

FINANCIAL STATEMENTS AND REQUIRED
SUPPLEMENTARY INFORMATION

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)
Year Ended December 31, 2017
With Report of Independent Auditors

Ernst & Young LLP



Building a better
working world

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Financial Statements and Required Supplementary Information

Year Ended December 31, 2017

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Report of Independent Auditors

Management and The Boston Retirement Board

Report on the Financial Statements

We have audited the accompanying financial statements of fiduciary net position and changes in fiduciary net position of the Boston Retirement System (the System), a component unit of the City of Boston, Massachusetts, as of and for the year ended December 31, 2017, and the related notes to the financial statements, which collectively comprise the Boston Retirement System's basic financial statements as listed in the table of contents.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in conformity with U.S. generally accepted accounting principles; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free of material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinions

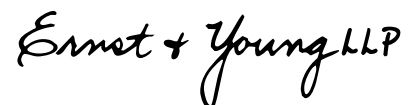
In our opinion, the financial statements referred to above present fairly, in all material respects, the fiduciary net position of the Boston Retirement System as of December 31, 2017, and the changes in fiduciary net position for the year then ended in conformity with U.S. generally accepted accounting principles.

Required Supplementary Information

U.S. generally accepted accounting principles require that Management's Discussion and Analysis on pages 5 through 9 and the schedules of changes in the net pension liability, contributions, and investment returns on pages 37 through 39 be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board which considers it to be an essential part of financial reporting for placing the basic financial statements in an appropriate operational, economic or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Other Reporting Required by Government Auditing Standards

In accordance with *Government Auditing Standards*, we also have issued our report dated September 12, 2018 on our consideration of the System's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on the internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the System's internal control over financial reporting and compliance.



September 12, 2018

Report of Independent Auditors on Internal Control Over Financial Reporting and on Compliance and Other Matters Based on an Audit of Financial Statements Performed in Accordance with *Government Auditing Standards*

Management and The Boston Retirement Board

We have audited, in accordance with auditing standards generally accepted in the United States and the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States, the financial statements of the Boston Retirement System (the System), which comprise the statement of fiduciary net position as of December 31, 2017, and the related statement of changes in fiduciary net position for the year then ended, and the related notes to the financial statements, and have issued our report thereon dated September 12, 2018.

Internal Control Over Financial Reporting

In planning and performing our audit of the financial statements, we considered the System's internal control over financial reporting (internal control) to determine the audit procedures that are appropriate in the circumstances for the purpose of expressing our opinion on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of the System's internal control. Accordingly, we do not express an opinion on the effectiveness of the System's internal control.

A deficiency in internal control exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct misstatements on a timely basis. A *material weakness* is a deficiency, or combination of deficiencies, in internal control, such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected on a timely basis. A *significant deficiency* is a deficiency, or a combination of deficiencies, in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance.

Our consideration of internal control was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies. Given these limitations, during our audit we did not identify any deficiencies in internal control that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

Compliance and Other Matters

As part of obtaining reasonable assurance about whether the System's financial statements are free of material misstatement, we performed tests of its compliance with certain provisions of laws, regulations, contracts and grant agreements, noncompliance with which could have a direct and material effect on the determination of financial statement amounts. However, providing an opinion on compliance with those provisions was not an objective of our audit, and accordingly, we do not express such an opinion. The results of our tests disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards*.

Purpose of this Report

The purpose of this report is solely to describe the scope of our testing of internal control and compliance and the result of that testing, and not to provide an opinion on the effectiveness of the entity's internal control or on compliance. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the entity's internal control and compliance. Accordingly, this communication is not suitable for any other purpose.

Ernst + Young LLP

September 12, 2018

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

**Required Supplementary Information –
Management’s Discussion and Analysis**

December 31, 2017

The following discussion provides an overview and analysis of the fiduciary net position and changes in fiduciary net position of the Boston Retirement System (the System or Plan) by management for the year ended December 31, 2017.

Overview of the Financial Statements

The System’s financial statements comprise a statement of fiduciary net position, statement of changes in fiduciary net position, and notes to the financial statements.

The Statement of Fiduciary Net Position presents information on the System’s assets and liabilities and the resulting net position held in trust for pension benefits. This statement reflects the System’s investments at fair value, as well as cash, receivables, and other assets and liabilities.

The Statement of Changes in Fiduciary Net Position presents information showing how the System’s net position restricted for pension benefits changed during the year ended December 31, 2017. It reflects contributions by members and participating employers, along with deductions for retirement benefits, refunds and withdrawals, and administrative expenses. Investment income from investing and securities lending activities is also presented.

The Notes to Financial Statements provide additional information that is essential for the reader to gain a full understanding of the data provided in the financial statements.

The Required Supplementary Information includes management’s discussion and analysis and schedules of changes in the net pension liability, contributions, and investment returns.

Financial Highlights and Analysis

- Net position is available for payment of monthly retirement benefits and other qualified distributions to the System’s participants. Net position restricted for pension benefits was \$6.77 billion at December 31, 2017, compared to \$5.85 billion at December 31, 2016. The increase in net position of \$.92 billion resulted primarily from an increase in the fair value of portfolio investments and investment income.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

**Required Supplementary Information –
Management’s Discussion and Analysis (continued)**

- The System’s equity and fixed income investments comprised 60.0% of invested assets; the remaining 40.0% of investments were invested in real estate investments (6.7%), alternative investments, including private equity and hedge fund of funds investments (7.7%), PRIT general allocation account (24.6%) and short-term investments (1.0%).
- Receivables increased by \$119 million at December 31, 2017, more than 97% is due to an increase in Domestic Investment Receivables.
- Liabilities decreased by \$2.8 million at December 31, 2017 predominately due to the decrease in Domestic Investment Payable.

Employers’ contributions are made in accordance with a funding schedule approved by the Massachusetts Public Employee Retirement Administration Commission. The System’s funding objective is to meet long-term benefit obligations through contributions and investment income. As of January 1, 2016, the funding ratio was 58.44%. All employers fully met the required funding amounts in 2017.

