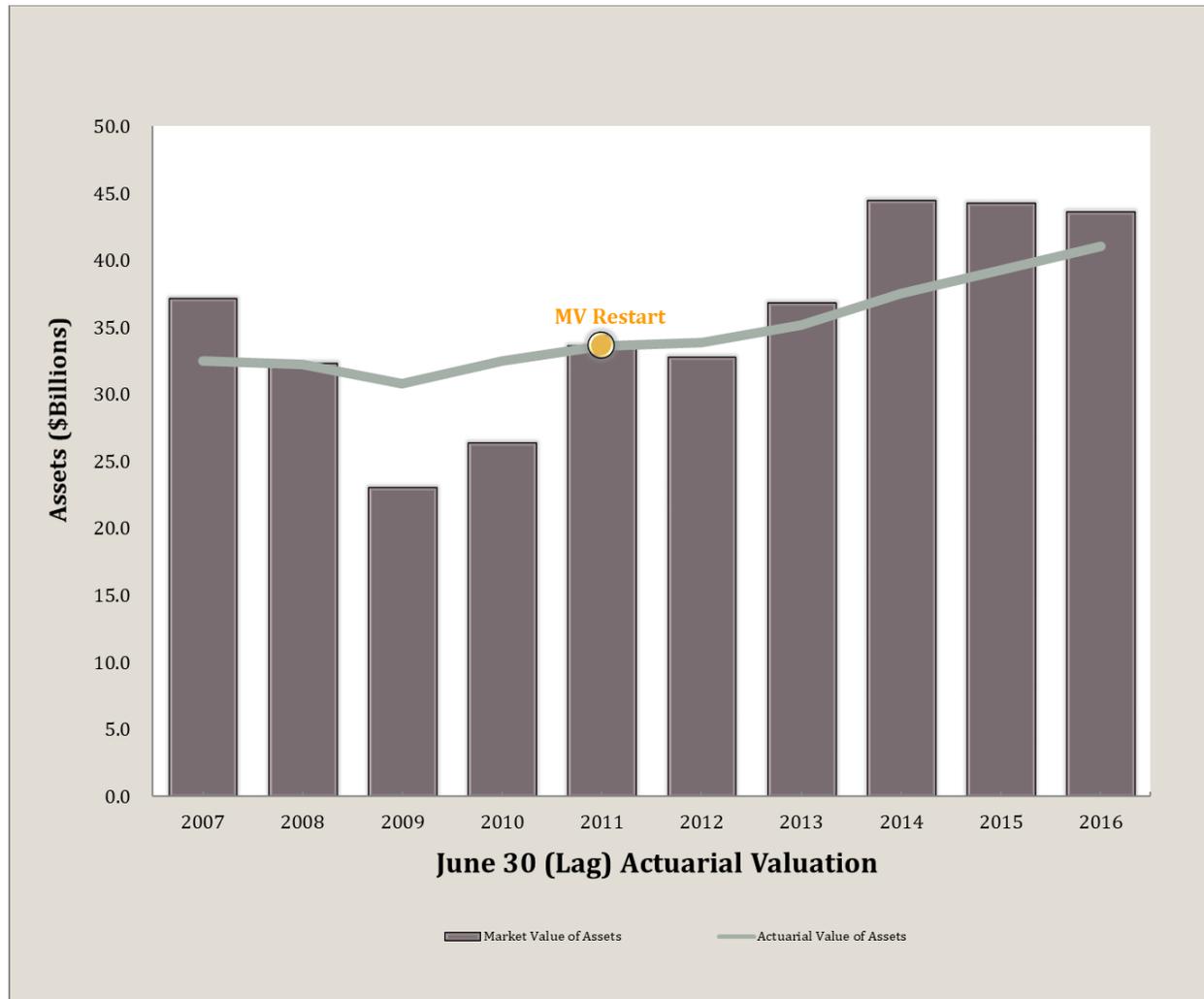
**Table II-2**  
**Statement of Changes in Plan Net Assets**

(\$ Thousands)		
	<b>June 30, 2016</b>	<b>June 30, 2015</b>
<b>ADDITIONS</b>		
Contributions		
Member Contributions	\$ 173,696	\$ 158,590
Employer Contributions	3,702,569	3,270,007
Other Employer Contributions	<u>58,145</u>	<u>55,521</u>
<b>Total Contributions</b>	<b>\$ 3,934,410</b>	<b>\$ 3,484,118</b>
Investment Income		
Interest Income	\$ 860,223	\$ 758,526
Dividend Income	896,208	889,231
Net (Depreciation) in Fair Value of Investments	<u>(598,443)</u>	<u>146,833</u>
Total Investment Income	\$ 1,157,988	\$ 1,794,590
Less:		
Investment Expenses	\$ 222,163	\$ 209,321
Net (Decrease) in Fair Variable Expense Provision	<u>(7,095)</u>	<u>(6,360)</u>
<b>Net Investment Income</b>	<b>\$ 942,920</b>	<b>\$ 1,591,629</b>
Securities Lending Transactions		
Securities Lending Income	\$ 18,742	\$ 21,713
Securities Lending Fees	<u>(1,395)</u>	<u>(1,413)</u>
<b>Net Securities Lending Income (Loss)</b>	<b>\$ 17,347</b>	<b>\$ 20,300</b>
Other		
<b>Net Receipts from (to) Other Retirement Systems</b>	<b>\$ 1,233</b>	<b>\$ 329</b>
<b>TOTAL ADDITIONS</b>	<b>\$ 4,895,910</b>	<b>\$ 5,096,376</b>
<b>DEDUCTIONS</b>		
Benefit Payments and Withdrawals	\$ 4,107,455	\$ 4,024,272
Administrative Expenses	<u>59,367</u>	<u>58,391</u>
Other		
Interest from (to) TDA Program's Fixed Return Fund	\$ 1,354,207	\$ 1,248,988
<b>TOTAL DEDUCTIONS</b>	<b>\$ 5,521,029</b>	<b>\$ 5,331,651</b>
<b>NET INCREASE (DECREASE) IN PLAN NET ASSETS</b>	<b>\$ (625,119)</b>	<b>\$ (235,275)</b>
<b>PLAN NET ASSETS HELD IN TRUST FOR PENSION BENEFITS</b>		
Beginning of Year	\$ 44,254,664	\$ 44,489,939
End of Year	\$ 43,629,545	\$ 44,254,664

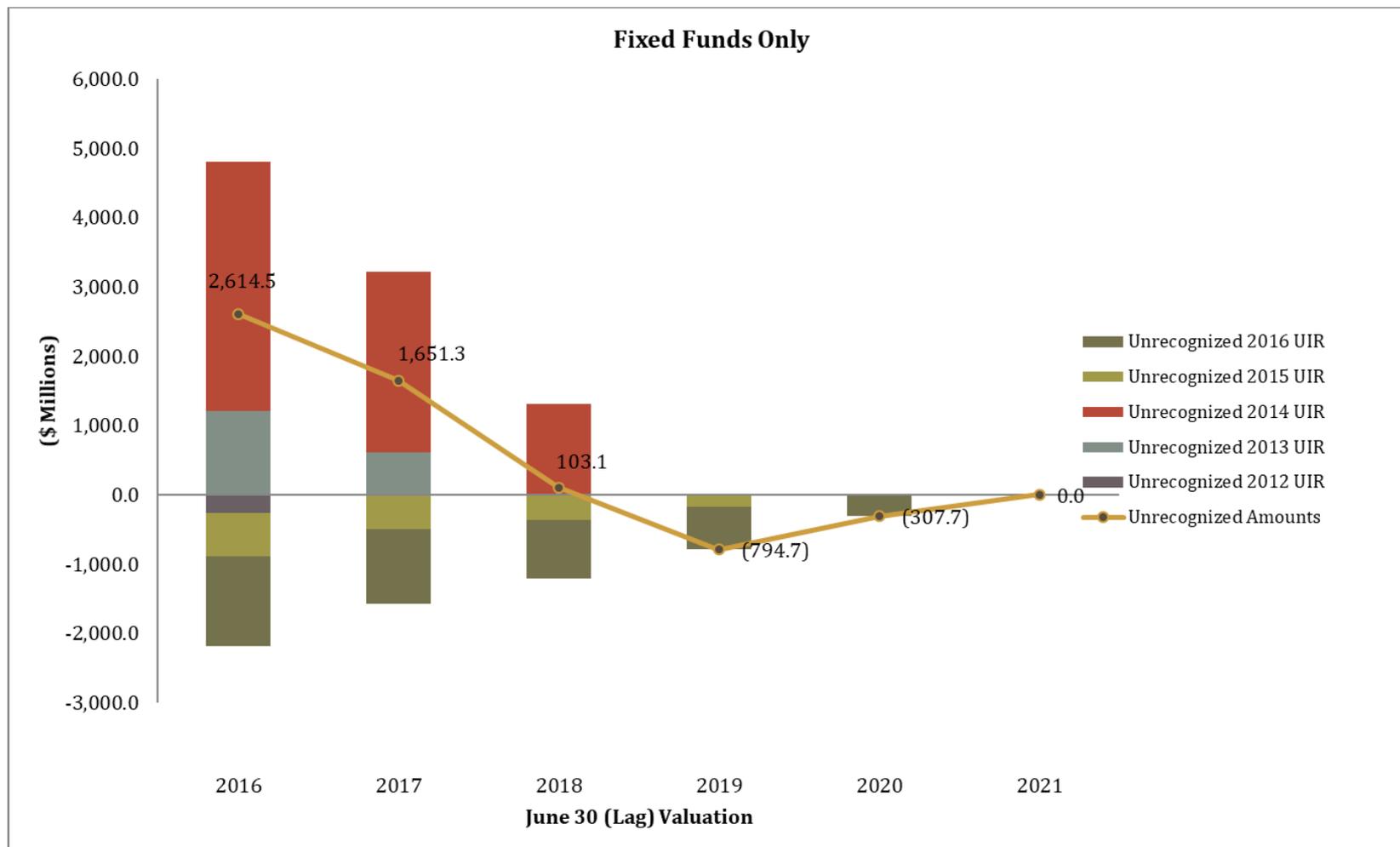
**Table II-3**  
**Development of Actuarial Value of Assets as of June 30, 2016**

(\$ Thousands)		
Valuation Date	June 30, 2016	June 30, 2015
<b>Fixed Fund</b>		
Market Value of Assets (MVA)		
Beginning of Year (BOY)	\$ 41,452,045	\$ 41,199,955
End of Year (EOY)	\$ 41,440,456	\$ 41,452,045
1. Contributions		
a. Employee	\$ 173,287	\$ 158,124
b. Employer	3,702,569	3,270,007
c. Other	<u>58,105</u>	<u>55,467</u>
d. Total Contributions	\$ 3,933,961	\$ 3,483,598
2. Net Investment Income		
a. Investment Income	\$ 1,197,299	\$ 1,659,659
b. Investment Expenses	<u>(216,240)</u>	<u>(202,504)</u>
c. Total Net Investment Income	\$ 981,059	\$ 1,457,155
3. Cash Flow (Other)	\$ (4,926,609)	\$ (4,688,661)
4. Net Cash Flow (1.d. + 3.)	\$ (992,648)	\$ (1,205,063)
5. Average invested assets		
a. AVA @ BOY	\$ 36,487,453	\$ 34,231,439
b. 1/2 Net Cash Flow ((1.d. + 3.) / 2)	<u>(496,324)</u>	<u>(602,532)</u>
c. Total	\$ 35,991,129	\$ 33,628,907
6. Expected Rate of Return (AIR)	7.00%	7.00%
7. Expected Investment Return (EIR) (5.c. x 6.)	\$ 2,519,379	\$ 2,354,023
8. Unexpected Investment Return (UIR) (2.c. - 7.)	\$ (1,538,320)	\$ (896,868)
9. AVA @ EOY		
a. AVA @ BOY (prior to corridor limit)	\$ 36,487,453	\$ 34,231,439
b. Net Cash Flow (4.)	(992,648)	(1,205,063)
c. Expected Investment Return (7.)	2,519,379	2,354,023
d. Phase in of UIR		
15% * UIR for prior year	(230,748)	(134,531)
15% * UIR for second prior year	(134,530)	980,957
15% * UIR for third prior year	980,958	454,114
15% * UIR for fourth prior year	454,115	(193,486)
20% * UIR for fifth prior year	(257,981)	N/A
20% * UIR for sixth prior year	<u>N/A</u>	<u>N/A</u>
Total	\$ 811,814	\$ 1,107,054
e. Preliminary AVA (9.a. + 9.b. + 9.c. + 9.d.)	\$ 38,825,998	\$ 36,487,453
10. Corridor		
a. 80% of MVA	\$ 33,152,365	\$ 33,161,636
b. 120% of MVA	\$ 49,728,547	\$ 49,742,454
<b>11. Final AVA of EOY (9e. bounded by 10)</b>	<b>\$ 38,825,998</b>	<b>\$ 36,487,453</b>
<b>12. Variable Assets</b>	<b>\$ 2,189,089</b>	<b>\$ 2,802,619</b>
<b>13. Total AVA @ EOY (11. + 12.)</b>	<b>\$ 41,015,087</b>	<b>\$ 39,290,072</b>

Graph II-4  
Historical Market and Actuarial Value of Assets



**Graph II-5**  
**Future Recognition of UIR as of June 30, 2016**



## SECTION III - CONTRIBUTION DEVELOPMENT AND HISTORY

**Table III-1**  
**Statutory Contributions**

**Table III-1** shows the components of the Fiscal Year 2018 and the Fiscal Year 2017 Statutory Contributions.

COMPONENTS OF CURRENT AND PRIOR FISCAL YEAR STATUTORY CONTRIBUTIONS		
Valuation Date	June 30, 2016 (Lag)	June 30, 2015 (Lag)
Fiscal Year	2018	2017
Normal Cost <sup>1</sup>	\$ 1,172,161,054 <sup>2</sup>	\$ 1,125,661,295 <sup>3</sup>
Amortization of Unfunded Accrued Liability		
-Initial UAL	1,841,243,371	1,787,614,923
-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	224,142,498	224,142,498
-2015 (Gain)/Loss	86,869,581	86,869,581
-2016 (Gain)/Loss	<u>(100,351,916)</u>	<u>NA</u>
Total	2,663,071,096	2,709,794,564
Administrative Expenses	54,477,777	52,943,611
<b>Total Contribution to the New York City Teachers' Retirement System</b>	<b>\$ 3,889,709,927</b>	<b>\$ 3,888,399,470</b>

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

<sup>2</sup> Includes \$2,853,453 for Group Life Insurance Plan.

<sup>3</sup> Includes \$2,807,952 for Group Life Insurance Plan.

**Table III-2**  
**Schedule of Unfunded Accrued Liability Bases**

The Initial 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/or Method Changes – Over a closed 20-year period.
- Actuarial Gains and Losses – Over a closed 15-year period.

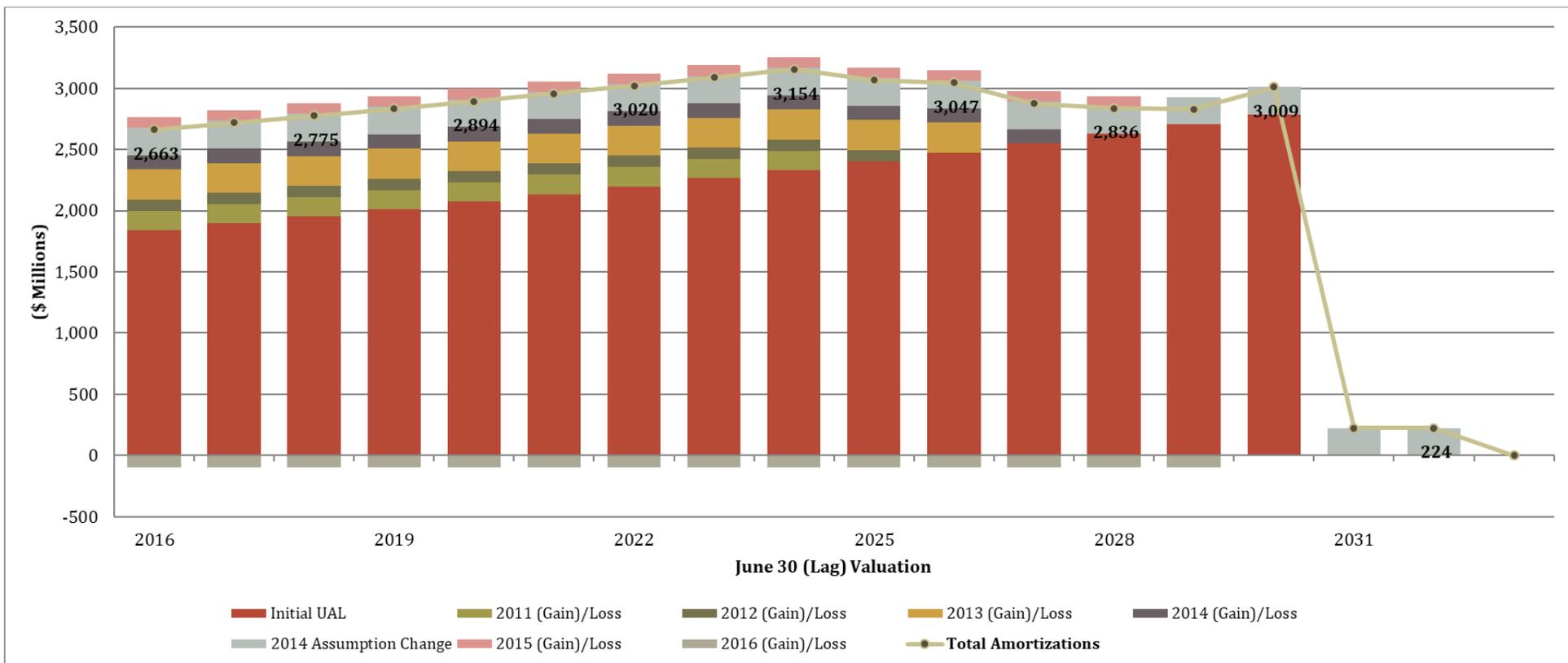
Under the One-Year Lag methodology (OYLM), the number of payments is one fewer than the number of years in the amortization period (e.g. 14 payments over a closed 15-year amortization period).