	2017	2016	Percentage Change 2017–2016
<i>(In Thousands)</i>			
Assets			
Cash and cash equivalents	\$ 250,060	\$ 253,687	-1%
Receivables	159,962	40,804	292%
Investments	6,403,654	5,606,574	14%
Prepaid expenses	28	–	N/A
Securities lending collateral investment pool	173,640	191,892	-10%
Total assets	6,987,344	6,092,957	15%
Liabilities			
Payables	47,331	50,048	-5%
Obligation to return securities lending collateral	173,522	191,826	-10%
Total liabilities	220,853	241,874	-9%
Net position restricted for pensions	\$ 6,766,491	\$ 5,851,083	16%

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Required Supplementary Information –
Management’s Discussion and Analysis (continued)

	2017	2016	Percentage Change 2017–2016
<i>(In Thousands)</i>			
Additions			
Total contributions	\$ 546,418	\$ 534,191	2%
Net investment income	987,542	360,051	174%
Intergovernmental reimbursements	8,961	7,566	18%
Miscellaneous income	213	89	139%
Total additions	1,543,134	901,897	71%
Deductions			
Benefit payments	587,307	566,850	4%
Other	40,419	43,257	-7%
Total deductions	627,726	610,107	3%
Net increase in net position	915,408	291,790	214%
Net position at beginning of year	5,851,083	5,559,293	5%
Net position at end of year	\$ 6,766,491	\$ 5,851,083	16%

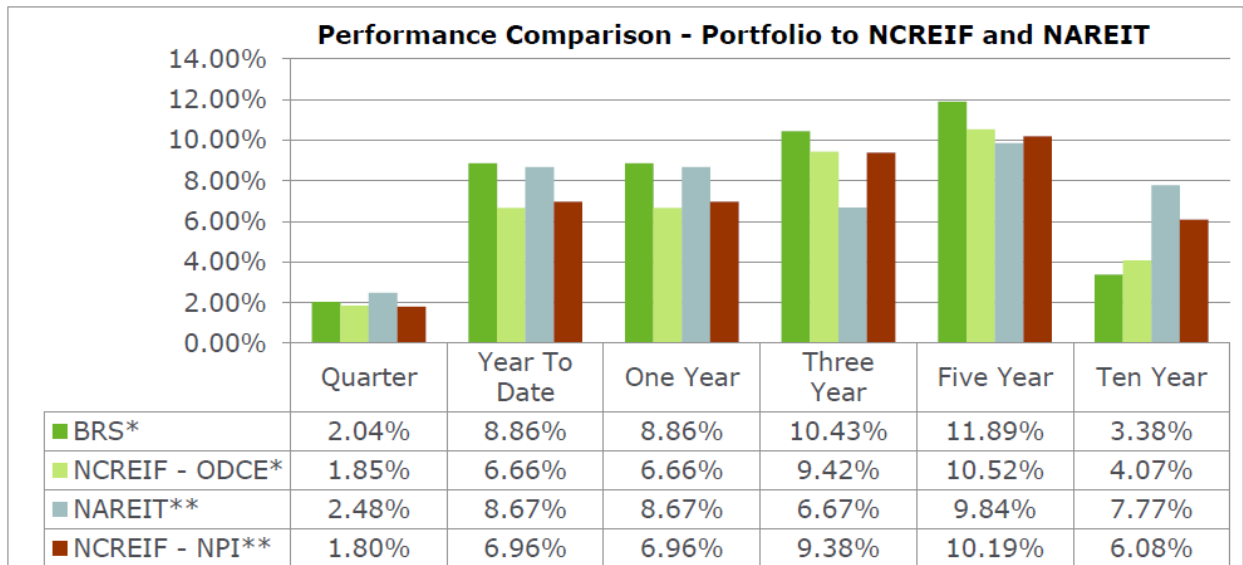
Plan Investments

- The total investment return for 2017 was approximately 17.9%. It was a banner year for the portfolio which ranked in the top quartile of its universe. Active management added 120 basis points relative to the allocation index and over/underweights relative to the System’s policy target added another 30 basis points. Improved global growth provided a favorable backdrop for economic performance and a tailwind for most active managers.
- In 2017, the large cap equity composite returned 24.9%, outperforming the S&P 500 index by 310 basis points. The small cap equity composite returned 26.7%, significantly outperforming the Russell 2000 Index, which gained 14.6% for the year.
- The international equity portfolio posted a return of 27.0% outperforming the MSCI EAFE index by 200 basis points. The emerging market equity portfolio gained 35.4%, but underperformed the MSCI EM, which gained 37.3%.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

**Required Supplementary Information –
Management’s Discussion and Analysis (continued)**

- Domestic fixed income had a positive return of 4.2%, beating the benchmark, Barclays Aggregate Bond Index, which returned 3.5%.
- Value added fixed income was a positive contributor to the portfolio. The System’s high yield investments gained 8.2%, outperforming the Barclays High Yield index by 70 basis points. The System’s global bond manager gained 8.7% and the emerging market debt portfolio gained 13.5%. The System’s global bond manager beat its respective benchmark, the Citigroup World Government Bond Index, by 120 basis points. The emerging market debt portfolio also beat its respective benchmark, the Custom Emerging Market Debt benchmark, by 120 basis points.



- The real estate portfolio yielded a return of 8.9% in 2017 and the portfolio is a combination of core, value-add and opportunistic investment strategies.
- The private equity portfolio earned a return of 12.7% for 2017 and is a combination of a variety of private equity and debt strategies designed to provide a diversified portfolio of assets that can beat the liquid market counterparts over time.

The System’s hedge fund composite underperformed in 2017, with the portfolio returning 4.1% versus HFRI Fund of Funds Index which returned 7.7%.

Boston Retirement System
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**Required Supplementary Information –
Management’s Discussion and Analysis (continued)**

- During calendar year 2017, the PRIT Core Fund returned 17.7%. At year end, the estimated fair value of the PRIT investment was \$1.57 billion.
- Over a 3, 5, and 10-year horizon, the System’s investments have earned 7.9%, 8.7%, and 5.7%, respectively. These returns are roughly in line with other public funds of a similar size. For perspective, the median public fund earned 6.0% over the ten-year period. Over that same 10-year period, domestic investments such as the S&P 500 and Barclays Aggregate Bond Index were up 8.5% and 4.0%, respectively. While non-U.S. investments such as the MSCI EAFE and MSCI Emerging Mkt. Index returned 1.9% and 1.7%, respectively.
- The portfolio remains intentionally invested in a broad array of asset classes and not concentrated from an asset or risk perspective in any one area. This diversification is designed to maximize returns while minimizing risk to help the System achieve its long-term expected rate of return. For 2017, the portfolio’s design managed to capture some gains from a strong equity run up. To note, 2017 was bullish on global equities with emerging markets leading the way.
- Since August 1994, the average annual return for the fund has been 8.1%.
- On a forward-looking basis, the portfolio’s target expected return over a long-term cycle (30 years) is 7.75%. The fund undertakes a formal asset allocation review each year to evaluate the current market landscape and, if necessary, to adjust the target allocations to reflect current opportunities.