**Table III-2** shows the Summary of Unfunded Accrued Liability (UAL) Bases as of June 30, 2016.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM SCHEDULE OF UNFUNDED ACCRUED LIABILITY BASES (\$ Thousands)						
Amortization Base	Date Established	Original Amount	Amortization Period/Method	Amortization Payment	Years/Payments Remaining	OYLM UAL June 30, 2016
Initial UAL	6/30/10	\$ 20,524,023 <sup>1</sup>	22 Years Closed/IDP - 3%	\$ 1,841,243	16/16	\$ 21,099,902
(Gain)/Loss	6/30/11	\$ 1,329,890	15 Years Closed/LDP	\$ 157,299	10/10	\$ 1,142,813
(Gain)/Loss	6/30/12	\$ 778,617	15 Years Closed/LDP	\$ 92,094	11/11	\$ 714,347
(Gain)/Loss	6/30/13	\$ 2,065,938	15 Years Closed/LDP	\$ 244,358	12/12	\$ 2,007,638
(Gain)/Loss	6/30/14	\$ 992,710	15 Years Closed/LDP	\$ 117,417	13/13	\$ 1,015,096
Assumption Change	6/30/14	\$ 2,239,586	20 Years Closed/LDP	\$ 224,142	18/18	\$ 2,332,248
(Gain)/Loss	6/30/15	\$ 734,444	15 Years Closed/LDP	\$ 86,870	14/14	\$ 785,855
(Gain)/Loss	6/30/16	\$ (848,432)	15 Years Closed/LDP	\$ (100,352)	15/14	\$ (848,432)

<sup>1</sup> Initial UAL as of June 30, 2010 after adjustments under OYLM. The amount prior to adjustments under OYLM was \$1,501,798,520.

**Graph III-3**  
**Remaining UAL Base Amortizations as of June 30, 2016**



**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
Initial UAL Amortization Base	\$ 20,524,023	\$ 21,960,705	\$ 21,902,884	\$ 21,793,164	\$ 21,626,476	\$ 21,397,353	\$ 21,099,902
2010-2011 (Gain)/Loss		1,329,890	1,422,983	1,359,880	1,292,361	1,220,116	1,142,813
ERI		5,793	6,199	4,803	3,309	1,710	0
2011-2012 (Gain)/Loss			778,617	833,121	796,176	756,645	714,347
2012-2013 (Gain)/Loss				2,065,937	2,210,553	2,112,526	2,007,638
2013-2014 (Gain)/Loss					992,710	1,062,200	1,015,096
Assumption Change at June 30, 2014					2,239,586	2,396,357	2,332,248
2014-2015 (Gain)/Loss						734,444	785,855
2015-2016 (Gain)/Loss							(848,432)
<b>Sum of Outstanding Amortization Amounts</b>	<b>\$ 20,524,023</b>	<b>\$ 23,296,388</b>	<b>\$ 24,110,683</b>	<b>\$ 26,056,905</b>	<b>\$ 29,161,171</b>	<b>\$ 29,681,351</b>	<b>\$ 28,249,467</b>

June 30 (Lag) Valuation Date	2010	2011	2012	2013	2014	2015	2016
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
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
3. Due (To)/From TDA	(250,030)	(322,818)	(304,649)	(363,493)	(464,899)	(486,005)	(488,763)
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
5. PV 1-year Adjusted Employer Contribution	2,386,846	1,055,636	1,034,859	1,037,450	1,015,997	1,050,590	1,088,218
6. PV Future Administrative Expense Reimbursement	0	71,988	71,326	71,999	76,284	89,600	100,403
<b>7. Adjusted UAL (4. - 5. - 6.)</b>	<b>\$ 20,524,023</b>	<b>\$ 23,296,388</b>	<b>\$ 24,110,683</b>	<b>\$ 26,056,905</b>	<b>\$ 29,161,171</b>	<b>\$ 29,681,351</b>	<b>\$ 28,249,467</b>

**Table III-5**  
**Actuarial and Statutory Contribution History**

**Table III-5** compares the Statutory Contributions to the Actuarial Contributions for Fiscal Years 2009 through 2018.

(\$ Thousands)			
Fiscal Year Ended June 30	Actuarial Contribution Certified	Statutory Contribution Contributed	Percentage of Actuarial Contribution Contributed
2009	2,223,644	2,223,644	100.0%
2010	2,484,074	2,484,074	100.0%
2011	2,468,973	2,468,973	100.0%
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%

**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 2009 through 2018, inclusive.

CITY RATES (\$ Thousands)			
Fiscal Year Ended June 30	Actuarial Contribution	Salary <sup>1</sup> at Time = 1.0	City Rate
2009	2,223,644	7,221,524	30.8%
2010	2,484,074	7,859,931	31.6%
2011	2,468,973	7,935,195	31.1%
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%

<sup>1</sup>Includes the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

## 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, 2016 (Lag)					
Fiscal Year	2018					
Obligor	Future Leaders	Harriet Tubman	KIPP Academy	KIPP NYC	Opportunity	Renaissance
<b>Contribution</b>						
1. Normal Cost	\$ 271,927	\$ 341,092	\$ 634,294	\$ 641,265	\$ 535,128	\$ 636,643
2. Amortization of Unfunded Accrued Liability	123,490	155,629	168,859	211,868	241,427	732,327
3. Administrative Expenses	<u>16,045</u>	<u>18,233</u>	<u>32,820</u>	<u>20,664</u>	<u>25,526</u>	<u>17,747</u>
4. Actuarial Contribution (1. + 2. + 3.)	\$ 411,462	\$ 514,954	\$ 835,973	\$ 873,797	\$ 802,081	\$ 1,386,717
5. Statutory Contribution	\$ 411,462	\$ 514,954	\$ 835,973	\$ 873,797	\$ 802,081	\$ 1,386,717
Obligor	South Bronx Early College Academy	UFT	University Prep Charter HS	Voice	Wildcat	Charter School Subtotal
<b>Contribution</b>						
1. Normal Cost	\$ 52,111	\$ 307,051	\$ 509,855	\$ 295,616	\$ 386,067	\$ 4,611,049
2. Amortization of Unfunded Accrued Liability	39,345	259,384	343,990	36,047	251,851	2,564,217
3. Administrative Expenses	<u>2,188</u>	<u>16,775</u>	<u>11,912</u>	<u>15,802</u>	<u>9,238</u>	<u>186,950</u>
4. Actuarial Contribution (1. + 2. + 3.)	\$ 93,644	\$ 583,210	\$ 865,757	\$ 347,465	\$ 647,156	\$ 7,362,216
5. Statutory Contribution	\$ 93,644	\$ 583,210	\$ 865,757	\$ 347,465	\$ 647,156	\$ 7,362,216

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

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM						
EMPLOYER CONTRIBUTION BY OBLIGOR						
Valuation Date	June 30, 2016 (Lag)					
Fiscal Year	2018					
Obligor	Charter School Subtotal	CUNY: Senior Colleges	CUNY: Community Colleges / Others	CUNY Subtotal	Department of Education <sup>1</sup>	Total
<b>Contribution</b>						
1. Normal Cost	\$ 4,611,049	\$ 29,144,146	\$ 18,151,278	\$ 47,295,424	\$ 1,120,254,581	\$ 1,172,161,054
2. Amortization of Unfunded Accrued Liability	2,564,217	71,461,609	26,808,565	98,270,174	2,562,236,705	2,663,071,096
3. Administrative Expenses	186,950	1,509,463	827,543	2,337,006	51,953,821	54,477,777
4. Actuarial Contribution (1. + 2. + 3.)	\$ 7,362,216	\$ 102,115,218	\$ 45,787,386	\$ 147,902,604	\$ 3,734,445,107	\$ 3,889,709,927
5. Statutory Contribution	\$ 7,362,216	\$ 102,115,218	\$ 45,787,386	\$ 147,902,604	\$ 3,734,445,107	\$ 3,889,709,927

<sup>1</sup> Includes \$594,701 previously allocated to Beginning with Children Charter School prior to its closure in 2016.

**Table IV-2**  
**Accrued Liabilities by Obligor**

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM						
ACCRUED LIABILITIES BY OBLIGOR						
Valuation Date	June 30, 2016 (Lag)					
Fiscal Year	2018					
Obligor	Future Leaders	Harriet Tubman	KIPP Academy	KIPP NYC	Opportunity	Renaissance
<b>Accrued Liability</b>						
1. Active Members	\$ 2,375,212	\$ 3,487,398	\$ 5,753,174	\$ 8,269,500	\$ 4,881,584	\$ 11,781,675
2. Active/Inactive Members <sup>1</sup>	213,978	144,790	400,937	446,884	191,658	583,216
3. Terminated Vested Members	235,901	689,236	1,235,248	556,585	1,162,901	133,013
4. Retirees and Beneficiaries	<u>1,103,880</u>	<u>280,194</u>	<u>622,354</u>	<u>0</u>	<u>1,929,506</u>	<u>4,091,368</u>
5. Accrued Liability Pre-Adjustments (1. to 4.)	\$ 3,928,971	\$ 4,601,618	\$ 8,011,713	\$ 9,272,969	\$ 8,165,649	\$ 16,589,272
6. Actuarial Adjustments <sup>2</sup>	<u>117,543</u>	<u>68,682</u>	<u>238,006</u>	<u>185,176</u>	<u>134,252</u>	<u>254,033</u>
7. Total Accrued Liability (AL) (5. + 6.)	\$ 4,046,514	\$ 4,670,300	\$ 8,249,719	\$ 9,458,145	\$ 8,299,901	\$ 16,843,305
<b>Present Value of Benefits</b>						
1. Active Members	\$ 9,071,427	\$ 10,164,021	\$ 21,410,790	\$ 17,734,172	\$ 15,519,551	\$ 19,906,953
2. Active/Inactive Members <sup>1</sup>	213,978	144,790	400,937	446,884	191,658	583,216
3. Terminated Vested Members	235,901	689,236	1,235,248	556,585	1,162,901	133,013
4. Retirees and Beneficiaries	<u>1,103,880</u>	<u>280,194</u>	<u>622,354</u>	<u>0</u>	<u>1,929,506</u>	<u>4,091,368</u>
5. Present Value of Benefits (1. to 4.)	\$ 10,625,186	\$ 11,278,241	\$ 23,669,329	\$ 18,737,641	\$ 18,803,616	\$ 24,714,550
6. Actuarial Adjustments <sup>2</sup>	<u>117,543</u>	<u>68,682</u>	<u>238,006</u>	<u>185,176</u>	<u>134,252</u>	<u>254,033</u>
7. Total Present Value of Benefits (5. + 6.)	\$ 10,742,729	\$ 11,346,923	\$ 23,907,335	\$ 18,922,817	\$ 18,937,868	\$ 24,968,583
<b>Obligor</b>	<b>South Bronx Early College Academy</b>	<b>UFT</b>	<b>University Prep Charter HS</b>	<b>Voice</b>	<b>Wildcat</b>	<b>Charter School Subtotal</b>
<b>Accrued Liability</b>						
1. Active Members	\$ 327,743	\$ 3,530,948	\$ 6,517,450	\$ 2,048,397	\$ 6,047,006	\$ 55,020,087
2. Active/Inactive Members <sup>1</sup>	0	1,066,208	388,482	67,077	128,807	3,632,037
3. Terminated Vested Members	0	956,112	332,630	24,939	173,012	5,499,577
4. Retirees and Beneficiaries	<u>0</u>	<u>2,416,153</u>	<u>0</u>	<u>0</u>	<u>937,704</u>	<u>11,381,159</u>
5. Accrued Liability Pre-Adjustments (1. to 4.)	\$ 327,743	\$ 7,969,421	\$ 7,238,562	\$ 2,140,413	\$ 7,286,529	\$ 75,532,860
6. Actuarial Adjustments <sup>2</sup>	<u>6,881</u>	<u>119,268</u>	<u>111,483</u>	<u>48,287</u>	<u>97,426</u>	<u>1,381,037</u>
7. Total Accrued Liability (AL) (5. + 6.)	\$ 334,624	\$ 8,088,689	\$ 7,350,045	\$ 2,188,700	\$ 7,383,955	\$ 76,913,897
<b>Present Value of Benefits</b>						
1. Active Members	\$ 1,669,336	\$ 8,487,911	\$ 15,119,377	\$ 10,277,861	\$ 10,075,308	\$ 139,436,707
2. Active/Inactive Members <sup>1</sup>	0	1,066,208	388,482	67,077	128,807	3,632,037
3. Terminated Vested Members	0	956,112	332,630	24,939	173,012	5,499,577
4. Retirees and Beneficiaries	<u>0</u>	<u>2,416,153</u>	<u>0</u>	<u>0</u>	<u>937,704</u>	<u>11,381,159</u>
5. Present Value of Benefits (1. to 4.)	\$ 1,669,336	\$ 12,926,384	\$ 15,840,489	\$ 10,369,877	\$ 11,314,831	\$ 159,949,480
6. Actuarial Adjustments <sup>2</sup>	<u>6,881</u>	<u>119,268</u>	<u>111,483</u>	<u>48,287</u>	<u>97,426</u>	<u>1,381,037</u>
7. Total Present Value of Benefits (5. + 6.)	\$ 1,676,217	\$ 13,045,652	\$ 15,951,972	\$ 10,418,164	\$ 11,412,257	\$ 161,330,517

<sup>1</sup> Represents members no longer on payroll, but not otherwise classified.

<sup>2</sup> Includes actuarial loading adjustments.

**Table IV-2**  
**Accrued Liabilities by Obligor (cont'd)**

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM						
ACCRUED LIABILITIES BY OBLIGOR						
Valuation Date	June 30, 2016 (Lag)					
Fiscal Year	2018					
Obligor	Charter School Subtotal	CUNY: Senior Colleges	CUNY: Community Colleges / Others	CUNY Subtotal	Department of Education <sup>1</sup>	Total
<b>Accrued Liability</b>						
1. Active Members	\$ 55,020,087	\$ 351,705,946	\$ 163,185,435	\$ 514,891,381	\$ 23,168,255,192	\$ 23,738,166,660
2. Active/Inactive Members <sup>2</sup>	3,632,037	22,321,356	12,705,520	35,026,876	497,211,319	535,870,232
3. Terminated Vested Members	5,499,577	10,588,451	5,580,179	16,168,630	950,355,457	972,023,664
4. Retirees and Beneficiaries	<u>11,381,159</u>	<u>1,033,591,528</u>	<u>325,210,478</u>	<u>1,358,802,006</u>	<u>40,281,341,085</u>	<u>41,651,524,250</u>
5. Accrued Liability Pre-Adjustments (1. to 4.)	\$ 75,532,860	\$ 1,418,207,281	\$ 506,681,612	\$ 1,924,888,893	\$ 64,897,163,053	\$ 66,897,584,806
6. Actuarial Adjustments <sup>3</sup>	<u>1,381,037</u>	<u>177,800,836</u>	<u>75,828,789</u>	<u>253,629,625</u>	<u>2,811,816,530</u>	<u>3,066,827,192</u>
7. Total Accrued Liability (AL) (5. + 6.)	\$ 76,913,897	\$ 1,596,008,117	\$ 582,510,401	\$ 2,178,518,518	\$ 67,708,979,583	\$ 69,964,411,998
<b>Present Value of Benefits</b>						
1. Active Members	\$ 139,436,707	\$ 679,936,882	\$ 389,259,857	\$ 1,069,196,739	\$ 38,327,361,846	\$ 39,535,995,292
2. Active/Inactive Members <sup>2</sup>	3,632,037	22,321,356	12,705,520	35,026,876	497,211,319	535,870,232
3. Terminated Vested Members	5,499,577	10,588,451	5,580,179	16,168,630	950,355,457	972,023,664
4. Retirees and Beneficiaries	<u>11,381,159</u>	<u>1,033,591,528</u>	<u>325,210,478</u>	<u>1,358,802,006</u>	<u>40,281,341,085</u>	<u>41,651,524,250</u>
5. Present Value of Benefits (1. to 4.)	\$ 159,949,480	\$ 1,746,438,217	\$ 732,756,034	\$ 2,479,194,251	\$ 80,056,269,707	\$ 82,695,413,438
6. Actuarial Adjustments <sup>3</sup>	<u>1,381,037</u>	<u>177,800,836</u>	<u>75,828,789</u>	<u>253,629,625</u>	<u>2,811,816,530</u>	<u>3,066,827,192</u>
7. Total Present Value of Benefits (5. + 6.)	\$ 161,330,517	\$ 1,924,239,053	\$ 808,584,823	\$ 2,732,823,876	\$ 82,868,086,237	\$ 85,762,240,630

<sup>1</sup> Includes results for Beginning with Children Charter School which closed in 2016.

<sup>2</sup> Represents members no longer on payroll, but not otherwise classified.

<sup>3</sup> 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, 2016 (Lag)					
Fiscal Year	2018					
Obligor	Future Leaders	Harriet Tubman	KIPP Academy	KIPP NYC	Opportunity	Renaissance
<b>Participant Data</b>						
1. Active Members						
a. Number	43	54	89	46	68	58
b. Annual Salary <sup>1</sup>	\$ 2,809,418	\$ 3,187,301	\$ 6,816,819	\$ 4,308,082	\$ 4,983,941	\$ 4,709,950
c. Average Salary	\$ 65,335	\$ 59,024	\$ 76,593	\$ 93,654	\$ 73,293	\$ 81,206
2. Active/Inactive Members <sup>2</sup>	18	14	18	15	15	4
3. Terminated Vested Members	4	6	26	24	19	3
4. Retirees and Beneficiaries						
a. Number	1	1	2	0	3	8
b. Total Annual Benefits	\$ 90,810	\$ 24,370	\$ 59,373	\$ 0	\$ 155,677	\$ 326,509
c. Average Annual Benefit	\$ 90,810	\$ 24,370	\$ 29,687	\$ 0	\$ 51,892	\$ 40,814
Obligor	South Bronx Early College Academy	UFT	University Prep Charter HS	Voice	Wildcat	Charter School Subtotal
<b>Participant Data</b>						
1. Active Members						
a. Number	9	31	42	51	31	522
b. Annual Salary <sup>1</sup>	\$ 567,591	\$ 2,339,287	\$ 3,982,243	\$ 3,448,871	\$ 2,736,129	\$ 39,889,632
c. Average Salary	\$ 63,066	\$ 75,461	\$ 94,815	\$ 67,625	\$ 88,262	\$ 76,417
2. Active/Inactive Members <sup>2</sup>	0	15	1	12	2	114
3. Terminated Vested Members	0	20	6	2	3	113
4. Retirees and Beneficiaries						
a. Number	0	3	0	0	2	20
b. Total Annual Benefits	\$ 0	\$ 179,593	\$ 0	\$ 0	\$ 75,783	\$ 912,115
c. Average Annual Benefit	\$ 0	\$ 59,864	\$ 0	\$ 0	\$ 37,892	\$ 45,606

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

<sup>2</sup> 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, 2016 (Lag)					
Fiscal Year	2018					
Obligor	Charter School Subtotal	CUNY: Senior Colleges	CUNY: Community Colleges / Others	CUNY Subtotal	Department of Education <sup>1</sup>	Total
<b>Participant Data</b>						
1. Active Members						
a. Number	522	3,728	2,068	5,796	111,883	118,201
b. Annual Salary <sup>2</sup>	\$ 39,889,632	\$ 211,348,166	\$ 131,195,846	\$ 342,544,012	\$ 8,841,834,003	\$ 9,224,267,647
c. Average Salary	\$ 76,417	\$ 56,692	\$ 63,441	\$ 59,100	\$ 79,028	\$ 78,039
2. Active/Inactive Members <sup>3</sup>	114	299	617	916	6,371	7,401
3. Terminated Vested Members	113	148	77	225	14,055	14,393
4. Retirees and Beneficiaries						
a. Number	20	2,034	642	2,676	81,397	84,093
b. Total Annual Benefits	\$ 912,115	\$ 120,801,458	\$ 33,760,360	\$ 154,561,818	\$ 3,799,179,790	\$ 3,954,653,723
c. Average Annual Benefit	\$ 45,606	\$ 59,391	\$ 52,586	\$ 57,759	\$ 46,675	\$ 47,027

<sup>1</sup> Includes information for Beginning with Children Charter School which closed in 2016.

<sup>2</sup> Salaries shown reflect the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

<sup>3</sup> 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, 2015 (Lag) actuarial valuation and the June 30, 2016 (Lag) actuarial valuation.

DEVELOPMENT OF EXPERIENCE (GAIN) / LOSS		
June 30, 2016		
(\$ Thousands)		
1.	Expected Accrued Liability (AL)	
	a. AL at June 30, 2015	\$ 69,625,608
	b. Total Normal Cost and Administrative Expenses at June 30, 2015	1,230,945
	c. Interest on 1.a. and 1.b. to June 30, 2016	4,959,959
	d. Fiscal Year 2016 Benefit Payments with Interest to June 30, 2016	<u>(4,248,784)</u>
	e. Expected AL at June 30, 2016	\$ 71,567,728
2.	Actual AL at June 30, 2016	\$ 69,964,412
3.	Expected Total Actuarial Value of Assets (AVA)	
	a. Total at June 30, 2015	\$ 38,804,067
	b. Interest on 3.a. to June 30, 2016	2,716,285
	c. Total Contributions Paid in Fiscal Year 2016	3,876,265
	d. Interest on 3.c. to June 30, 2016	133,375
	e. Fiscal Year 2016 Benefit Payments with Interest to June 30, 2016 (1.d.)	<u>(4,248,784)</u>
	f. Expected Total at June 30, 2016	\$ 41,281,208
4.	Actual Total AVA at June 30, 2016	\$ 40,526,324
5.	Accrued Liability (Gain) / Loss (2. - 1.e.)	\$ <b>(1,603,316)</b>
6.	Actuarial Asset (Gain) / Loss (3.f. - 4.)	\$ <b>754,884</b>
7.	Total Actuarial (Gain) / Loss (5. + 6.)	\$ <b>(848,432)</b>

## SECTION VI – SCHEDULE OF FUNDING PROGRESS

A schedule of funding progress is provided below. This schedule of funding progress was previously required by GASB 25, which has been superseded by GASB 67, 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%

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 Fiscal Year 2018 employer contribution is based on the census data reported as of June 30, 2016 and on actuarial assumptions and methods adopted by the Board of Trustees during Fiscal Year 2012 and enacted by the New York State Legislature as Chapter 3 of the Laws of 2013 (the 2012 A&M), with revisions made to the post-retirement mortality assumptions and to the AAVM during Fiscal Year 2016 (the 2016 A&M).

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. Many of the risks faced by the Plan are described in fuller detail below; quantifying these risks for the Plan is beyond the scope of this valuation but may be undertaken in future years.

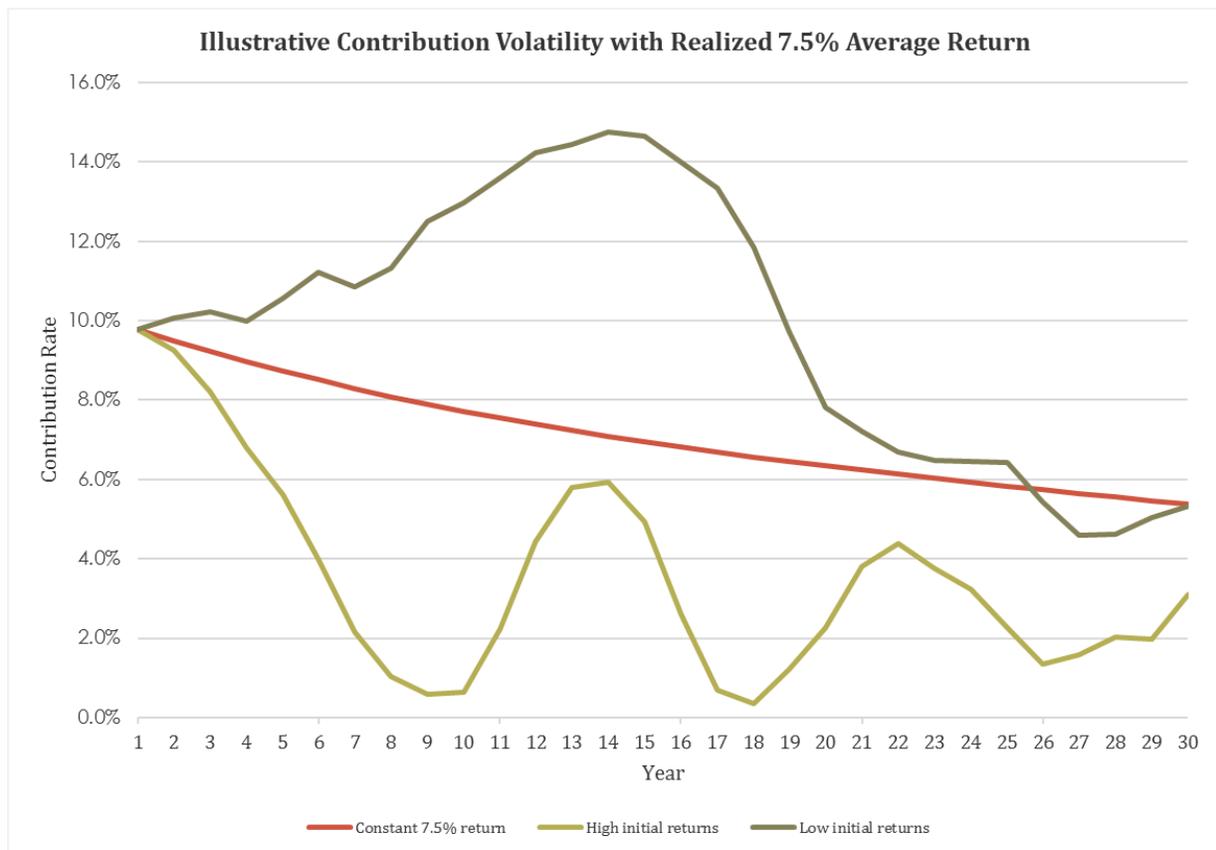
These risks have been separated, based on the Actuary's professional judgement, into high, medium, and low risks.

## High Risk Types

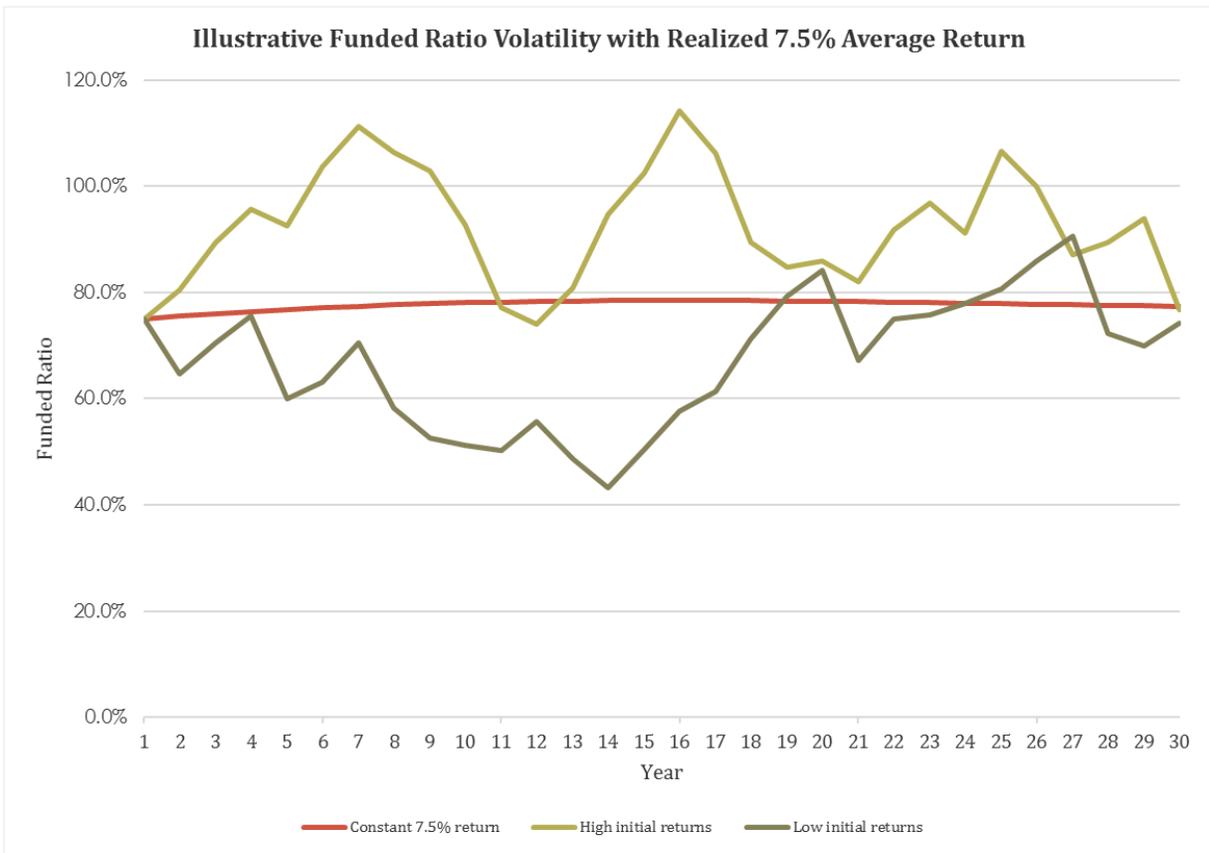
### Investment Risk

The most substantial risk for TRS is the investment risk that investment returns may be different than assumed. As risk-free investment return rates have fallen in recent decades, more aggressive asset allocations have become necessary to achieve long-term rates of return commensurate with the actuarial assumption of 7.0%.

This investment return volatility can contribute substantially to contribution and funded status volatility, even if the long-term investment return assumption of 7.0% is realized. While not 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.<sup>1</sup> Similar scenario analysis could be done for TRS.



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



Note that these illustrations show volatility even if long-term expected rates of return are realized. Further risk exists that long-term expected rates of return may not be realized.

## Medium Risk Types

### Maturity Risk

With respect to future fiscal years, it should be noted that TRS is not a fully mature retirement system. A mature retirement system has a significant ratio of retirees to active members and, usually, of assets to active member payroll and of Accrued Liability (AL) to active member payroll. These ratios, sometimes known as volatility ratios, for the Plan can be found in the chart below.

Valuation Date	June 30, 2016 (Lag)	June 30, 2015 (Lag)
Fiscal Year	2018	2017
<b>Volatility Ratios</b>		
1. Market Value of Assets (MVA)	\$ 43,629,545,000	\$ 44,254,664,000
2. Actuarial Value of Assets (AVA)	41,015,087,000	39,290,072,000
3. Accrued Liability	69,964,411,998	69,625,607,776
4. Active Salary	9,224,267,647	8,844,650,633
5. Asset Volatility Ratio (MVA basis) (1. / 4.)	4.7	5.0
6. Asset Volatility Ratio (AVA basis) (2. / 4.)	4.4	4.4
7. Liability Volatility Ratio (3. / 4.)	7.6	7.9

A plan's Support Ratio (i.e. the ratio of inactive participants to active participants) is a measure of maturity risk. A low Support Ratio implies that contributions are potentially low as a percentage of active payroll and support the benefit payments of few inactive participants. A high Support Ratio implies that contributions are potentially high as a percentage of active payroll and support the benefit payments of many inactive participants. Because the Plan's Support Ratio is low, contributions for active members form a larger proportion of the total actuarial contribution than in more mature pension funds (see page 63).