Other Information

This financial report is designed to provide a general overview of the System’s finances. Questions concerning the information provided in this report or requests for additional financial information should be addressed to the Boston Retirement Board, Boston City Hall, Room 816, Boston, Massachusetts 02201.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Statement of Fiduciary Net Position
(In Thousands)

December 31, 2017

Assets

Cash and cash equivalents	\$ 250,060
Investments, at fair value:	
Short-term:	
Domestic	59,258
International	7,333
Equity:	
Domestic	1,374,977
International	1,372,795
Fixed income:	
Domestic	763,822
International	331,347
PRIT external investment pooled fund	1,572,852
Real estate	429,435
Alternative	491,835
Total investments, at fair value	6,403,654
Securities lending collateral investment pool	173,640
Receivables:	
Receivable for securities sold	130,646
Accrued interest and dividends	7,294
Other receivables	5,313
Contributions receivable from employers	16,709
Total receivables	159,962
Prepaid expenses	28
Total assets	6,987,344

Liabilities

Payable for securities purchased	30,714
Accounts payable, accrued expenses and other liabilities	16,617
Obligation to return securities lending collateral	173,522
Total liabilities	220,853
Net position restricted for pensions	\$ 6,766,491

See accompanying notes.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Statement of Changes in Fiduciary Net Position
(In Thousands)

Year Ended December 31, 2017

Additions

Contributions:

Employers	\$ 260,165
Commonwealth of Massachusetts	131,298
Employees	154,955
Total contributions	546,418

Investment income:

Interest and dividends	118,788
Net appreciation in fair value of investments	897,860
Less management and related fees	(30,304)
Net income from investing, other than from securities lending	986,344

Securities lending activities:

Securities lending income	3,026
Less borrower rebates and fees	(1,828)
Net income from securities lending activities	1,198
Total net investment income	987,542

Intergovernmental reimbursements

8,961

Miscellaneous income

213

Total additions

1,543,134

Deductions

Benefit payments to plan members and beneficiaries	587,307
Reimbursements to other systems	12,515
Refunds of contributions and transfers to other systems	20,439
Administrative and other expenses	7,465
Total deductions	627,726

Net increase in net position

915,408

Net position restricted for pensions:

Beginning of year	5,851,083
End of year	\$ 6,766,491

See accompanying notes.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements

December 31, 2017

1. Plan Description

The following description of the Boston Retirement System (formerly, the State-Boston Retirement System) (the System, BRS, or the Plan) is provided for general information purposes only. Participants should refer to Chapter 32 of the Massachusetts General Law (M.G.L.) for more detailed information. The Board of Trustees is primarily responsible for the administration of the System and consists of five members as follows: the City Auditor (who serves as an ex officio member), a second member appointed by the Mayor, a third and fourth member elected by active or retired members, and a fifth member chosen by the other four members (or appointed by the Mayor if the other four members do not agree on a selection within 30 days of a vacancy).

General

The Plan is a cost-sharing, multiple-employer qualified defined benefit governmental pension plan established under Chapter 32 of the M.G.L. The Plan provides pension benefits for participating employees of the following plan member governmental units:

- City of Boston (the City)*
- Commonwealth of Massachusetts (Other contributing entity – contributing towards City of Boston Teachers pensions)
- Boston Redevelopment Authority*
- Boston Housing Authority*
- Boston Water and Sewer Commission*
- Boston Public Health Commission*
- Sheriff of Suffolk County (Retirees as of December 31, 2009, funded by the City)*

* Indicates participating employer of the Plan

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements (continued)

1. Plan Description (continued)

At January 1, 2016, System membership consisted of the following:

Active plan members	20,498
Retirees and beneficiaries receiving benefits	14,485
Inactive members entitled to a return of contributions	8,690
Inactive members entitled to, but not yet receiving benefits	1,050
Total membership	44,723
 Number of participating employers	6

The Commonwealth of Massachusetts (the Commonwealth) is responsible for funding the employer portion of all teacher pensions in the Commonwealth. All teachers in the Commonwealth are members of the Massachusetts Teachers Retirement System, with the exception of teachers employed by the City (Boston Teachers), who are members of the System. Although Boston Teachers are members of the System, the Commonwealth is the responsible contributing entity. Additionally, the Commonwealth reimburses the Plan for all cost-of-living increases paid to recipients that were awarded before 1997.

Benefits Provided

Participation in the System is mandatory for all permanent, full-time, and certain part-time employees immediately upon the commencement of employment. Participants who resign from employment or are receiving workers' compensation benefits and who are not eligible to receive a retirement allowance are entitled to request a refund of their accumulated total deductions. In addition, those participants who resign voluntarily with less than ten years of service are entitled to receive 3% per year interest; all others receive interest that has accrued on their cumulative deductions at the regular interest rate (.10% at December 31, 2017).

Employees with ten or more years of service having attained age 55 are entitled to pension benefits; an earlier retirement is allowed upon completion of 20 years of service. The System provides for retirement allowance benefits up to a maximum of 80% of a participant's highest consecutive three-year average annual rate of regular compensation (highest consecutive five-year average for those members who join the System on or after April 2, 2012). Benefit payments are based upon a participant's age, length of creditable service, regular compensation, and group classification.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements (continued)

1. Plan Description (continued)

Participants become vested after ten years of creditable service. Effective July 1, 1998, Chapter 32 of the M.G.L. assigned the authority to establish and amend benefit provisions and grant cost-of-living increases for the Plan to the Boston Retirement Board.

If a member in service dies due to causes unrelated to his or her job, the surviving spouse and/or surviving dependent children may receive retirement allowance benefits, either in a lump sum or in the form of an annuity, based on the length of service, contributions, and age. In the event there is no spouse and/or dependent children named, other beneficiaries may be entitled to a lump-sum distribution. Participants who become permanently and totally disabled from further duty may be eligible to receive accidental or ordinary disability retirement benefits.

Accidental disability is provided to members with incapacitation resulting from a work-related injury or hazard. Generally, annual pension benefits are provided based on 72% of the annual rate of regular compensation a member earned while an active employee on date of injury or average annual rate of regular compensation. Ordinary disability is available to any member whose permanent incapacitation is not work-related and has attained ten years of creditable service. Such benefits are provided as if the member had attained the age of 55 (or actual age if over 55) based on the amount of creditable service actually earned. Limits are placed on how much a disability employee can earn from other sources while collecting a disability retirement pension.

2. Summary of Significant Accounting Policies

Financial Reporting Entity

Because of the significance of its operational and financial relationship with the City, the System is included as a component unit reported as a pension trust fund in the City's basic financial statements. The System adheres to reporting requirements established by the Government Accounting Standards Board (GASB).

Basis of Accounting

The accompanying financial statements are presented on the accrual basis of accounting.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements (continued)

2. Summary of Significant Accounting Policies (continued)

Cash Equivalents

Highly liquid investments with maturities of three months or less at date of purchase are considered to be cash equivalents.

Short-Term Investment Funds

Cash balances maintained by investment managers are recorded as short-term investments on the statement of fiduciary net position.

Revenue Recognition

Contributions are recognized as additions in the period when they become due pursuant to formal statutory obligations. Investment income is recognized when earned.

Benefit Payments and Refunds of Contributions

Benefits and refunds to plan members and beneficiaries are recognized as expenses when due and payable in accordance with the terms of the Plan.

Intergovernmental, Reimbursements, and Transfers to Other Systems

When members transfer to or from other Massachusetts public retirement systems, their cumulative contributions are transferred from the prior employer to the respective Massachusetts public retirement system, and are recognized as receipts or expenses when paid. Additionally, the prior employer reimburses the respective system for a pro rata portion of such members' pension benefits (based on years of service) upon retirement.

Valuation of Investments and Income Recognition

The Plan's investments are stated at fair value. Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date (an exit price). See Note 4 for further discussion and disclosures related to fair value measurements.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements (continued)

2. Summary of Significant Accounting Policies (continued)

Following is a description of the valuation techniques and inputs used for each major class of assets and liabilities measured at fair value.

Short-Term, Equity and Fixed Income Investments

Securities traded on a national or international exchange are valued at the last reported sales price at current exchange rates. Certain fixed income securities not traded on an exchange are valued using a matrix pricing technique. Matrix pricing is used to value securities based on the securities' relationship to benchmark quoted prices.

Pooled Funds

The fair value of shares in managed investment pools is based on unit values reported by the funds.

Alternative Investments

Alternative investments include hedge funds, holdings through commingled limited partnerships of venture capital funds, including equity interests in early, middle, and later stage companies, as well as debt and equity interests in buyouts, acquisitions, restructurings, mezzanine structures and special situations, such as litigation or spin-off activities. These investments are carried at the limited partnership interest or redemption value, the equivalent of net asset value, which approximates fair value. Values assigned to such investments are based on available information and do not necessarily represent amounts that may ultimately be realized in liquidation. Liquidation values depend largely on future circumstances, including marketability, and frequently cannot reasonably be estimated until at, or near, the liquidation date.

Real Estate

Real estate investments consist of interests in commercial properties held by various partnerships and other limited liability entities, some of which utilize debt financing. Fair values of such holdings are reported based on the net asset values of the entities, which are estimated using third-party appraisals and other information provided by property managers.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements (continued)

2. Summary of Significant Accounting Policies (continued)

Basis of Investment Transactions

Purchases and sales of investments are recorded on the trade date. Transactions unsettled as of the measurement date are recorded as payables for securities purchased and as receivables for securities sold.

Foreign Currency Contracts

The System's investment policy permits it to enter into forward foreign currency contracts for the purpose of hedging foreign currency fluctuations. A forward foreign currency contract is an agreement between two parties to buy or sell a fixed quantity of currency at a set price on a future date. The System may enter into forward foreign currency contracts to hedge its exposure to the effect of changes in foreign currency exchange rates upon its non-U.S. dollar-denominated investments. The contracts are valued daily, and the changes in fair value are recorded by the System as investment income in the statement of changes in fiduciary net position. When the contract is closed, the System records a realized gain or loss equal to the difference between the cost of the contract at the time it was opened and the value at the time it was closed.

3. Cash Deposits, Investments, Securities Lending, and Derivatives

The following disclosures represent essential risk information about the System's deposits and investments.

Investment Policy

The provisions of M.G.L. chapter 32 § 23(2); 840 C.M.R. 16-19, 21, 23, 26; and, the Plan's own investment regulations (stated at <http://www.mass.gov/perac/board-info/profiles/investment/bostonintsup.html>) govern the System's investment practice.

Diversification is attained through varied investment management styles that comply with Massachusetts state law. This is accomplished through the retention of investment managers that adhere to M.G.L. chapter 32, § 3(3), the Prudent Person rule.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements (continued)

3. Cash Deposits, Investments, Securities Lending, and Derivatives (continued)

The System has retained an investment consultant to work with The Boston Retirement Board in a fiduciary capacity to assure that strategic investment diversification is attained, to employ investment managers with expertise in their respective asset classes, and to closely monitor the implementation and performance of the respective investment strategies.

The System is currently invested in stocks (domestic and foreign), fixed income securities (domestic and foreign), real estate, private equity, the Commonwealth's Pension Reserve Investment Trust (PRIT) and hedge funds.

The following was the adopted asset allocation policy as of December 31, 2017:

Asset Class	BRS Excluding Boston Teachers – Target Allocation	Boston Teachers – Target Allocation
Domestic equity	25%	17.5%
International developed markets equity	16	15.5
International emerging markets equity	11	6
Core fixed income	11	12
High yield fixed income	13	10
Real estate	10	10
Commodities	0	4
Hedge fund, GTAA, Risk parity	7	13
Private Equity	7	12
Total	<u>100%</u>	<u>100%</u>

Rate of Return

For the year ended December 31, 2017, the annual money-weighted rate of return on pension plan investments, net of pension plan investment expense, was 17.7 percent. The money-weighted rate of return expresses investment performance, net of investment expense, adjusted for the changing amounts actually invested.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements (continued)

3. Cash Deposits, Investments, Securities Lending, and Derivatives (continued)

Interest Rate Risk

The following is a listing of the System's fixed income investments (in thousands) and related maturity schedule (in years) as of December 31, 2017:

Investment Type	Fair Value	Less Than 1	1-5	6-10	More Than 10
U.S. treasury notes and bonds	\$ 189,398	\$ 2,785	\$ 92,240	\$ 79,392	\$ 14,981
U.S. agencies	53,581	-	457	372	52,752
Domestic corporate	762,627	1,462	93,404	168,222	499,539
Municipal	2,689	-	1,750	-	939
International corporate	31,214	459	8,072	17,466	5,217
International government	11,242	176	3,540	4,382	3,144
Asset-backed:					
CMOs	14,851	11	-	658	14,182
Other	29,567	-	7,625	5,386	16,556
	<u>\$ 1,095,169</u>	<u>\$ 4,893</u>	<u>\$ 207,088</u>	<u>\$ 275,878</u>	<u>\$ 607,310</u>

The System's guidelines do not specifically address limits on maturities as a means of managing its exposure to fair value losses arising from increasing interest rates. The managers of each fixed income portfolio are responsible for determining the maturity and commensurate returns of their portfolio.

The collateralized mortgage obligations (CMOs) held by the System as of December 31, 2017, are highly sensitive to changes in interest rates.

Credit Risk

The System allows investment managers to apply discretion under the Prudent Person rule. Investments are made, as a prudent person would be expected to act with discretion and intelligence, to seek reasonable income, preserve capital and, in general, avoid speculative investments.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements (continued)

3. Cash Deposits, Investments, Securities Lending, and Derivatives (continued)

The System's fixed income investments as of December 31, 2017, were rated by Standard & Poor's and/or an equivalent national rating organization and the ratings are presented below (in thousands) using the Standard & Poor's rating scale:

Investment Type	Fair Value	AAA	AA	A	BBB	BB	B	CCC	Not Rated
U.S. agencies	\$ 53,581	\$ -	\$ 265	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 53,316
Domestic									
corporate	762,627	1,051	3,318	13,636	39,111	33,635	50,312	46,774	574,790
Municipal	2,689	-	2,328	123	238	-	-	-	-
International									
corporate	31,214	149	525	2,579	7,198	12,159	7,799	375	430
International									
government	11,242	721	1,324	908	602	464	-	-	7,223
Asset-backed:									
CMOs	14,851	1,185	-	28	-	-	-	-	13,638
Other	29,567	10,902	3,424	1,046	355	-	-	-	13,840
	<u>\$ 905,771</u>	<u>\$ 14,008</u>	<u>\$ 11,184</u>	<u>\$ 18,320</u>	<u>\$ 47,504</u>	<u>\$ 46,258</u>	<u>\$ 58,111</u>	<u>\$ 47,149</u>	<u>\$663,237</u>

In addition to the above schedule, the System has approximately \$189.4 million invested in U.S. government securities, which are explicitly guaranteed by the U.S. government.