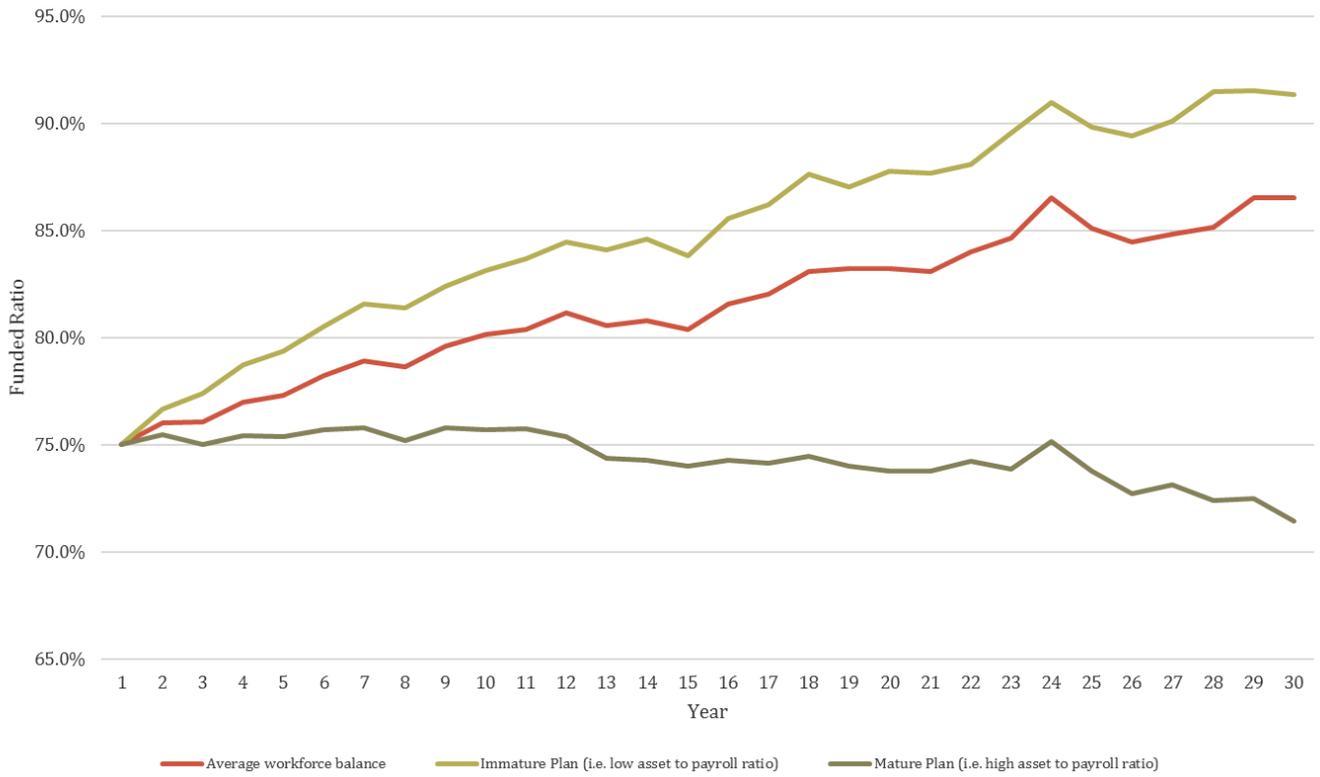
As a plan approaches maturity, Asset Volatility and Liability Volatility Ratios increase, and the plan becomes more sensitive to investment losses. In a mature plan, an investment loss could greatly increase contributions as a percentage of payroll compared to the same loss suffered by a less mature plan. Generally, mature plans will need to consider more conservative investment strategies. These ratios for the Plan are not yet overly high.

While not available specifically for the Plan, illustrative forecasts of sample plans of various maturities can demonstrate this effect.<sup>1</sup>

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<sup>1</sup> Boyd, Donald J. and Yin, Yimeng. "How Public Pension Plan Demographic Characteristics Affect Funding and Contribution Risk." Pension Simulation Project. *The Nelson A. Rockefeller Institute of Government*.

### Median Simulated Funded Ratio



## Interest Rate Risk

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 Investment Risk above, the long-term rate of return assumption of 7.0% depends itself on the allocation of Plan assets.

If market conditions or the allocation of Plan assets no longer justifies a long-term rate of return assumption of 7.0%, a reduction in the Actuarial Interest Rate (AIR) may significantly increase the Accrued Liability and Unfunded Accrued Liability of the Plan, as well as the Normal Cost and resulting contribution. While not on a funding basis, the sensitivity could be expected to be generally similar to the sensitivity reported for GASB 67/68 purposes.<sup>1</sup>

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM	
GASB 67/68 SENSITIVITY ANALYSIS AS OF JUNE 30, 2016	
Valuation Date	June 30, 2016
<b>Results at 7.0%</b>	
1. Total Pension Liability	\$ 70,000,777,108
2. Plan Fiduciary Net Position	<u>43,629,545,000</u>
3. Net Pension Liability (1. - 2.)	\$ 26,371,232,108
4. Funded Ratio (GASB Basis) (2. / 1.)	62.3%
<b>Results at 6.0%</b>	
1. Total Pension Liability	\$ 77,330,775,107
2. Plan Fiduciary Net Position	<u>43,629,545,000</u>
3. Net Pension Liability (1. - 2.)	\$ 33,701,230,107
4. Funded Ratio (GASB Basis) (2. / 1.)	56.4%
<b>Sensitivity Analysis for 1.0% Reduction in Interest Rate</b>	
1. Increase in Total Pension Liability	10.5%
2. Increase in Net Pension Liability	27.8%
3. Decrease in Funded Ratio	5.9%

<sup>1</sup> As disclosed in the fiscal year 2016 report for GASB 67/68, dated October 11, 2016.

### Inflation Risk

TRS faces risk in the event that 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). This risk is not currently quantified but should be considered in future years.

### Longevity Risk

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-2015 was subsequently applied to these base rates.<sup>1</sup>

This scale MP-2015 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 that the mortality improvement inherent in the Plan population is higher than the improvement seen in the population provided by the Social Security Administration.

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.”<sup>2</sup> 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.

This longevity risk is not currently quantified but should be considered in future years.

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<sup>1</sup> Retirement Plans Experience Committee. “Mortality Improvement Scale MP-2015 Report” and “Mortality Improvement Scale MP-2014 report.” *Society of Actuaries*.

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

## Low Risk Types

### Credit/Solvency Risk

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 and TRS face low solvency risk.

### Contribution Risk

Many public pension systems suffer from high contribution risk, wherein sponsoring governmental entities fail to make contributions as determined by the actuary under their funding policies. A recent study found that in 2010, the Annual Required Contribution<sup>1</sup> was not made for over 35% of the 110 public plans in the study.<sup>2</sup>

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 as 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.

### Agency Risk

Because of long-term asset returns and the gradual amortization of unfunded liabilities, the long-term funded status of the Plan is expected to improve. 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.

In future years of higher funded status, this may become a higher risk to the Plan, as current taxpayers and plan members may receive preferential treatment over future taxpayers and plan members when considering changes in statute and plan provisions.

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<sup>1</sup> As defined at the time in GASB 25/27.

<sup>2</sup> Shnitser, Natalya. "Funding Discipline for U.S. Public Pension Plans: An Empirical Analysis of Institutional Design." *Iowa Law Review*, Vol. 100 (2015).

## 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.<sup>1</sup> For more information about plan provisions, see the applicable Summary Plan Descriptions at [www.trsnyc.org](http://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% per year interest compounded annually.

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

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<sup>1</sup> Less than 0.5% of active members as of June 30, 2016 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%
\$45,000 up to \$55,000	3.50%
\$55,000 up to \$75,000	4.50%
\$75,000 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 3 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 Additional Member Contributions.

**E. Credited Service**

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

- Membership Service is service earned while a member of TRS.
- Prior Service is 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 is 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 is service earned as a member of another public retirement system in the City or State of New York.

- Part-time Service is service that is prorated based on the number of hours or days worked in the year.
- Military Service is 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 Final Average Salary.

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

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 3 consecutive years or in the final 36 months of employment – excluding periods while on an authorized leave of absence at partial pay or no pay – if greater.

**Tier 6:** FAS is the highest average Salary earned in any five consecutive years or in the final 60 months of employment – excluding periods while on an authorized leave of absence at partial pay or no pay – 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. 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 further reduced 0.25% for each of the next 60 months that the age of commencement precedes age 60.

### b. Tier 6 Basic 63/10 Plan:

The service retirement benefit is reduced by  $\frac{13}{2400}$  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: Accident in the performance of duties while a member.
- b. Benefits: Greater of  $\frac{1}{60}$  times FAS times Credited Service or  $\frac{2}{3}$  times FAS. The member may elect a service retirement benefit, if eligible.

### 2. Ordinary Disability (ODR)

- a. Eligibility: 10 years of Credited Service.
  - 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 – Active Members

- a. Eligibility: 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 annual wages earned during the year prior to death. The benefit is based on 50% of the annual wage rate if the member had less than one year of Credited Service.

2. Ordinary Death Benefit – Active and Terminated Vested Members

- a. Eligibility for active members: Death while not in the performance of duties.
- b. Eligibility for terminated vested members: 10 years of Credited Service.
- c. Death benefit for active members and members who retired from active service: 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 three years times an Adjustment Factor described in the table below:

Year of Death	Adjustment Factor
Pre-retirement	100%
Post-retirement - 1 <sup>st</sup> year	50%
Post-retirement - 2 <sup>nd</sup> year	25%
Post-retirement – after 2 <sup>nd</sup> year	10% times the benefit in effect at age 60 or at retirement if earlier

The pre-retirement death benefit and post-retirement death benefit for the first two years of retirement are also reduced by another adjustment factor that is equal to 100% minus 5% times the lesser of 10 years and the number of years by which the age at commencement exceeds 60.

d. Death benefit for terminated vested members and members who retired from terminated vested status: Refund of BMC and the employee portion of AMC, if any, plus one half of the salary-based death benefit applicable to active and retired members described above.

e. 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 part H of this section.

b. Tier 6 Plan:

The service retirement benefit is payable at age 63, but in no cases can 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.

Optional forms of payment are reduced to provide a benefit that is actuarially equivalent to the Normal Form of Payment (Single Life Annuity).

## **N. Cost of Living Adjustments (COLA)**

Annuity payments are increased annually on September 1<sup>st</sup>, 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), not less than 1.0% and not greater than 3.0%.

## **O. Refund of Member Contributions**

Basic Member Contributions (BMC) and Additional Member Contributions (AMC) are refunded with interest under some circumstances. Only the employee portion of AMC are refunded.

1. Non-vested termination: BMC and employee portion of AMC are refunded with interest.
2. 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.
3. Ordinary death: BMC and the employee portion of AMC are refunded with interest.
4. Accidental death: The employee portion of AMC are refunded with interest.

5. Disability Retirement: The employee portion of AMC are refunded with interest.
6. Service Retirement: The employee portion of AMC are refunded with interest if the member retires on or after age 62.
7. Employee Portion of AMC: The employee portion of AMC is 50% for all plans that require AMC.

**P. Service and Early Retirement for Tier 1 and Tier 2 Members**

1. Eligibility:

- a. Tier 1: Age 55
- b. Tier 2: Age 55 and 5 years of Credited Service

2. Benefits:

- a. 50% times FAS, plus 1.70% times FAS times Credited Service greater than 20 years plus the annuity equivalent of employee contributions in excess of required contributions until the later of age 55 and the attainment of 25 years of Credited Service; or
- b. 1.20% times FAS times Credited earned prior to 7/1/1970 plus 1.53% times FAS times Credited Service earned from 7/1/1970 plus the annuity equivalent of employee contributions for less than 25 years of Credited Service.

3. FAS:

1-year final average salary for Tier 1 members and 3-year final average salary for Tier 2 members.

4. Early Commencement:

Tier 2 benefits are reduced for early commencement prior to age 62 based on the same factors applicable to the Basic Tier 4 62/5 plan.

5. COLA:

Retirement benefits are increased by the same COLA applicable to Tier 4 retirement benefits.

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

1. Eligibility:

- a. Age 55 and 5 years of Credited Service.

2. Benefits:

- a. Tier 4 members with Tier 3 rights 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 that:
  - i. Credited Service under the Tier 3 benefit formula is capped at 30 years
  - ii. The Tier 3 benefit formula includes an offset starting at age 62 equal to 50% of the Primary Social Security benefit, and
  - iii. The Tier 3 reduction factors for early commencement are less than the factors applicable to the Basic Tier 4 62/5 plan.

3. COLA and Escalation:

The COLA provisions applicable to Tier 4 retirement benefits are not applicable to Tier 3 retirement benefits.

Tier 3 retirement benefits may be adjusted annually by escalation. Benefits commencing on or after age 65 are eligible for full escalation. Full escalation is equal to the lesser of 3% and the Consumer Price Index (CPI-U) for increases in the CPI-U and the greater of -3% and the Consumer Price Index (CPI-U) for decreases in the CPI-U. Partial escalation is applicable for benefits commencing after age 62. Partial escalation is equal to full escalation reduced by 1/36 times the number of months that the age at commencement precedes age 65. A Tier 3 retirement benefit cannot be less than the Tier 3 retirement benefit without escalation.

**R. Loans**

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

**S. 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 on the exclusion for elective deferrals described in §402(g)(3) and the dollar limitation under §414(v)(2)(B)(i) of the Internal Revenue Code 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 a portion of the accumulated balance into an annuity upon retirement.

**T. Changes Since the Prior Valuation**

None.

## SECTION IX - CHAPTER AMENDMENTS

The June 30, 2016 (Lag) actuarial valuation results reflect the following Chapter amendments from the prior five years.

- **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 hostilities. This law will be reflected in future valuations as participants request military service credit.
- **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 plan year April 1 to March 31 to plan year January 1 to 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.
- **Chapter 489 of the Laws of 2013** (Chapter 489/13) addressed limitations in existing disability provisions intended to protect public employees who suffered injuries or illnesses in WTC rescue, recovery, and cleanup operations.
- **Chapter 3 of the Laws of 2013** (Chapter 3/13), effective retroactive to July 1, 2011, enacted those 2012 A&M that require State legislation.
- **Chapter 18 of the Laws of 2012** (Chapter 18/12), placed certain limitations on the Tier 3 and Tier 4 benefits available to participants hired on and after April 1, 2012 in most New York State Public Employee Retirement Systems, including TRS, and is generally referred to as Tier 6.

## SECTION X - SUBSEQUENT EVENTS

In February 2017, the City engaged Bolton to perform an actuarial audit of the five New York City Retirement Systems and Pensions Funds, serving as the Independent Actuary under Section 96 of the New York City Charter. The engagement includes, but is not limited to, contribution audits, experience studies, and administrative reviews of each system. Bolton released their reports for the First Engagement on March 12, 2018. Further experience studies are being conducted and changes to actuarial assumptions in future actuarial valuations are anticipated; the first year in which changes to actuarial assumptions will impact the employer contribution is expected to be Fiscal Year 2019.

## SECTION XI - ACTUARIAL ASSUMPTIONS AND METHODS

The February 10, 2012 report entitled, "Proposed Changes in Actuarial Assumptions and Methods For Determining Employer Contributions For Fiscal Years Beginning on and After July 1, 2011 For the New York City Teachers' Retirement System" contains the 2012 A&M.

A memorandum dated December 4, 2015 to the Board of Trustees of TRS contains the revised probabilities of post-retirement mortality beginning with the June 30, 2014 (Lag) actuarial valuation.

In addition, beginning with the June 30, 2014 (Lag) actuarial valuation, the AVA is constrained to be within a corridor of 80% to 120% of market value.

The 2012 A&M, including the above changes to the probabilities of post-retirement mortality and the introduction of the AVA corridor, are referred to as the 2016 A&M.

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 Did Elect an Improved Retirement Program		
		Year 1	Year 2	Ultimate	Year 1	Year 2	Ultimate
19	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
20	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
21	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
22	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
23	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
24	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
25	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
26	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
27	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
28	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
29	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
30	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
31	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
32	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
33	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
34	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
35	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
36	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
37	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
38	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
39	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
40	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
41	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
42	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
43	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
44	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
45	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
46	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
47	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
48	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
49	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
50	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
51	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
52	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
53	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
54	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
55	2.00%	20.00%	0.00%	0.00%	30.00%	0.00%	0.00%
56	2.00%	20.00%	15.00%	0.00%	30.00%	20.00%	0.00%
57	2.00%	20.00%	15.00%	15.00%	30.00%	20.00%	20.00%
58	2.00%	20.00%	15.00%	15.00%	30.00%	20.00%	20.00%
59	3.00%	20.00%	15.00%	15.00%	30.00%	20.00%	20.00%
60	4.00%	20.00%	15.00%	15.00%	30.00%	20.00%	20.00%
61	5.00%	20.00%	15.00%	15.00%	30.00%	20.00%	20.00%
62	0.00%	30.00%	20.00%	20.00%	40.00%	30.00%	30.00%
63	0.00%	20.00%	15.00%	15.00%	30.00%	20.00%	20.00%
64	0.00%	20.00%	15.00%	15.00%	30.00%	20.00%	20.00%
65	0.00%	30.00%	20.00%	20.00%	40.00%	30.00%	30.00%
66	0.00%	20.00%	15.00%	15.00%	30.00%	20.00%	20.00%
67	0.00%	20.00%	15.00%	15.00%	30.00%	20.00%	20.00%
68	0.00%	20.00%	15.00%	15.00%	30.00%	20.00%	20.00%
69	0.00%	20.00%	15.00%	15.00%	30.00%	20.00%	20.00%
70+	NA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

**Table XI-2**  
**Active Termination Rates**

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM	
PROBABILITIES OF TERMINATION	
Years of Service	Withdrawal
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 or greater	0.50%

**Table XI-3**  
**Active Disability Rates**

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM				
PROBABILITIES OF DISABILITY RETIREMENT				
	Ordinary Disability		Accidental Disability	
Age	Males	Females	Males	Females
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+	NA	NA	NA	NA

**Table XI-4**  
**Active Mortality Rates**

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM			
PROBABILITIES OF ACTIVE MEMBER MORTALITY			
	Ordinary Death		
Age	Males	Females	Accidental Death
19	0.040%	0.020%	0.000%
20	0.040%	0.020%	0.000%
21	0.040%	0.020%	0.000%
22	0.040%	0.020%	0.000%
23	0.040%	0.020%	0.000%
24	0.040%	0.020%	0.000%
25	0.040%	0.020%	0.000%
26	0.040%	0.020%	0.000%
27	0.040%	0.020%	0.000%
28	0.040%	0.020%	0.000%
29	0.040%	0.020%	0.000%
30	0.040%	0.020%	0.000%
31	0.042%	0.021%	0.000%
32	0.044%	0.022%	0.000%
33	0.046%	0.023%	0.000%
34	0.048%	0.024%	0.000%
35	0.050%	0.025%	0.000%
36	0.052%	0.026%	0.000%
37	0.054%	0.027%	0.000%
38	0.056%	0.028%	0.000%
39	0.058%	0.029%	0.000%
40	0.060%	0.030%	0.000%
41	0.070%	0.035%	0.000%
42	0.080%	0.040%	0.000%
43	0.090%	0.045%	0.000%
44	0.100%	0.050%	0.000%
45	0.110%	0.055%	0.000%
46	0.120%	0.060%	0.000%
47	0.130%	0.065%	0.000%
48	0.140%	0.070%	0.000%
49	0.150%	0.075%	0.000%
50	0.160%	0.080%	0.000%
51	0.170%	0.085%	0.000%
52	0.180%	0.090%	0.000%
53	0.190%	0.095%	0.000%
54	0.200%	0.100%	0.000%
55	0.210%	0.105%	0.000%
56	0.220%	0.110%	0.000%
57	0.230%	0.115%	0.000%
58	0.240%	0.120%	0.000%
59	0.250%	0.125%	0.000%
60	0.260%	0.130%	0.000%
61	0.270%	0.135%	0.000%
62	0.280%	0.140%	0.000%
63	0.290%	0.145%	0.000%
64	0.300%	0.150%	0.000%
65	0.320%	0.160%	0.000%
66	0.350%	0.175%	0.000%
67	0.390%	0.195%	0.000%
68	0.440%	0.220%	0.000%
69	0.500%	0.250%	0.000%
70+	NA	NA	NA

**Table XI-5**  
**Service Retiree Mortality**

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM					
PROBABILITIES OF MORTALITY IN THE NEXT YEAR FOR SERVICE RETIREES IN THE JUNE 30, 2016 (LAG) VALUATION					
Age	Males	Females	Age	Males	Females
19	0.0201%	0.0121%	68	1.3284%	0.7212%
20	0.0211%	0.0122%	69	1.4438%	0.7722%
21	0.0227%	0.0130%	70	1.5591%	0.8472%
22	0.0241%	0.0138%	71	1.7145%	0.9532%
23	0.0258%	0.0149%	72	1.8689%	1.0620%
24	0.0272%	0.0160%	73	2.0225%	1.1711%
25	0.0284%	0.0174%	74	2.1748%	1.2797%
26	0.0300%	0.0189%	75	2.3263%	1.3856%
27	0.0314%	0.0204%	76	2.6013%	1.5969%
28	0.0333%	0.0223%	77	2.8741%	1.8103%
29	0.0357%	0.0242%	78	3.1443%	2.0237%
30	0.0391%	0.0263%	79	3.4137%	2.2354%
31	0.0448%	0.0323%	80	3.7179%	2.4420%
32	0.0504%	0.0375%	81	4.2625%	2.9185%
33	0.0554%	0.0422%	82	4.8144%	3.4047%
34	0.0600%	0.0460%	83	5.3730%	3.8808%
35	0.0643%	0.0494%	84	5.9371%	4.4052%
36	0.0666%	0.0520%	85	6.5065%	4.9200%
37	0.0685%	0.0546%	86	7.4200%	5.5438%
38	0.0703%	0.0572%	87	8.3578%	6.0979%
39	0.0731%	0.0604%	88	9.3225%	6.6569%
40	0.0775%	0.0643%	89	10.3127%	7.5151%
41	0.0863%	0.0676%	90	11.3340%	8.4842%
42	0.0955%	0.0722%	91	13.0934%	9.4906%
43	0.1054%	0.0782%	92	14.9212%	10.4707%
44	0.1162%	0.0857%	93	16.7992%	11.4842%
45	0.1283%	0.0956%	94	18.7579%	13.2439%
46	0.1416%	0.1074%	95	20.8225%	15.1652%
47	0.1564%	0.1211%	96	22.8744%	17.0930%
48	0.1727%	0.1362%	97	24.8995%	18.9834%
49	0.1905%	0.1529%	98	27.0176%	20.5720%
50	0.2119%	0.1702%	99	29.0098%	21.0838%
51	0.2457%	0.1882%	100	30.7448%	21.2515%
52	0.2817%	0.2062%	101	32.3665%	22.1344%
53	0.3194%	0.2239%	102	33.7861%	23.1735%
54	0.3587%	0.2412%	103	35.0826%	24.4013%
55	0.3984%	0.2580%	104	36.1722%	25.7784%
56	0.4482%	0.2797%	105	36.9822%	27.2744%
57	0.4966%	0.3006%	106	37.4491%	28.8471%
58	0.5419%	0.3208%	107	37.7175%	30.4676%
59	0.5838%	0.3399%	108	38.0028%	32.0883%
60	0.6214%	0.3587%	109	38.2863%	33.6686%
61	0.7012%	0.3865%	110	96.4196%	96.4583%
62	0.7767%	0.4150%	111	97.1087%	97.1672%
63	0.8499%	0.4452%	112	97.8219%	97.8611%
64	0.9211%	0.4774%	113	98.5792%	98.5792%
65	0.9755%	0.5118%	114	99.2823%	99.2823%
66	1.0955%	0.5706%	115	100.0000%	100.0000%
67	1.2126%	0.6333%			

Mortality Improvement Scale MP-2015 is applied to these rates to estimate future mortality improvement.

**Table XI-6**  
**Disabled Retiree Mortality**

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM					
PROBABILITIES OF MORTALITY IN THE NEXT YEAR FOR DISABLED RETIREES IN THE JUNE 30, 2016 (LAG) VALUATION					
Age	Males	Females	Age	Males	Females
19	0.6974%	0.4602%	68	2.6370%	1.6846%
20	0.7009%	0.4668%	69	2.7176%	1.7033%
21	0.7316%	0.4980%	70	2.8363%	1.7240%
22	0.7637%	0.5314%	71	2.9151%	1.7974%
23	0.8105%	0.5621%	72	3.0574%	1.9538%
24	0.8598%	0.5935%	73	3.1732%	2.1327%
25	0.9058%	0.6242%	74	3.3559%	2.3356%
26	0.9612%	0.6564%	75	3.4868%	2.5617%
27	1.0060%	0.6809%	76	3.7123%	2.7832%
28	1.0560%	0.7073%	77	3.9983%	3.0213%
29	1.1024%	0.7240%	78	4.2494%	3.2741%
30	1.1780%	0.7412%	79	4.5246%	3.5407%
31	1.2493%	0.9540%	80	4.8217%	3.8173%
32	1.2752%	1.1595%	81	5.3459%	4.2807%
33	1.2706%	1.3552%	82	5.9071%	4.7075%
34	1.2623%	1.4302%	83	6.4751%	5.0330%
35	1.2451%	1.4004%	84	7.3396%	5.5946%
36	1.2194%	1.3664%	85	8.3183%	6.1574%
37	1.1889%	1.3263%	86	9.3355%	6.6808%
38	1.1633%	1.2941%	87	10.2650%	7.5383%
39	1.1387%	1.2652%	88	11.2781%	8.5104%
40	1.1332%	1.2585%	89	13.0238%	9.4552%
41	1.1356%	1.2545%	90	14.8360%	10.4201%
42	1.1459%	1.2428%	91	16.6950%	11.4815%
43	1.1653%	1.2558%	92	18.5187%	12.8381%
44	1.1949%	1.2869%	93	20.6625%	14.0129%
45	1.2174%	1.3409%	94	22.6844%	15.3755%
46	1.2482%	1.4050%	95	24.5390%	16.7001%
47	1.2875%	1.4636%	96	26.7872%	18.3369%
48	1.3492%	1.5263%	97	28.7511%	19.6835%
49	1.4214%	1.5809%	98	30.2883%	20.5720%
50	1.5233%	1.6253%	99	32.0879%	21.0838%
51	1.6347%	1.6814%	100	33.4990%	21.2515%
52	1.7793%	1.7228%	101	34.5697%	22.1344%
53	1.9218%	1.7784%	102	35.6330%	23.1735%
54	2.0692%	1.8199%	103	36.4423%	24.4013%
55	2.2037%	1.8735%	104	36.9101%	25.7784%
56	2.3320%	1.9158%	105	37.1787%	27.2744%
57	2.4146%	1.8801%	106	37.4491%	28.8471%
58	2.4439%	1.8371%	107	37.7175%	30.4676%
59	2.4719%	1.7958%	108	38.0028%	32.0883%
60	2.4868%	1.7559%	109	38.2863%	33.6686%
61	2.4779%	1.7200%	110	96.4196%	96.4583%
62	2.4799%	1.6910%	111	97.1087%	97.1672%
63	2.4711%	1.6709%	112	97.8219%	97.8611%
64	2.4848%	1.6589%	113	98.5792%	98.5792%
65	2.5117%	1.6557%	114	99.2823%	99.2823%
66	2.5199%	1.6598%	115	100.0000%	100.0000%
67	2.5605%	1.6696%			

Mortality Improvement Scale MP-2015 is applied to these rates to estimate future mortality improvement.

**Table XI-7  
Beneficiary Mortality**

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM					
PROBABILITIES OF BENEFICIARY MORTALITY IN THE NEXT YEAR IN THE JUNE 30, 2016 (LAG) VALUATION					
Age	Males	Females	Age	Males	Females
19	0.0201%	0.0121%	68	1.3284%	0.7212%
20	0.0211%	0.0122%	69	1.4438%	0.7722%
21	0.0227%	0.0130%	70	1.5591%	0.8472%
22	0.0241%	0.0138%	71	1.7145%	0.9532%
23	0.0258%	0.0149%	72	1.8689%	1.0620%
24	0.0272%	0.0160%	73	2.0225%	1.1711%
25	0.0284%	0.0174%	74	2.1748%	1.2797%
26	0.0300%	0.0189%	75	2.3263%	1.3856%
27	0.0314%	0.0204%	76	2.6013%	1.5969%
28	0.0333%	0.0223%	77	2.8741%	1.8103%
29	0.0357%	0.0242%	78	3.1443%	2.0237%
30	0.0391%	0.0263%	79	3.4137%	2.2354%
31	0.0448%	0.0323%	80	3.7179%	2.4420%
32	0.0504%	0.0375%	81	4.2625%	2.9185%
33	0.0554%	0.0422%	82	4.8144%	3.4047%
34	0.0600%	0.0460%	83	5.3730%	3.8808%
35	0.0643%	0.0494%	84	5.9371%	4.4052%
36	0.0666%	0.0520%	85	6.5065%	4.9200%
37	0.0685%	0.0546%	86	7.4200%	5.5438%
38	0.0703%	0.0572%	87	8.3578%	6.0979%
39	0.0731%	0.0604%	88	9.3225%	6.6569%
40	0.0775%	0.0643%	89	10.3127%	7.5151%
41	0.0863%	0.0676%	90	11.3340%	8.4842%
42	0.0955%	0.0722%	91	13.0934%	9.4906%
43	0.1054%	0.0782%	92	14.9212%	10.4707%
44	0.1162%	0.0857%	93	16.7992%	11.4842%
45	0.1283%	0.0956%	94	18.7579%	13.2439%
46	0.1416%	0.1074%	95	20.8225%	15.1652%
47	0.1564%	0.1211%	96	22.8744%	17.0930%
48	0.1727%	0.1362%	97	24.8995%	18.9834%
49	0.1905%	0.1529%	98	27.0176%	20.5720%
50	0.2119%	0.1702%	99	29.0098%	21.0838%
51	0.2457%	0.1882%	100	30.7448%	21.2515%
52	0.2817%	0.2062%	101	32.3665%	22.1344%
53	0.3194%	0.2239%	102	33.7861%	23.1735%
54	0.3587%	0.2412%	103	35.0826%	24.4013%
55	0.3984%	0.2580%	104	36.1722%	25.7784%
56	0.4482%	0.2797%	105	36.9822%	27.2744%
57	0.4966%	0.3006%	106	37.4491%	28.8471%
58	0.5419%	0.3208%	107	37.7175%	30.4676%
59	0.5838%	0.3399%	108	38.0028%	32.0883%
60	0.6214%	0.3587%	109	38.2863%	33.6686%
61	0.7012%	0.3865%	110	96.4196%	96.4583%
62	0.7767%	0.4150%	111	97.1087%	97.1672%
63	0.8499%	0.4452%	112	97.8219%	97.8611%
64	0.9211%	0.4774%	113	98.5792%	98.5792%
65	0.9755%	0.5118%	114	99.2823%	99.2823%
66	1.0955%	0.5706%	115	100.0000%	100.0000%
67	1.2126%	0.6333%			

Mortality Improvement Scale MP-2015 is applied to these rates to estimate future mortality improvement.

**Table XI-8**  
**Salary Scale**

NEW YORK CITY TEACHERS' RETIREMENT		
ANNUAL RATES OF SALARY INCREASE		
Years of Service	Merit Increase	Salary Scale
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 or greater	1.00%	4.00%

## Additional Assumptions and Methods

1. **Marital Assumption:** All active members are assumed to be married and females are assumed to be three years younger than their male spouses.
2. **Credited Service:** Calculated in whole year increments for valuation purposes.
3. **Actuarial Interest Rate:** 7.0% per annum, net of investment expenses.
4. **COLA:** Based on an assumed long-term Consumer Price Index Inflation rate of 2.5% per year. 1.5% per year for Auto COLA, 2.5% per year for Escalation.
5. **Actuarial Asset Valuation Method (AAVM):**

The Actuary reset the Actuarial Value of Assets to market value as of June 30, 2011.

Beginning with the June 30, 2012 (Lag) actuarial valuation, the AAVM recognizes investment returns greater or less than expected over a period of six years.

In accordance with this AAVM, actual Unexpected Investment Returns (UIR) are phased into the Actuarial Value of Assets (AVA) at rates of 15%, 15%, 15%, 15%, 20%, and 20% per year (i.e. cumulative rates of 15%, 30%, 45%, 60%, 80%, and 100% over a period of six years).

Beginning with the June 30, 2014 (Lag) actuarial valuation, the AVA is constrained to be within a corridor of 80% to 120% of the market value.

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

6. **Actuarial Cost Method:** Beginning with the June 30, 2010 (Lag) actuarial valuation, the Entry Age Normal (EAN) cost method of funding is used by the Actuary to calculate the contribution required of the employer under the 2016 A&M.

Under this method, the Present Value of Future Benefits (PVFB) of each individual included in the actuarial valuation is allocated on a level basis over the earnings between the age a member enters the plan 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.

Under EAN, the explicit UALs that are developed each year are generally financed over fixed periods. Ideally, these periods are reasonably consistent with the expected future working lifetimes of all active participants. For more information see Page 12.

Under EAN, the employer normal cost remains constant as a percentage of payroll and changes gradually over time for the entire Plan as the characteristics of the members change (e.g. more Tier 6 active members decrease the average employer normal cost).