Concentration Risk

Other than the PRIT fund, the System has no investments at fair value that exceed 5% of the System's total investments as of December 31, 2017.

The System adheres to the provisions of M.G.L. chapter 32 § 23(2); 840 C.M.R. 16-19, 21, 23, 26; and the Plan's own investment regulations when managing concentration risk.

Foreign Currency Risk

Foreign currency risk is the risk that changes in exchange rates will adversely affect the fair value of an investment or a deposit. Similar to the investments in domestic equities, the System employs or encourages its investment advisor to employ diversification, asset allocation, and quality strategies.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements (continued)

3. Cash Deposits, Investments, Securities Lending, and Derivatives (continued)

Risk of loss arises from changes in currency exchange rates. The System's exposure to foreign currency risk is presented on the following table (in thousands):

Currency	Cash and Short-Term Investments	Fixed Income	Equity	Alternative	Total
Argentina	\$ 10	\$ 95	\$ —	\$ —	\$ 105
Australian dollar	78	716	30,649	—	31,443
Austria	—	—	1,829	—	1,829
Belgium	—	—	7,727	—	7,727
Brazilian real	10	208	—	—	218
Canadian dollar	107	696	299	—	1,102
Chile	2	—	—	—	2
Columbian peso	7	102	—	—	109
Danish krone	35	169	14,566	—	14,770
Euro currency	980	—	—	1,612	2,592
Finland	—	227	5,684	—	5,911
France	—	711	66,647	—	67,358
Germany	—	1,051	52,309	—	53,360
Hong Kong dollar	9	—	22,388	—	22,397
Indonesian rupiah	8	358	264	—	630
Ireland	—	129	—	—	129
Israel	5	—	523	—	528
Italy	—	588	19,484	—	20,072
Japanese yen	30	2,384	99,694	—	102,108
Korea	54	—	7,700	—	7,754
Luxembourg	—	—	724	—	724
Malaysian ringgit	6	71	—	—	77
Mexican peso	24	239	—	—	263
Netherlands	—	259	31,175	—	31,434
New Zealand dollar	15	223	1,319	—	1,557
Norwegian krone	10	216	1,199	—	1,425
Polish zloty	12	44	—	—	56
Portugal	—	—	1,982	—	1,982
Pound sterling	293	1,866	71,310	19,131	92,600
Romania	—	25	—	—	25
Singapore dollar	22	160	1,445	—	1,627
South African rand	11	256	—	—	267

Boston Retirement System
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Notes to Financial Statements (continued)

3. Cash Deposits, Investments, Securities Lending, and Derivatives (continued)

Spain	–	535	20,290	–	20,825
Swedish krona	12	92	9,461	–	9,565
Swiss franc	70	149	36,322	–	36,541
Thailand Baht	33	121	–	–	154
Uruguay	–	62	–	–	62
Total securities subject to foreign currency risk	1,843	11,752	504,990	20,743	539,328
U.S. dollars (securities held by international investment managers)	–	32,386	207,552	–	239,938
Total international investment securities	<u>\$ 1,843</u>	<u>\$ 44,138</u>	<u>\$ 712,542</u>	<u>\$ 20,743</u>	<u>\$ 779,266</u>

PRIT External Investment Pooled Fund

The Massachusetts legislature enacted Section 17 of Chapter 112 of the Acts of 2010 that requires the System to invest all assets, current and future, related to Boston Teachers in the PRIT pooled fund. The PRIT pooled fund is an external investment pool that is not registered with the Securities and Exchange Commission, but is subject to oversight provided by the Pension Reserves Investment Management Board (the PRIM Board). The PRIM Board was created by legislation to provide general supervision of the investments and management of PRIT. PRIT is not a rated fund.

The fair value of the PRIT pooled fund is based on unit value as reported by management of the PRIT pooled fund. The PRIT fund issues separately available audited financial statements with a year-end of June 30.

On July 1, 2010, the System transferred 27% of its assets, or \$1.1 billion, to the PRIT pooled fund. As of December 31, 2017, the System had the following amounts invested in the PRIT fund (in thousands):

General allocation account	\$ 1,572,852
Cash fund	<u>131,350</u>
Total PRIT pooled funds	<u><u>\$ 1,704,202</u></u>

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements (continued)

3. Cash Deposits, Investments, Securities Lending, and Derivatives (continued)

As of December 31, 2017, the general allocation account is diversified into the following:

<u>Asset Class</u>	<u>Percentage</u>
Core fixed income	12.4%
Domestic equity	19.4
Emerging markets	8.2
Equity Hedge Fund	1.1
Hedge funds	7.8
Other Credit Opportunities	0.2
International equity	18.3
Liquidating portfolio	0.3
Private equity	10.2
Risk Premia	0.9
Real Assets	0.5
Real estate	8.1
Cash overlay	1.2
Distressed debt	1.7
Timber natural resources	3.6
Value-added fixed income	6.1
Total	<u><u>100.0%</u></u>

Securities Lending Transactions

The Public Employee Retirement Administration Commission (PERAC) has issued supplemental regulations that permit the System to engage in securities lending transactions. Securities lending is an investment management enhancement that utilizes certain existing securities of the Plan to earn additional income. These transactions are conducted by the System's custodian, who lends certain securities owned by the System to broker-dealers and banks pursuant to a form of loan agreement. The System and the borrowers maintain the right to terminate all securities lending transactions on demand.

Securities lending involves the loaning of securities to approved banks and broker-dealers. In return for the loaned securities, the custodian, prior to or simultaneous with delivery of the loaned securities to the borrower, receives collateral in the form of cash (including both U.S. and foreign currency) or U.S. government securities, sovereign debt of foreign countries, and

Boston Retirement System
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Notes to Financial Statements (continued)

3. Cash Deposits, Investments, Securities Lending, and Derivatives (continued)

irrevocable bank letters of credit as collateral to serve as a safeguard against possible default of any borrower on the return of the loan. The custodian does not have the ability to pledge or sell collateral unless the borrower defaults. Borrowers are required to deliver collateral in amounts equal to not less than 100% of the market value of the loaned securities. The collateral is marked to market on a daily basis. In the event the counterparty is unable to meet its contractual obligation under the securities lending arrangement, the Plan may incur losses equal to the amount by which the market value of the securities differs from the amount of collateral held. The Plan mitigates credit risk associated with securities lending arrangements by monitoring the fair value of the securities loaned on a daily basis, with additional collateral obtained or refunded as necessary. At December 31, 2017, the System had no credit risk exposure to borrowers because the amounts the System owed the borrowers exceeded the amounts owed to the System.