7. **Lump Sum Death Benefits:** Liabilities for group life lump sum death benefits are calculated under the One-Year Term Cost method.
8. **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.
9. **WTC Disability and Death Benefits:** For actuarial valuations beginning June 30, 2014, obligations attributable to the WTC Disability Law and to the WTC Death Benefits Law are determined through the use of explicit assumptions in the 2016 A&M, and through estimation techniques for post-retirement reclassifications.
10. **One-Year Lag Methodology:** One-Year Lag methodology uses a June 30, XX-2 valuation date to determine Fiscal Year XX employer contributions.

This methodology requires adjustments to determine Fiscal Year XX employer contributions as follows:

Present Value of Future Salary (PVFS): The PVFS at June 30, XX-2 is reduced by the value of salary projected to be paid during Fiscal Year XX-1.

Salary for Determining Employer Normal Contributions: Salary used to determine the employer Normal Contribution is the salary projected to be paid during Fiscal Year XX to members on payroll at June 30, XX-2.

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 paid during Fiscal Year XX-1 and the discounted value of Administrative Expenses reimbursed during Fiscal Years XX-1 and XX.

11. **Excess Benefit Plan:** The valuation includes liabilities and costs, if any, associated with the Excess Benefit Plan administered by the Board of Education in the case that members exceed Internal Revenue Code Section 415 limitations.

12. **Term Cost for TDA Fixed Fund:** Beginning with the June 30, 2016 (Lag) actuarial valuation, 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

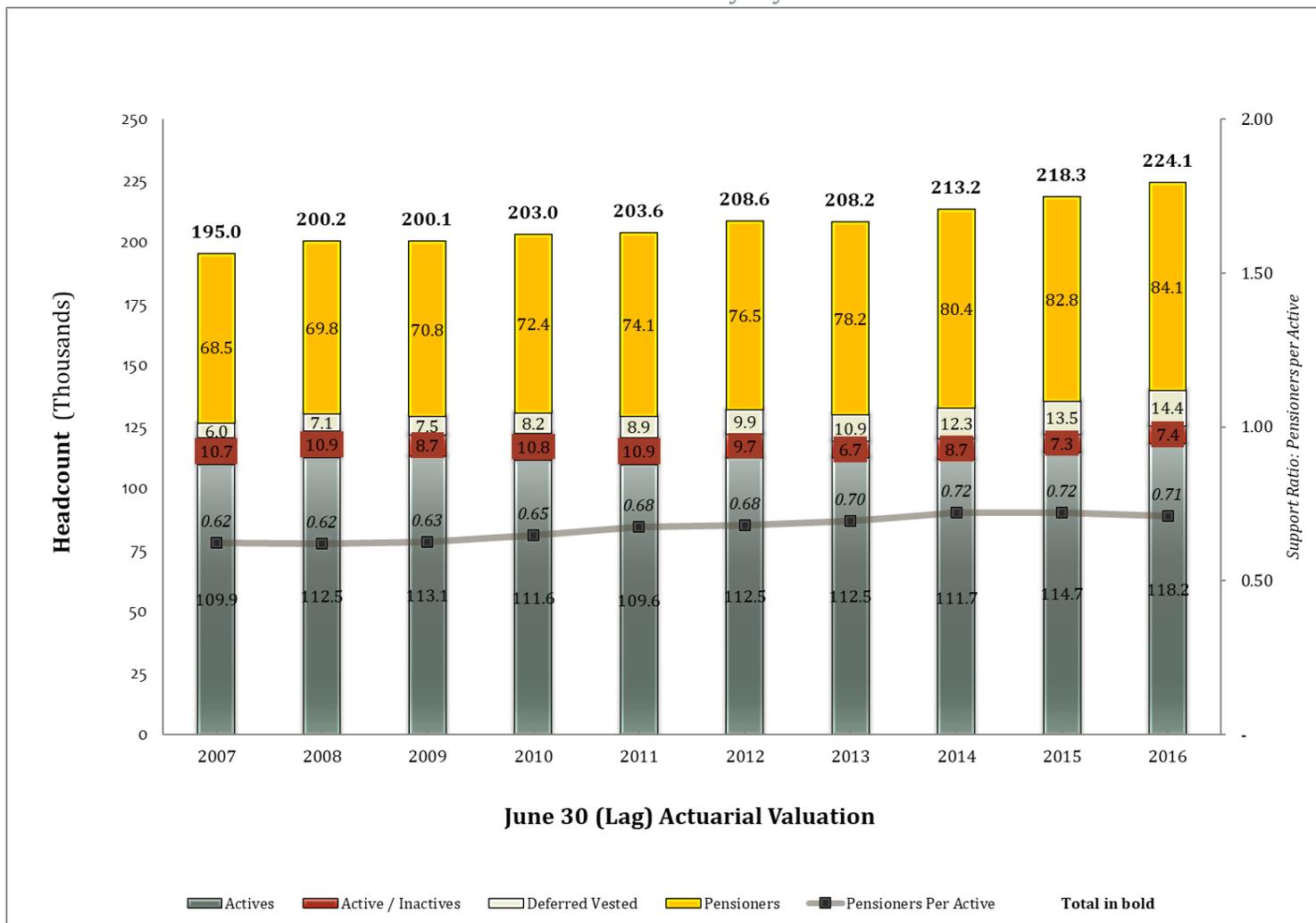
The June 30, 2016 (Lag) and June 30, 2015 (Lag) actuarial valuations are based upon census data as of those dates submitted by the Plan's administrative staff and the employer's payroll facilities. Financial information was provided by the Office of the Comptroller as of June 30, 2016 and June 30, 2015.

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/ Inactive	(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)
<b>1. Number at June 30, 2015</b>	<b>114,652</b>	<b>7,347</b>	<b>13,482</b>	75,251	2,481	732	0	4,313	<b>82,777</b>	<b>218,258</b>
New Entrants	<b>10,239</b>	<b>0</b>	<b>0</b>	0	0	0	0	0	<b>0</b>	<b>10,239</b>
Rehires	<b>1,551</b>	<b>(1,188)</b>	<b>(210)</b>	0	0	0	0	0	<b>0</b>	<b>153</b>
Leaving Active Payroll	<b>(4,070)</b>	<b>4,070</b>	<b>0</b>	0	0	0	0	0	<b>0</b>	<b>0</b>
Vested Termination	<b>(1,056)</b>	<b>(326)</b>	<b>1,382</b>	0	0	0	0	0	<b>0</b>	<b>0</b>
Non-Vested Termination / Cashout	<b>(619)</b>	<b>(1,844)</b>	<b>(1)</b>	0	0	0	0	0	<b>0</b>	<b>(2,464)</b>
Accidental Death (from Active)	<b>0</b>	<b>0</b>	<b>0</b>	0	0	0	0	0	<b>0</b>	<b>0</b>
Ordinary Death (from Active)	<b>(84)</b>	<b>(31)</b>	<b>(32)</b>	0	0	0	0	0	<b>0</b>	<b>(147)</b>
Service Retirement	<b>(2,354)</b>	<b>(516)</b>	<b>(220)</b>	3,090	0	0	0	0	<b>3,090</b>	<b>0</b>
Ordinary Disability Retirement	<b>(54)</b>	<b>(93)</b>	<b>(6)</b>	0	153	0	0	0	<b>153</b>	<b>0</b>
Accidental Disability Retirement	<b>(4)</b>	<b>(18)</b>	<b>(2)</b>	0	0	24	0	0	<b>24</b>	<b>0</b>
Death with Beneficiary	<b>0</b>	<b>0</b>	<b>0</b>	(473)	(22)	(6)	0	501	<b>0</b>	<b>0</b>
Death without Beneficiary	<b>0</b>	<b>0</b>	<b>0</b>	(1,504)	(69)	(11)	0	(351)	<b>(1,935)</b>	<b>(1,935)</b>
On/(Off) Pension Payroll	<b>0</b>	<b>0</b>	<b>0</b>	(18)	(2)	6	0	(2)	<b>(16)</b>	<b>(16)</b>
Net Change	<b>3,549</b>	<b>54</b>	<b>911</b>	1,095	60	13	0	148	<b>1,316</b>	<b>5,830</b>
<b>2. Number at June 30, 2016</b>	<b>118,201</b>	<b>7,401</b>	<b>14,393</b>	<b>76,346</b>	<b>2,541</b>	<b>745</b>	<b>0</b>	<b>4,461</b>	<b>84,093</b>	<b>224,088</b>

Graph XII-2  
Headcount Summary by Status

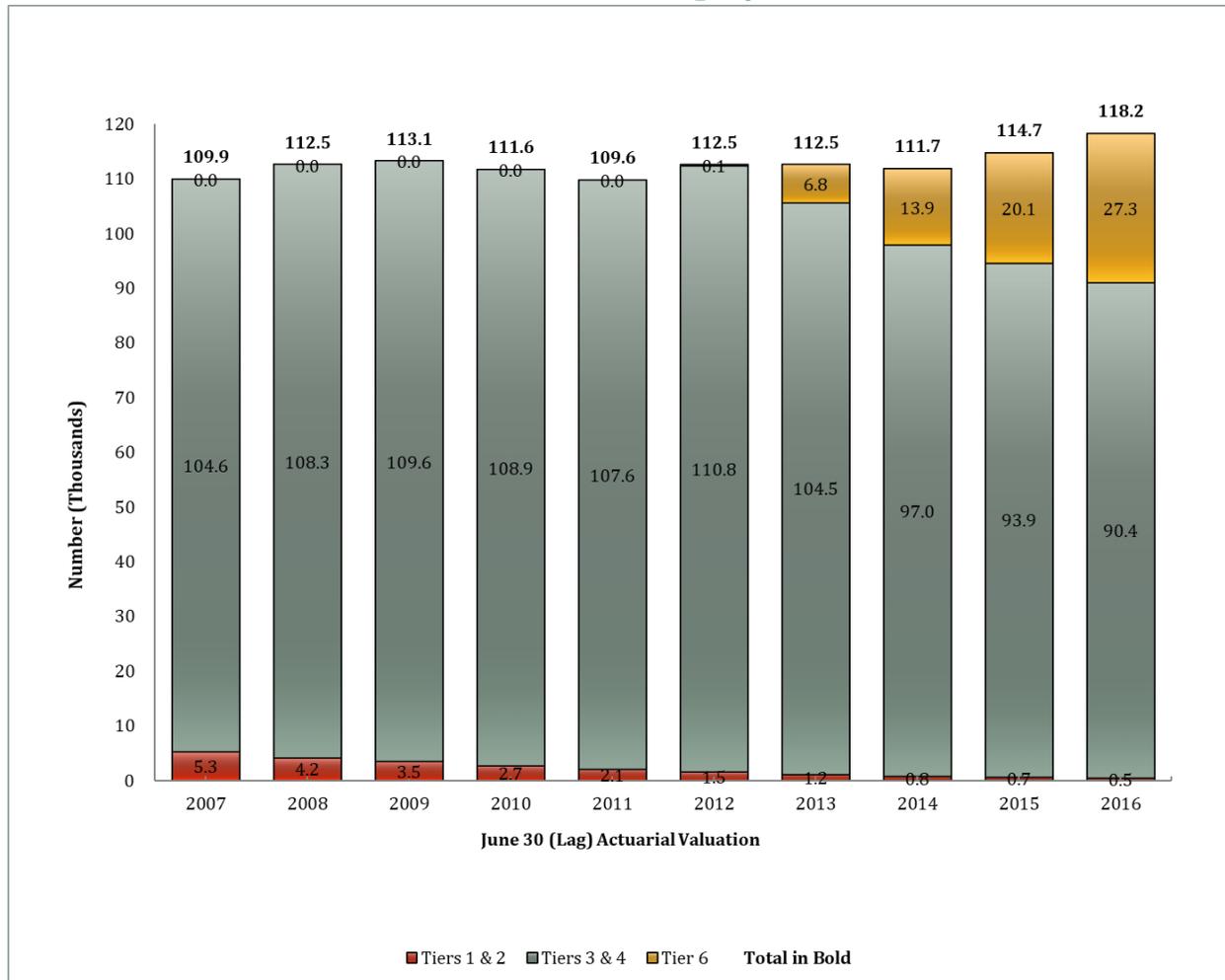


**Table XII-3**  
**Summary of Active Membership**

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM		
ACTIVE MEMBERS INCLUDED IN THE JUNE 30, 2016 (LAG) AND THE JUNE 30, 2015 (LAG) ACTUARIAL VALUATIONS		
	June 30, 2016 (Lag)	June 30, 2015 (Lag)
Number		
Males	26,649	26,065
Females	91,552	88,587
Total	118,201	114,652
Annual Salary <sup>1</sup>		
Males	\$ 2,219,964,658	\$ 2,143,041,264
Females	7,004,302,989	6,701,609,369
Total	\$ 9,224,267,647	\$ 8,844,650,633
Average Salary <sup>1</sup>		
Males	\$ 83,304	\$ 82,219
Females	76,506	75,650
Total Average	\$ 78,039	\$ 77,143
Average Age		
Males	44.1	44.2
Females	44.0	44.1
Total Average	44.0	44.1
Average Past Service		
Males	11.1	11.0
Females	11.3	11.3
Total Average	11.2	11.3

<sup>1</sup>Salaries 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**

<b>June 30 (Lag) Actuarial Valuation</b>	<b>Number</b>	<b>Annual Salary</b>	<b>Average Annual Salary</b>	<b>Percentage Increase/ (Decrease) In Avg. Salary</b>
2007(Lag)	109,868	\$7,222,471,073	\$65,738	3.6%
2008(Lag)	112,472	7,926,647,584	70,477	7.2%
2009(Lag)	113,132	8,016,635,700	70,861	0.5%
2010(Lag)	111,647	7,979,671,378	71,472	0.9%
2011(Lag)	109,636	7,888,203,642	71,949	0.7%
2012(Lag)	112,460	8,013,395,184	71,256	- 1.0%
2013(Lag)	112,481	8,128,378,071	72,264	1.4%
2014(Lag)	111,726	8,274,685,657	74,062	2.5%
2015(Lag)	114,652	8,844,650,633	77,143	4.2%
2016(Lag)	118,201	9,224,267,647	78,039	1.2%

Annualized covered payrolls used for the Fiscal Year 2012 Employer Contributions and subsequent years are based on revised actuarial assumptions enacted by Chapter 3/13 (i.e. the 2012 A&M).

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, 2016**

		<b>Male Total</b>									
<b>AGE \ SVC</b>		<b>UNDER 5</b>	<b>5-9</b>	<b>10-14</b>	<b>15-19</b>	<b>20-24</b>	<b>25-29</b>	<b>30-34</b>	<b>35-39</b>	<b>40 &amp; UP</b>	<b>ALL YEARS</b>
<i>NUMBER:</i>											
UNDER 20		1	0	0	0	0	0	0	0	0	1
20 TO 24		484	1	0	0	0	0	0	0	0	485
25 TO 29		2,571	194	4	0	0	0	0	0	0	2,769
30 TO 34		2,063	1,497	315	1	0	0	0	0	0	3,876
35 TO 39		1,124	1,146	1,543	192	2	0	0	0	0	4,007
40 TO 44		745	610	1,329	863	91	1	0	0	0	3,639
45 TO 49		556	421	902	859	587	87	5	0	0	3,417
50 TO 54		403	316	621	590	495	494	102	0	0	3,021
55 TO 59		324	238	488	432	416	385	198	24	0	2,505
60 TO 64		231	163	345	322	282	209	127	66	8	1,753
65 TO 69		148	70	163	163	101	85	54	20	37	841
70 & UP		52	31	48	54	40	19	14	7	70	335
<b>TOTAL</b>		<b>8,702</b>	<b>4,687</b>	<b>5,758</b>	<b>3,476</b>	<b>2,014</b>	<b>1,280</b>	<b>500</b>	<b>117</b>	<b>115</b>	<b>26,649</b>

<i>SALARIES (IN THOUSANDS):</i>											
UNDER 20		52	0	0	0	0	0	0	0	0	52
20 TO 24		23,815	103	0	0	0	0	0	0	0	23,918
25 TO 29		151,115	14,958	360	0	0	0	0	0	0	166,432
30 TO 34		129,781	127,144	29,512	138	0	0	0	0	0	286,575
35 TO 39		71,659	96,504	148,587	19,431	272	0	0	0	0	336,453
40 TO 44		47,543	50,161	127,639	90,297	10,162	108	0	0	0	325,909
45 TO 49		33,419	32,606	83,356	87,990	65,200	9,305	593	0	0	312,469
50 TO 54		23,039	23,234	54,865	58,314	54,885	56,476	11,985	0	0	282,798
55 TO 59		17,027	16,529	41,952	40,847	45,022	42,947	23,462	3,317	0	231,104
60 TO 64		10,816	11,592	29,083	30,153	29,574	22,910	14,799	8,217	804	157,948
65 TO 69		6,273	3,958	12,760	14,059	9,347	9,221	6,120	2,567	4,664	68,971
70 & UP		1,602	1,460	3,425	4,144	3,878	2,157	1,581	723	8,365	27,335
<b>TOTAL*</b>		<b>516,142</b>	<b>378,248</b>	<b>531,538</b>	<b>345,373</b>	<b>218,340</b>	<b>143,125</b>	<b>58,541</b>	<b>14,824</b>	<b>13,833</b>	<b>2,219,965</b>

<i>AVERAGE SALARIES: **</i>											
UNDER 20		52,066	0	0	0	0	0	0	0	0	52,066
20 TO 24		49,204	103,192	0	0	0	0	0	0	0	49,316
25 TO 29		58,777	77,102	89,992	0	0	0	0	0	0	60,106
30 TO 34		62,909	84,932	93,689	137,696	0	0	0	0	0	73,936
35 TO 39		63,753	84,209	96,298	101,202	136,059	0	0	0	0	83,966
40 TO 44		63,816	82,231	96,041	104,631	111,672	107,524	0	0	0	89,560
45 TO 49		60,106	77,449	92,413	102,433	110,073	106,954	118,611	0	0	91,446
50 TO 54		57,168	73,526	88,349	98,837	110,879	114,325	117,503	0	0	93,611
55 TO 59		52,553	69,451	85,967	94,554	108,227	111,552	118,497	138,191	0	92,257
60 TO 64		46,824	71,115	84,298	93,644	104,872	109,618	116,530	124,501	100,444	90,102
65 TO 69		42,387	56,542	78,280	86,254	92,547	108,488	113,336	128,358	126,064	82,010
70 & UP		30,808	47,104	71,347	76,734	96,946	113,521	112,933	103,283	119,505	81,596
<b>TOTAL</b>		<b>59,313</b>	<b>80,702</b>	<b>92,313</b>	<b>99,359</b>	<b>108,411</b>	<b>111,816</b>	<b>117,083</b>	<b>126,699</b>	<b>120,289</b>	<b>83,304</b>

Note: Age is last birthday. Service is completed years.

\* 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, 2016 (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	7	0	0	0	0	0	0	0	0	7
20 TO 24	1,782	1	0	0	0	0	0	0	0	1,783
25 TO 29	9,754	843	2	0	0	0	0	0	0	10,599
30 TO 34	6,111	5,559	1,429	2	0	0	0	0	0	13,101
35 TO 39	3,261	3,412	5,312	827	1	0	0	0	0	12,813
40 TO 44	2,264	2,158	3,843	3,176	338	2	0	0	0	11,781
45 TO 49	2,012	1,680	2,773	2,768	1,780	409	8	0	0	11,430
50 TO 54	1,529	1,358	2,135	2,137	1,577	1,648	399	1	0	10,784
55 TO 59	936	985	1,865	2,210	1,450	1,162	705	76	1	9,390
60 TO 64	491	530	1,137	1,669	1,300	915	382	167	25	6,616
65 TO 69	167	186	387	577	471	375	198	88	79	2,528
70 & UP	82	46	93	131	108	88	68	29	75	720
<b>TOTAL</b>	<b>28,396</b>	<b>16,758</b>	<b>18,976</b>	<b>13,497</b>	<b>7,025</b>	<b>4,599</b>	<b>1,760</b>	<b>361</b>	<b>180</b>	<b>91,552</b>

<i>SALARIES (IN THOUSANDS):</i>										
UNDER 20	174	0	0	0	0	0	0	0	0	174
20 TO 24	89,306	61	0	0	0	0	0	0	0	89,368
25 TO 29	589,867	62,287	126	0	0	0	0	0	0	652,280
30 TO 34	383,338	453,041	127,383	152	0	0	0	0	0	963,914
35 TO 39	197,093	269,657	479,313	78,036	93	0	0	0	0	1,024,191
40 TO 44	126,755	157,928	339,408	303,697	34,942	141	0	0	0	962,871
45 TO 49	105,019	108,969	229,581	254,627	186,254	41,775	669	0	0	926,894
50 TO 54	75,559	80,781	160,176	179,289	156,088	175,201	43,470	122	0	870,685
55 TO 59	46,281	56,563	134,854	172,710	130,854	116,841	79,423	8,366	70	745,962
60 TO 64	23,528	30,217	82,102	127,044	112,433	85,247	41,775	19,499	2,779	524,623
65 TO 69	6,729	9,789	26,594	42,055	39,443	31,638	19,119	9,596	9,139	194,102
70 & UP	2,184	2,095	5,516	8,652	7,839	6,678	5,986	2,569	7,721	49,239
<b>TOTAL *</b>	<b>1,645,834</b>	<b>1,231,388</b>	<b>1,585,053</b>	<b>1,166,259</b>	<b>667,945</b>	<b>457,521</b>	<b>190,441</b>	<b>40,152</b>	<b>19,709</b>	<b>7,004,303</b>

<i>AVERAGE SALARIES: **</i>										
UNDER 20	24,877	0	0	0	0	0	0	0	0	24,877
20 TO 24	50,116	61,446	0	0	0	0	0	0	0	50,122
25 TO 29	60,474	73,887	63,219	0	0	0	0	0	0	61,542
30 TO 34	62,729	81,497	89,142	75,981	0	0	0	0	0	73,576
35 TO 39	60,440	79,032	90,232	94,360	92,687	0	0	0	0	79,934
40 TO 44	55,987	73,183	88,319	95,622	103,379	70,474	0	0	0	81,731
45 TO 49	52,196	64,862	82,792	91,990	104,637	102,140	83,573	0	0	81,093
50 TO 54	49,418	59,485	75,024	83,897	98,978	106,311	108,946	122,388	0	80,739
55 TO 59	49,446	57,424	72,308	78,149	90,244	100,552	112,657	110,084	69,853	79,442
60 TO 64	47,919	57,012	72,209	76,120	86,487	93,166	109,359	116,758	111,166	79,296
65 TO 69	40,293	52,628	68,718	72,885	83,743	84,369	96,562	109,043	115,683	76,781
70 & UP	26,639	45,534	59,313	66,044	72,581	75,881	88,025	88,593	102,949	68,388
<b>TOTAL</b>	<b>57,960</b>	<b>73,481</b>	<b>83,529</b>	<b>86,409</b>	<b>95,081</b>	<b>99,483</b>	<b>108,205</b>	<b>111,225</b>	<b>109,495</b>	<b>76,506</b>

Note: Age is last birthday. Service is completed years.

\* 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, 2016 (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	8	0	0	0	0	0	0	0	0	8
20 TO 24	2,266	2	0	0	0	0	0	0	0	2,268
25 TO 29	12,325	1,037	6	0	0	0	0	0	0	13,368
30 TO 34	8,174	7,056	1,744	3	0	0	0	0	0	16,977
35 TO 39	4,385	4,558	6,855	1,019	3	0	0	0	0	16,820
40 TO 44	3,009	2,768	5,172	4,039	429	3	0	0	0	15,420
45 TO 49	2,568	2,101	3,675	3,627	2,367	496	13	0	0	14,847
50 TO 54	1,932	1,674	2,756	2,727	2,072	2,142	501	1	0	13,805
55 TO 59	1,260	1,223	2,353	2,642	1,866	1,547	903	100	1	11,895
60 TO 64	722	693	1,482	1,991	1,582	1,124	509	233	33	8,369
65 TO 69	315	256	550	740	572	460	252	108	116	3,369
70 & UP	134	77	141	185	148	107	82	36	145	1,055
<b>TOTAL</b>	<b>37,098</b>	<b>21,445</b>	<b>24,734</b>	<b>16,973</b>	<b>9,039</b>	<b>5,879</b>	<b>2,260</b>	<b>478</b>	<b>295</b>	<b>118,201</b>

<i>SALARIES (IN THOUSANDS):</i>										
UNDER 20	226	0	0	0	0	0	0	0	0	226
20 TO 24	113,121	165	0	0	0	0	0	0	0	113,286
25 TO 29	740,982	77,245	486	0	0	0	0	0	0	818,713
30 TO 34	513,119	580,185	156,895	290	0	0	0	0	0	1,250,489
35 TO 39	268,752	366,161	627,900	97,466	365	0	0	0	0	1,360,644
40 TO 44	174,298	208,089	467,047	393,993	45,104	248	0	0	0	1,288,780
45 TO 49	138,438	141,575	312,937	342,617	251,454	51,080	1,262	0	0	1,239,363
50 TO 54	98,598	104,015	215,040	237,603	210,973	231,677	55,455	122	0	1,153,483
55 TO 59	63,308	73,092	176,806	213,557	175,876	159,789	102,885	11,683	70	977,066
60 TO 64	34,345	41,808	111,184	157,197	142,007	108,157	56,574	27,716	3,583	682,571
65 TO 69	13,002	13,747	39,354	56,114	48,790	40,860	25,239	12,163	13,803	263,072
70 & UP	3,786	3,555	8,941	12,795	11,717	8,834	7,567	3,292	16,087	76,574
<b>TOTAL*</b>	<b>2,161,976</b>	<b>1,609,636</b>	<b>2,116,591</b>	<b>1,511,633</b>	<b>886,286</b>	<b>600,646</b>	<b>248,982</b>	<b>54,976</b>	<b>33,542</b>	<b>9,224,268</b>

<i>AVERAGE SALARIES: **</i>										
UNDER 20	28,276	0	0	0	0	0	0	0	0	28,276
20 TO 24	49,921	82,319	0	0	0	0	0	0	0	49,950
25 TO 29	60,120	74,489	81,068	0	0	0	0	0	0	61,244
30 TO 34	62,775	82,226	89,963	96,553	0	0	0	0	0	73,658
35 TO 39	61,289	80,334	91,597	95,649	121,602	0	0	0	0	80,894
40 TO 44	57,926	75,177	90,303	97,547	105,138	82,824	0	0	0	83,578
45 TO 49	53,909	67,384	85,153	94,463	106,233	102,985	97,049	0	0	83,476
50 TO 54	51,034	62,136	78,026	87,130	101,821	108,159	110,688	122,388	0	83,555
55 TO 59	50,245	59,765	75,141	80,831	94,253	103,289	113,937	116,830	69,853	82,141
60 TO 64	47,569	60,329	75,023	78,954	89,764	96,225	111,148	118,952	108,566	81,559
65 TO 69	41,277	53,698	71,552	75,830	85,298	88,826	100,156	112,620	118,994	78,086
70 & UP	28,257	46,166	63,410	69,164	79,166	82,564	92,277	91,449	110,942	72,582
<b>TOTAL</b>	<b>58,277</b>	<b>75,059</b>	<b>85,574</b>	<b>89,061</b>	<b>98,051</b>	<b>102,168</b>	<b>110,169</b>	<b>115,013</b>	<b>113,703</b>	<b>78,039</b>

Note: Age is last birthday. Service is completed years.

\* Total may not add up due to rounding.

\*\* Average based on unrounded salary.

**Table XII-7**  
**Detailed Reconciliation of Active Membership**

		<b>TOTAL ACTIVE MEMBERS AS OF JUNE 30, 2016</b>					<b>TOTAL ACTIVE MEMBERS AS OF JUNE 30, 2015</b>				
<b>TIER</b>	<b>GENDER</b>	<b>NUMBER</b>	<b>SALARY</b>	<b>AVG SAL</b>	<b>AVG AGE</b>	<b>AVG SVC</b>	<b>NUMBER</b>	<b>SALARY</b>	<b>AVG SAL</b>	<b>AVG AGE</b>	<b>AVG SVC</b>
I	M	116	13,494,032	116,328	73.0	41.9	138	15,418,229	111,726	72.0	40.5
I	F	254	28,052,917	110,445	70.0	35.3	308	33,432,337	108,547	69.0	34.3
		370	41,546,949	112,289	70.9	37.4	446	48,850,566	109,530	69.9	36.2
II	M	37	4,432,755	119,804	67.0	35.3	47	5,713,047	121,554	66.0	34.6
II	F	139	14,812,107	106,562	65.3	30.1	185	19,850,761	107,301	64.5	29.9
		176	19,244,862	109,346	65.6	31.2	232	25,563,808	110,189	64.8	30.8
IV	M	20,512	1,836,233,336	89,520	46.8	13.6	21,410	1,856,869,510	86,729	46.3	12.8
IV	F	69,882	5,721,902,401	81,879	47.0	14.0	72,504	5,765,824,573	79,524	46.4	13.3
		90,394	7,558,135,737	83,613	46.9	13.9	93,914	7,622,694,083	81,167	46.3	13.2
VI	M	5,984	365,804,535	61,130	33.9	1.8	4,470	265,040,478	59,293	33.3	1.5
VI	F	21,277	1,239,535,564	58,257	33.7	1.9	15,590	882,501,698	56,607	32.9	1.5
		27,261	1,605,340,099	58,888	33.7	1.8	20,060	1,147,542,176	57,205	33.0	1.5
<b>ALL</b>		<b>118,201</b>	<b>9,224,267,647</b>	<b>78,039</b>	<b>44.0</b>	<b>11.2</b>	<b>114,652</b>	<b>8,844,650,633</b>	<b>77,143</b>	<b>44.1</b>	<b>11.3</b>

		<b>MEMBERS WITH SAME GENDER AND TIER IN BOTH VALUATION YEARS</b>					<b>MEMBERS WITH SAME GENDER AND TIER IN BOTH VALUATION YEARS</b>				
I	M	113	13,146,779	116,343	73.1	42.3	113	12,754,537	112,872	72.1	40.5
I	F	249	27,750,507	111,448	70.0	35.6	249	27,356,690	109,866	69.0	34.4
		362	40,897,286	112,976	71.0	37.7	362	40,111,227	110,804	70.0	36.3
II	M	35	4,140,053	118,287	67.0	36.8	35	4,265,293	121,866	66.0	35.9
II	F	133	14,413,019	108,369	65.3	30.7	133	14,331,677	107,757	64.3	29.7
		168	18,553,072	110,435	65.7	31.9	168	18,596,970	110,696	64.7	31.0
IV	M	19,968	1,798,439,272	90,066	47.0	13.8	19,968	1,740,534,450	87,166	46.0	12.7
IV	F	67,560	5,560,219,140	82,300	47.2	14.3	67,560	5,375,817,688	79,571	46.2	13.2
		87,528	7,358,658,412	84,072	47.1	14.2	87,528	7,116,352,138	81,304	46.1	13.0
VI	M	3,806	243,717,206	64,035	34.2	2.4	3,806	223,897,028	58,827	33.2	1.5
VI	F	13,538	824,027,860	60,868	33.9	2.5	13,538	759,726,063	56,118	32.9	1.5
		17,344	1,067,745,066	61,563	33.9	2.5	17,344	983,623,091	56,713	32.9	1.5
<b>ALL</b>		<b>105,402</b>	<b>8,485,853,836</b>	<b>80,509</b>	<b>45.1</b>	<b>12.4</b>	<b>105,402</b>	<b>8,158,683,426</b>	<b>77,405</b>	<b>44.1</b>	<b>11.3</b>

		<b>ADDITIONS DURING THE YEAR *</b>					<b>SEPARATIONS FROM MEMBERSHIP DURING THE YEAR *</b>				
I	M	3	347,253	115,751	67.3	26.3	25	2,663,692	106,548	71.6	40.4
I	F	5	302,410	60,482	71.2	22.4	59	6,075,647	102,977	68.9	34.1
		8	649,663	81,208	69.8	23.9	84	8,739,339	104,040	69.7	36.0
II	M	2	292,702	146,351	66.5	9.0	12	1,447,754	120,646	66.2	30.6
II	F	6	399,088	66,515	64.7	16.8	52	5,519,084	106,136	64.8	30.1
		8	691,790	86,474	65.1	14.9	64	6,966,838	108,857	65.1	30.2
IV	M	544	37,794,064	69,474	42.0	6.1	1,442	116,335,060	80,676	50.2	14.3
IV	F	2,322	161,683,261	69,631	40.6	6.8	4,944	390,006,885	78,885	48.7	15.0
		2,866	199,477,325	69,601	40.8	6.6	6,386	506,341,945	79,289	49.1	14.8
VI	M	2,178	122,087,329	56,055	33.3	0.7	664	41,143,450	61,963	33.6	1.7
VI	F	7,739	415,507,704	53,690	33.4	0.8	2,052	122,775,635	59,832	33.3	1.7
		9,917	537,595,033	54,209	33.4	0.8	2,716	163,919,085	60,353	33.4	1.7
<b>ALL</b>		<b>12,799</b>	<b>738,413,811</b>	<b>57,693</b>	<b>35.1</b>	<b>2.1</b>	<b>9,250</b>	<b>685,967,207</b>	<b>74,159</b>	<b>44.8</b>	<b>11.3</b>

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

\* Separations and additions do not include members who joined after June 30, 2015 and are no longer members on June 30, 2016.