The System does not impose any restrictions on the amount of securities lent on its behalf by the custodian. There were no failures by any borrowers to return loaned securities or pay distributions thereon and there were no losses from a default of the borrowers or the custodian for the year ended December 31, 2017. The cash collateral received by the custodian on each loan was invested, together with the cash collateral of other qualified tax-exempt plan lenders, in a collective investment pool. The relationship between the average maturities of the investment pool and loans was affected by the maturities of the loans made by other plans that invested cash collateral in the collective investment pool, which the System could not determine.

The Plan maintains full ownership rights to the securities loaned and, accordingly, classifies loaned securities as investments. At December 31, 2017, the fair value of securities loaned by the System amounted to \$291,308,969, against which was held collateral at fair value of \$306,380,113 as follows (in thousands):

Short-term collateral investment pool	\$ 173,522
Noncash collateral	<u>132,858</u>
	<u>\$ 306,380</u>

Commitments

At December 31, 2017, the System had contractual commitments to provide \$204 million of additional funding to private equity funds and \$84 million to real estate funds.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements (continued)

3. Cash Deposits, Investments, Securities Lending, and Derivatives (continued)

Derivatives

The System trades financial instruments with off-balance sheet risk in the normal course of its investing activities to assist in managing exposure to market risks. The System uses forward foreign currency contracts to hedge against the risk of future foreign currency fluctuations. As of December 31, 2017, the System had 24 forward foreign currency contracts with a net notional amount of \$6,077,144 and fair value of \$(19,305).

4. Fair Value Measurements

The fair value framework establishes a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. The fair value hierarchy gives the highest priority to unadjusted quoted prices in active markets for identical assets and liabilities (Level 1) and the lowest priority to unobservable inputs (Level 3). The three levels of the fair value hierarchy are described below:

- Level 1 – Unadjusted quoted prices in active markets that are accessible to the reporting entity at the measurement date for identical assets and liabilities.
- Level 2 – Inputs other than quoted prices in active markets for identical assets and liabilities that are observable either directly or indirectly for substantially the full term of the asset or liability. Level 2 inputs include the following:
 - Quoted prices for similar assets and liabilities in active markets
 - Quoted prices for identical or similar assets or liabilities in markets that are not active
 - Observable inputs other than quoted prices that are used in the valuation of the asset or liabilities (e.g., interest rate and yield curve quotes at commonly quoted intervals)
 - Inputs that are derived principally from or corroborated by observable market data by correlation or other means
- Level 3 – Unobservable inputs for the asset or liability (i.e., supported by little or no market activity). Level 3 inputs include management’s own assumption about the assumptions that market participants would use in pricing the asset or liability (including assumptions about risk).

Boston Retirement System
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Notes to Financial Statements (continued)

4. Fair Value Measurements (continued)

The level in the fair value hierarchy within which the fair value measurement is classified is determined based the lowest level input that is significant to the fair value measure in its entirety.

The following table sets forth by fair value hierarchy level, the Plan's assets carried at fair value at December 31, 2017 (in thousands):

	Total at December 31, 2017	Fair Value Measurements Using:		
		Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Short-term:				
Domestic	\$ 59,258	\$ 59,258	\$ —	\$ —
International	7,333	7,333	—	—
Total short-term	66,591	66,591	—	—
U.S. equities:				
Large cap core	773,900	773,900	—	—
Large cap growth	135,436	135,436	—	—
Large cap value	128,001	128,001	—	—
Small cap core	99,597	99,597	—	—
Small cap growth	137,660	137,660	—	—
Small cap value	100,383	100,383	—	—
Total U.S. equities	1,374,977	1,374,977	—	—
International equities	1,372,795	1,372,795	—	—
Fixed income securities:				
U.S. treasury securities	189,398	189,398	—	—
Corporate debt securities	762,627	451,816	310,811	—
Global multi-sector fixed income	42,456	—	42,456	—
Municipal	2,689	—	2,689	—

Boston Retirement System
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Notes to Financial Statements (continued)

4. Fair Value Measurements (continued)

	Total at December 31, 2017	Fair Value Measurements Using:		
		Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Fixed income securities: (cont'd)				
CMO	\$ 14,851	\$ –	\$ 14,851	\$ –
Other asset backed securities	29,567	–	29,567	–
U.S. agencies	53,581	–	53,581	–
Total fixed income securities	1,095,169	641,214	453,955	–
Total investments by fair value level	3,909,532	\$ 3,455,577	\$ 453,955	\$ –
Government external investment pool:				
PRIT fund	1,572,852			
Investments measured at the net asset value (NAV):				
Hedge fund of funds	223,180			
Private equity funds	268,655			
Private real estate funds	429,435			
Total investments measured at the NAV	921,270			
Total investments at fair value	\$ 6,403,654			

Fixed income and equity securities classified in Level 1 of the fair value hierarchy are valued using prices quoted in active markets for those securities. Fixed income securities classified in Level 2 of the fair value hierarchy are valued using a matrix pricing technique. Matrix pricing is used to value securities based on the securities' relationship to benchmark quoted prices.

The PRIT pooled fund is an external investment pool that is not registered with the Securities and Exchange Commission, but is subject to oversight provided by the Pension Reserves Investment Management Board (the PRIM Board). The PRIM Board was created by legislation to provide general supervision of the investments and management of PRIT. PRIT is not a rated fund. The fair value of the PRIT pooled fund is based on unit value as reported by management of the PRIT pooled fund. The PRIT fund issues separately available audited financial statements with a year-end of June 30. The Plan is required to provide a 30-day redemption notice for this investment.

Boston Retirement System
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Notes to Financial Statements (continued)

4. Fair Value Measurements (continued)

The valuation method for investments measured at the net asset value (NAV) per share (or its equivalent) is presented on the following table (in thousands).

	Investments Measured at the NAV			
	Fair Value	Unfunded Commitments	Redemption Frequency	Redemption Notice Period
Global multi-strategy hedge fund of funds ¹	\$ 223,180	\$ –	Quarterly	60-90 days
Real estate funds ²	429,435	84,007		
Private equity funds ³	268,655	203,735		

1. Global Multi-strategy Hedge Fund of Funds. This type includes investments in 5 hedge funds that invest in other hedge fund managers. Management of each hedge fund is given full discretion to invest with direct hedge fund managers. The fair value of the investments in this type has been determined using the NAV per share of the investments.
2. Real Estate Funds. This type includes 29 real estate funds that invest primarily in U.S. commercial real estate. The fair values of the investments in this type have been determined using the NAV per share (or its equivalent) of the System's ownership interest in partners' capital. Distributions from each fund will be received as the underlying investments of the funds are liquidated. It is expected that the underlying assets of the funds will be liquidated over the next 7 to 10 years.
3. Private Equity Funds. This type includes 60 private equity funds that invest primarily in U.S. companies. These investments can never be redeemed with the funds; instead, the nature of the investments in this type is that distributions are received through the liquidation of the underlying assets of the funds. It is expected that the underlying assets of the funds will be liquidated over the next 7 to 10 years.