Table XII-8  
Summary of Non-Pensioner Membership as of June 30, 2016

STATUS	TIER 1		TIER 2		TIER 3/4		TIER 6		ALL TIERS	
	NUMBER	SALARY	NUMBER	SALARY	NUMBER	SALARY	NUMBER	SALARY	NUMBER	SALARY
<i>MALES:</i>										
ACTIVES	116	13,494,032	37	4,432,755	20,512	1,836,233,336	5,984	365,804,535	26,649	2,219,964,658
INACTIVES	17	1,594,931	4	449,798	981	62,407,293	418	24,212,184	1,420	88,664,206
VESTED	81	2,456,939	10	542,089	3,128	208,697,410	0	0	3,219	211,696,438
<b>ALL STATUS</b>	<b>214</b>	<b>17,545,902</b>	<b>51</b>	<b>5,424,642</b>	<b>24,621</b>	<b>2,107,338,039</b>	<b>6,402</b>	<b>390,016,719</b>	<b>31,288</b>	<b>2,520,325,302</b>
<i>FEMALES:</i>										
ACTIVES	254	28,052,917	139	14,812,107	69,882	5,721,902,401	21,277	1,239,535,564	91,552	7,004,302,989
INACTIVES	31	3,022,477	26	2,694,496	4,637	314,582,726	1,287	74,572,558	5,981	394,872,257
VESTED	117	2,977,678	71	2,361,354	10,986	653,694,129	0	0	11,174	659,033,161
<b>ALL STATUS</b>	<b>402</b>	<b>34,053,072</b>	<b>236</b>	<b>19,867,957</b>	<b>85,505</b>	<b>6,690,179,256</b>	<b>22,564</b>	<b>1,314,108,122</b>	<b>108,707</b>	<b>8,058,208,407</b>
<i>TOTAL:</i>										
ACTIVES	370	41,546,949	176	19,244,862	90,394	7,558,135,737	27,261	1,605,340,099	118,201	9,224,267,647
INACTIVES	48	4,617,408	30	3,144,294	5,618	376,990,019	1,705	98,784,742	7,401	483,536,463
VESTED	198	5,434,617	81	2,903,443	14,114	862,391,539	0	0	14,393	870,729,599
<b>ALL STATUS</b>	<b>616</b>	<b>51,598,974</b>	<b>287</b>	<b>25,292,599</b>	<b>110,126</b>	<b>8,797,517,295</b>	<b>28,966</b>	<b>1,704,124,841</b>	<b>139,995</b>	<b>10,578,533,709</b>

**Table XII-9**  
**Summary of Pensioner Membership**

Group	June 30, 2016 (Lag)					June 30, 2015 (Lag)				
	Number	Annual Amounts Payable				Number	Annual Amounts Payable			
		Fixed	Variable	Supplement	Total		Fixed	Variable	Supplement	Total
Service Pensioners	76,346	\$ 3,058,908,934	\$ 506,891,684	\$ 155,982,834	\$ 3,721,783,452	75,251	\$ 2,955,103,766	\$ 550,099,051	\$ 154,912,352	\$ 3,660,115,169
Ordinary Disability Pensioners	2,541	49,210,913	3,266,193	4,146,958	56,624,064	2,481	46,799,415	3,700,681	4,132,411	54,632,507
Accidental Disability Pensioners	745	26,125,336	2,323,589	2,462,548	30,911,473	732	25,315,963	2,509,364	2,450,256	30,275,583
Accidental Death Pensioners	0	0	0	0	0	0	0	0	0	0
Other Beneficiaries	4,461	103,571,969	31,799,222	9,963,543	145,334,734	4,313	96,455,702	32,589,118	9,957,662	139,002,482
Total	84,093	\$ 3,237,817,152	\$ 544,280,688	\$ 172,555,883	\$ 3,954,653,723	82,777	\$ 3,123,674,846	\$ 588,898,214	\$ 171,452,681	\$ 3,884,025,741

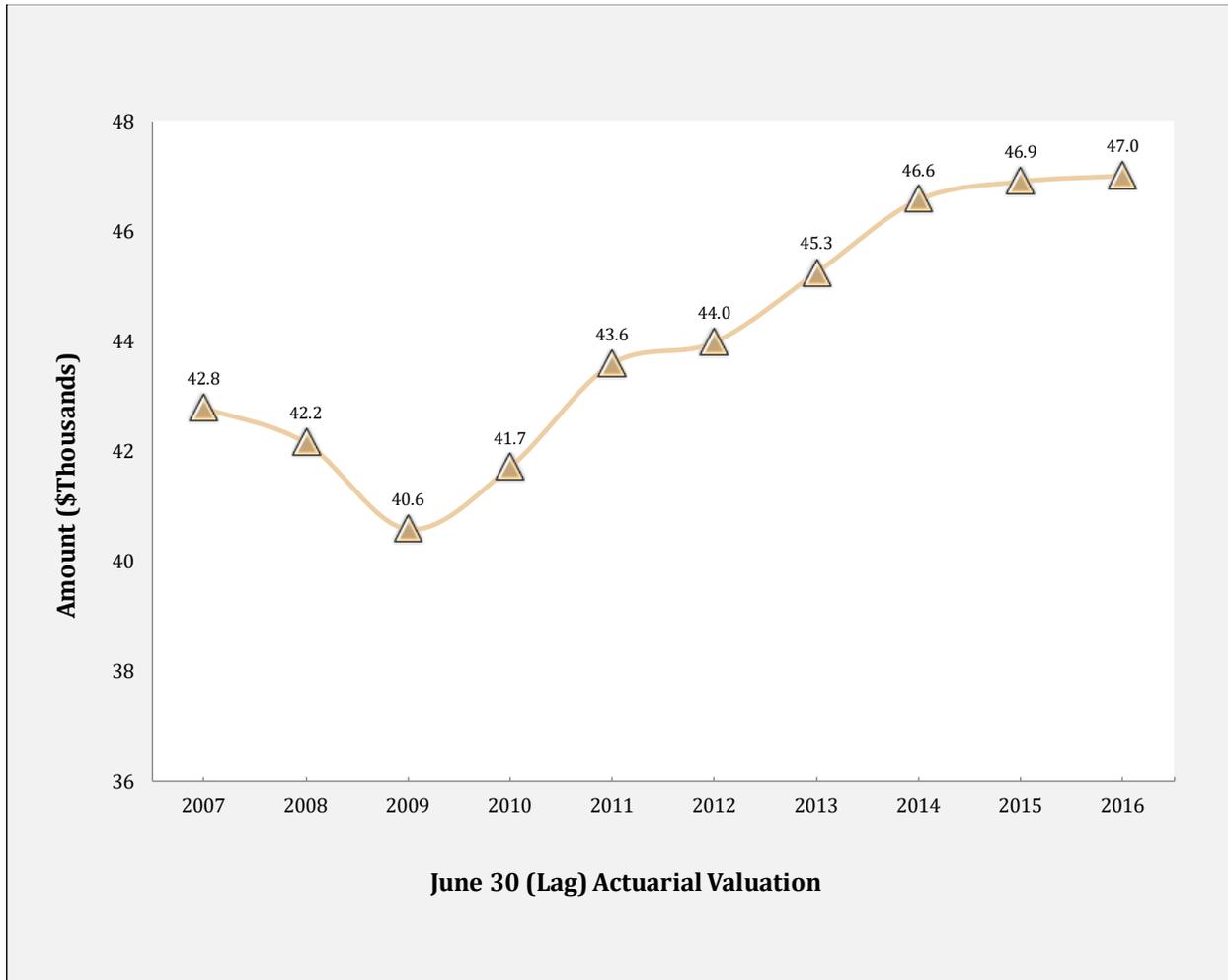
**Table XII-10**  
**Distribution of Pension Benefits by Cause and Age as of June 30, 2016**

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	767	39,857,417	51,965	2,281	115,172,286	50,492	3,048	155,029,703	50,863
60 TO 64	1,969	100,578,825	51,081	6,677	324,232,344	48,560	8,646	424,811,169	49,134
65 TO 69	5,792	353,489,142	61,031	14,065	737,370,168	52,426	19,857	1,090,859,310	54,936
70 TO 74	5,654	342,626,525	60,599	11,377	538,093,400	47,297	17,031	880,719,925	51,713
75 TO 79	3,248	175,762,024	54,114	7,572	313,314,291	41,378	10,820	489,076,315	45,201
80 TO 84	2,293	121,873,527	53,150	5,353	199,533,728	37,275	7,646	321,407,255	42,036
85 TO 89	1,556	79,322,353	50,978	3,966	145,159,817	36,601	5,522	224,482,170	40,652
90 & UP	854	39,687,007	46,472	2,922	95,710,598	32,755	3,776	135,397,605	35,857
<b>TOTAL</b>	<b>22,133</b>	<b>1,253,196,820</b>	<b>56,621</b>	<b>54,213</b>	<b>2,468,586,632</b>	<b>45,535</b>	<b>76,346</b>	<b>3,721,783,452</b>	<b>48,749</b>
<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	2	34,798	17,399	9	221,512	24,612	11	256,310	23,301
40 TO 44	10	277,382	27,738	28	607,362	21,692	38	884,744	23,283
45 TO 49	21	545,544	25,978	84	2,057,585	24,495	105	2,603,129	24,792
50 TO 54	47	1,239,491	26,372	177	4,605,610	26,020	224	5,845,101	26,094
55 TO 59	74	2,011,267	27,179	287	6,780,539	23,626	361	8,791,806	24,354
60 TO 64	95	2,191,632	23,070	399	8,685,799	21,769	494	10,877,431	22,019
65 TO 69	143	3,641,679	25,466	418	9,142,715	21,873	561	12,784,394	22,789
70 TO 74	98	2,432,572	24,822	268	5,292,650	19,749	366	7,725,222	21,107
75 TO 79	41	901,058	21,977	145	2,330,162	16,070	186	3,231,220	17,372
80 TO 84	19	372,782	19,620	72	1,144,102	15,890	91	1,516,884	16,669
85 TO 89	13	311,374	23,952	42	740,661	17,635	55	1,052,035	19,128
90 & UP	7	218,222	31,175	42	837,566	19,942	49	1,055,788	21,547
<b>TOTAL</b>	<b>570</b>	<b>14,177,801</b>	<b>24,873</b>	<b>1,971</b>	<b>42,446,263</b>	<b>21,535</b>	<b>2,541</b>	<b>56,624,064</b>	<b>22,284</b>
<i>ACCIDENTAL DISABILITY:</i>									
UNDER 30	0	0	0	0	0	0	0	0	0
30 TO 34	1	34,828	34,828	1	38,810	38,810	2	73,638	36,819
35 TO 39	1	23,307	23,307	6	226,256	37,709	7	249,563	35,652
40 TO 44	6	284,151	47,359	8	365,885	45,736	14	650,036	46,431
45 TO 49	4	207,469	51,867	13	619,594	47,661	17	827,063	48,651
50 TO 54	5	230,818	46,164	34	1,431,678	42,108	39	1,662,496	42,628
55 TO 59	13	635,936	48,918	61	2,293,865	37,604	74	2,929,801	39,592
60 TO 64	29	1,533,730	52,887	87	3,548,403	40,786	116	5,082,133	43,811
65 TO 69	61	2,698,250	44,234	128	5,234,743	40,896	189	7,932,993	41,974
70 TO 74	43	2,017,425	46,917	94	3,712,034	39,490	137	5,729,459	41,821
75 TO 79	23	1,088,984	47,347	38	1,350,985	35,552	61	2,439,969	39,999
80 TO 84	12	489,873	40,823	32	1,047,369	32,730	44	1,537,242	34,937
85 TO 89	8	321,970	40,246	17	653,789	38,458	25	975,759	39,030
90 & UP	6	252,022	42,004	14	569,299	40,664	20	821,321	41,066
<b>TOTAL</b>	<b>212</b>	<b>9,818,763</b>	<b>46,315</b>	<b>533</b>	<b>21,092,710</b>	<b>39,574</b>	<b>745</b>	<b>30,911,473</b>	<b>41,492</b>

**Table XII-10**  
**Distribution of Pension Benefits by Cause and Age as of June 30, 2016 (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
<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<i>OTHER BENEFICIARIES:</i>									
UNDER 30	5	111,396	22,279	6	134,088	22,348	11	245,484	22,317
30 TO 34	4	30,108	7,527	8	189,993	23,749	12	220,101	18,342
35 TO 39	11	218,623	19,875	12	222,952	18,579	23	441,575	19,199
40 TO 44	10	237,174	23,717	18	341,104	18,950	28	578,278	20,653
45 TO 49	17	250,129	14,713	18	320,008	17,778	35	570,137	16,290
50 TO 54	26	289,145	11,121	55	975,444	17,735	81	1,264,589	15,612
55 TO 59	34	662,983	19,500	86	2,004,199	23,305	120	2,667,182	22,227
60 TO 64	58	1,362,789	23,496	124	4,089,313	32,978	182	5,452,102	29,957
65 TO 69	129	4,018,115	31,148	311	12,542,869	40,331	440	16,560,984	37,639
70 TO 74	188	6,712,687	35,706	461	18,557,157	40,254	649	25,269,844	38,937
75 TO 79	165	4,680,257	28,365	455	17,639,134	38,767	620	22,319,391	35,999
80 TO 84	170	4,446,146	26,154	518	18,718,904	36,137	688	23,165,050	33,670
85 TO 89	195	4,892,499	25,090	517	17,479,204	33,809	712	22,371,703	31,421
90 & UP	255	6,459,543	25,332	605	17,748,771	29,337	860	24,208,314	28,149
<b>TOTAL</b>	<b>1,267</b>	<b>34,371,594</b>	<b>27,128</b>	<b>3,194</b>	<b>110,963,140</b>	<b>34,741</b>	<b>4,461</b>	<b>145,334,734</b>	<b>32,579</b>
<i>ALL PENSIONERS AND BENEFICIARIES:</i>									
UNDER 30	5	111,396	22,279	6	134,088	22,348	11	245,484	22,317
30 TO 34	5	64,936	12,987	9	228,803	25,423	14	293,739	20,981
35 TO 39	14	276,728	19,766	27	670,720	24,841	41	947,448	23,108
40 TO 44	26	798,707	30,720	54	1,314,351	24,340	80	2,113,058	26,413
45 TO 49	42	1,003,142	23,884	115	2,997,187	26,062	157	4,000,329	25,480
50 TO 54	78	1,759,454	22,557	266	7,012,732	26,364	344	8,772,186	25,501
55 TO 59	888	43,167,603	48,612	2,715	126,250,889	46,501	3,603	169,418,492	47,022
60 TO 64	2,151	105,666,976	49,125	7,287	340,555,859	46,735	9,438	446,222,835	47,279
65 TO 69	6,125	363,847,186	59,404	14,922	764,290,495	51,219	21,047	1,128,137,681	53,601
70 TO 74	5,983	353,789,209	59,132	12,200	565,655,241	46,365	18,183	919,444,450	50,566
75 TO 79	3,477	182,432,323	52,468	8,210	334,634,572	40,759	11,687	517,066,895	44,243
80 TO 84	2,494	127,182,328	50,995	5,975	220,444,103	36,894	8,469	347,626,431	41,047
85 TO 89	1,772	84,848,196	47,883	4,542	164,033,471	36,115	6,314	248,881,667	39,417
90 & UP	1,122	46,616,794	41,548	3,583	114,866,234	32,059	4,705	161,483,028	34,322
<b>TOTAL</b>	<b>24,182</b>	<b>1,311,564,978</b>	<b>54,237</b>	<b>59,911</b>	<b>2,643,088,745</b>	<b>44,117</b>	<b>84,093</b>	<b>3,954,653,723</b>	<b>47,027</b>

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 <sup>1</sup>	Number	Annual Allowances	Number	Annual Allowances		
2007	3,078	\$234,183,351	2,162	\$66,646,428	68,492	\$2,931,295,173	6.1%	\$42,798
2008	3,252	75,074,813	1,969	64,757,835	69,775	2,941,612,151	0.4%	42,159
2009	3,115	6,288,013	2,065	73,586,895	70,825	2,874,313,269	- 2.3%	40,583
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

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

## APPENDIX: ACRONYMS AND ABBREVIATIONS

2012 A&M	Actuarial Assumptions and Methods enacted by Chapter 3/13
2016 A&M	2012 A&M with changes proposed by the Actuary and adopted by Board of Trustees during Fiscal Year 2016
AAVM	Actuarial Asset Valuation Method
AIR	Actuarial Interest Rate
AL	Accrued Liability
AMC	Additional Member Contribution(s)
ASAF	Annuity Savings Accumulation Fund
AVA	Actuarial Value of Assets
BMC	Basic Member Contribution(s)
CAFR	Comprehensive Annual Financial Report
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
GASB5	Governmental Accounting Standards Board Statement No. 5
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