Boston Retirement System
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Notes to Financial Statements (continued)

5. Contributions and Funding Policy

Participating employers are required to pay into the System their share of the remaining actuarially determined contribution and plan administration costs, which are apportioned among the participating employers based on an actuarial computation.

The participating employers' actual contributions to the System for the year ended December 31, 2017 were as follows (in thousands):

City of Boston	\$ 210,373
Commonwealth of Massachusetts (Boston Teachers)	131,298
Sheriff of Suffolk County	3,875
Boston Housing Authority	13,054
Boston Public Health Commission	19,264
Boston Redevelopment Authority	2,530
Boston Water and Sewer Commission	11,069
	<u>\$ 391,463</u>

As a condition of participation, employees are required to contribute 5% of their salary if hired prior to January 1, 1975; 7% if hired after January 1, 1975, and before January 1, 1984; 8% if hired after January 1, 1984, and before July 1, 1996; and 9% if hired after July 1, 1996. Employees hired after January 1, 1979, contribute an additional 2% of earnings in excess of \$30,000 per year. Additionally, teachers who became members of the System after June 30, 2001, or other teachers who elect this option, are required by law to contribute 11% of their salary. Overtime and certain additional earnings are not subject to these assessments and are not considered in the determination of final average salary.

Boston Retirement System
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Notes to Financial Statements (continued)

6. Legally Required Reserve Accounts

The balances in the System's legally required reserves at December 31, 2017, were as follows (in thousands):

		<u>Purpose</u>
Annuity Savings Fund	\$ 1,763,239	Active members' contribution balance
Annuity Reserve Fund	440,791	Retired members' contribution account
Military Service Fund	50	Members' contribution account while on military leave
Pension Reserve Fund	4,431,640	Amounts appropriated to fund future retirement benefits
Pension Fund	130,771	Remaining net position
	<u>\$ 6,766,491</u>	

All reserve accounts are funded at levels required by state statute.

7. Net Pension Liability of Participating Employers

The components of the net pension liability of the participating employers are as follows (in thousands):

	<u>December 31, 2017</u>	<u>January 1, 2017</u>
Total pension liability	\$ 10,786,155	\$ 10,011,688
Plan fiduciary net position	6,766,491	5,851,083
Employers' net pension liability	<u>\$ 4,019,664</u>	<u>\$ 4,160,605</u>
Plan fiduciary net position as a percentage of the total pension liability	62.73%	58.44%

Boston Retirement System
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Notes to Financial Statements (continued)

7. Net Pension Liability of Participating Employers (continued)

Actuarial assumptions. The total pension liability as of December 31, 2017 was measured by an actuarial valuation as of December 31, 2015, using the following actuarial assumptions, applied to all periods included in the measurement:

Inflation 3.25% for BRS excluding Teachers, 3.25% for Teachers
Salary increases:

Years of Service	Boston Teachers	BRS Excluding Boston Teachers		
		Group 1	Group 2	Group 4
0	7.50%	4.00%	4.25%	4.50%
1	7.10	4.00	4.25	4.50
2	7.00	4.00	4.25	4.50
3	6.90	4.00	4.25	4.50
4	6.80	4.00	4.25	4.50
5	6.70	4.00	4.25	4.50
6	6.60	4.00	4.25	4.50
7	6.50	4.00	4.25	4.50
8	6.30	4.00	4.25	4.50
9	6.10	4.00	4.25	4.50
10	5.90	4.00	4.25	4.50
11	5.70	4.00	4.25	4.50
12	5.20	4.00	4.25	4.50
13	4.70	4.00	4.25	4.50
14	4.35	4.00	4.25	4.50
15–16	4.20	4.00	4.25	4.50
17–19	4.10	4.00	4.25	4.50
20 and later	4.00	4.00	4.25	4.50

Investment rate of return 7.50% for BRS excluding Boston Teachers and 7.35% for Boston Teachers, net of investment expenses, including inflation (previously, 7.75% for BRS excluding Teachers and 7.50% for Teachers)

Boston Retirement System
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Notes to Financial Statements (continued)

7. Net Pension Liability of Participating Employers (continued)

Cost of Living Adjustments	3% of first \$14,000 (previously 3% of first \$13,000)
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Mortality Rates

December 31, 2016 TPL

Healthy	RP-2000 Employee and Healthy Annuitant Mortality Tables projected generationally using Scale BB2D from 2009 for BRS excluding Boston Teachers and RP-2014 Employee and Healthy Annuitant Mortality Tables projected generationally using Scale BB2D from 2014 for Boston Teachers
Disabled	RP-2000 Healthy Annuitant Mortality Table projected generationally with Scale BB2D from 2015 for BRS excluding Boston Teachers and RP-2014 Healthy Annuitant Mortality Table set forward four years projected generationally using Scale BB2D from 2014 for Boston Teachers

December 31, 2017 TPL

Healthy	RP-2014 Blue Collar Employee and Healthy Annuitant Mortality Tables set forward 1 year for female participants projected generationally using Scale MP-2017 for BRS excluding Teachers and RP-2014 White Collar Employee and Healthy Annuitant Mortality Tables projected generationally with Scale MP-2016 for Teachers
Disabled	RP-2014 Blue Collar Healthy Annuitant Mortality Table set forward 1 year projected generationally using Scale MP-2017 for BRS excluding Teachers and RP-2014 Healthy Annuitant Mortality Table set forward four years projected generationally using Scale BB2D from 2014 for Teachers

Boston Retirement System
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Notes to Financial Statements (continued)

7. Net Pension Liability of Participating Employers (continued)

The long-term expected rate of return on pension plan investments was determined using a building-block method in which expected future real rates of return (expected returns, net of inflation) are developed for each major asset class. These returns are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage, adding expected inflation and subtracting expected investment expenses and a risk margin. The target allocation (approved by the Board) and the projected arithmetic real rates of return for each major asset class, after deducting inflation, but before investment expenses, used in the derivation of the long-term expected investment rate of return assumption are summarized in the following table:

<u>Asset Class</u>	<u>Long-Term Expected Real Rate of Return</u>
Domestic equity	6.15%
International developed markets equity	7.11
Emerging markets equity	9.41
Core fixed income	1.68
High yield fixed income	4.13
Real estate	4.90
Commodities	4.71
Hedge fund, GTAA, Risk parity	3.94
Private equity	10.28

Discount rate: The discount rates used to measure the TPL and NPL as of December 31, 2017 was 7.50% for the BRS excluding Boston Teachers and 7.35% for Boston Teachers. The discount rates used to measure the TPL and NPL as of December 31, 2016 were 7.75% for the BRS excluding Teachers and 7.50% for the Teachers. The projection of cash flows used to determine the discount rate assumed plan member contributions will be made at the current contribution rate and that employer contributions will be made at rates equal to the actuarially determined contribution rates. For this purpose, only employer contributions that are intended to fund benefits for the current plan members and beneficiaries, as well as projected contributions from future plan members, are not included. Based on those assumptions, the Plan Fiduciary Net Position (FNP) was projected to be available to make all projected future benefit payments for current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the TPL as of both December 31, 2017.

Boston Retirement System
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Notes to Financial Statements (continued)

7. Net Pension Liability of Participating Employers (continued)

Sensitivity of the net pension liability to changes in the discount rate. The following presents the net pension liability of the Boston Retirement System, calculated using the discount rate of 7.50% for the BRS excluding Boston Teachers and 7.35% for the Boston Teachers, as well as what the Boston Retirement System’s net pension liability would be if it were calculated using a discount rate that is 1-percentage-point lower (6.50% for the BRS excluding Boston Teachers and 6.35% for the Boston Teachers) or 1-percentage-point higher (8.50% for the BRS excluding Boston Teachers and 8.35% for the Boston Teachers) than the current rate (in thousands):

	1% Decrease	Current Discount	1% Increase
Boston Retirement System’s net pension liability as of December 31, 2017	\$ 5,253,711	\$ 4,019,664	\$ 2,984,051

8. Contingencies

There are various pending claims arising in the ordinary course of operations; however, management believes that the probable liability resulting from such claims and litigation would not materially affect the System’s financial position.

9. Commitments

During fiscal year 2008, the System signed a memorandum of understanding with the City for the purpose of financing the development, design, purchase, and installation of a pension management system of \$16.0 million. Subsequently, the System obtained an additional \$4.6 million and, therefore, is committed to repaying the City \$20.6 million. As of December 31, 2017, approximately \$17.8 million has been repaid. Refer to Note 3 for additional disclosures regarding commitments.

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Notes to Financial Statements (continued)

10. Tax Status

The Plan has received a determination letter from the Internal Revenue Service dated August 13, 2014, stating that the Plan is qualified under Section 401(a) of the Internal Revenue Code (the Code) and therefore, the related trust is exempt from taxation. Once qualified, the Plan is required to operate in conformity with the Code to maintain its qualified status. The plan administrator believes the Plan is being operated in compliance with the applicable requirements of the Code and therefore, believes the Plan is qualified and the related trust is tax exempt.

The Plan is subject to routine audits by taxing jurisdictions; however, there are currently no audits for any tax periods in progress.

11. Subsequent Events

Management has evaluated subsequent events through September 12, 2018, the date that the financial statements were available to be issued, and concluded that no material events have occurred that would require recognition or disclosure.

Required Supplementary Information

Boston Retirement System
(A Component Unit of the City of Boston, Massachusetts)

Schedule of Changes in the Net Pension Liability – Last Ten Years

Year Ended December 31, 2017

	2017	2016	2015	2014
Total pension liability				
Service cost	\$ 204,906,499	\$ 200,166,141	\$ 194,996,031	\$ 184,938,621
Interest	758,643,816	755,579,729	739,499,439	705,610,897
Differences between expected and actual experience	–	(318,650,369)	–	–
Changes of assumptions	377,158,333	–	89,776,142	94,626,461
Changes of benefit terms	45,062,181	–	–	–
Benefit payments, including refunds of employee contributions	(611,304,014)	(594,950,681)	(576,941,443)	(550,984,406)
Net change in total pension liability	774,466,815	42,144,820	447,330,169	434,191,573
Total pension liability – beginning	10,011,687,897	9,969,543,077	9,522,212,908	9,088,021,335
Total pension liability – ending (a)	\$ 10,786,154,712	\$ 10,011,687,897	\$ 9,969,543,077	\$ 9,522,212,908
Plan fiduciary net position				
Contributions – employer	\$ 260,164,547	\$ 247,770,904	\$ 218,812,904	\$ 203,074,621
Contributions – non employer contributing entity	131,298,000	132,477,000	120,434,000	114,335,385
Contributions – employee	154,937,098	153,879,817	147,090,451	143,397,524
Net investment income	987,384,683	360,333,280	(15,257,000)	283,342,371
Benefit payments, including refunds of employee contributions	(611,304,014)	(594,950,681)	(576,982,464)	(550,984,406)
Administrative expenses	(7,072,347)	(7,720,520)	(8,951,662)	(10,215,495)
Net change in fiduciary net position	915,407,967	291,789,800	(114,853,771)	182,950,000
Plan fiduciary net position – beginning	5,851,083,170	5,559,293,370	5,674,147,141	5,491,197,000
Plan fiduciary net position – ending (b)	\$ 6,766,491,137	\$ 5,851,083,170	\$ 5,559,293,370	\$ 5,674,147,000
Net pension liability – ending: (a)-(b)	\$ 4,019,663,575	\$ 4,160,604,727	\$ 4,410,249,707	\$ 3,848,065,908
Plan’s fiduciary net position as a percentage of the total pension liability	62.23 %	58.44 %	55.76 %	59.59 %
Covered payroll	\$ 1,547,478,524	\$ 1,498,768,546	\$ 1,493,958,273	\$ 1,444,652,177
Net pension liability as a percentage of covered payroll	259.76 %	277.60 %	295.21 %	266.37 %

Note: Schedule is intended to show information for ten years. Historical information prior to implementation of GASB 67 is not required if the information is not available. Additional years will be displayed as they become available.

Note: Total pension liability and Plan fiduciary net position calculations were completed separately for the BRS excluding Boston Teachers and the Boston Teachers.

Note: Covered payroll for 2017 and 2016 as estimated from the January 1, 2016 valuation report.

Boston Retirement System
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Schedule of Contributions – Last Ten Years

Year Ended December 31, 2017
(In Thousands)

Year Ended December 31	Actuarially Determined Contribution	Contributions in Relation to the Actuarially Determined Contribution	Contribution Deficiency (Excess)	Covered Payroll	Contributions as a Percentage of Covered Payroll
2017	\$ 391,463	\$ 391,463	\$ –	\$ 1,547,479	25.30%
2016	368,248	380,248	(12,000)	1,498,769	25.37%
2015	339,247	339,247	–	1,493,958	22.71%
2014	312,560	312,560	–	1,444,652	21.64%
2013	288,458	288,458	–	N/A	N/A
2012	261,943	261,943	–	N/A	N/A
2011	245,280	245,280	–	N/A	N/A
2010	463,656	463,656	–	N/A	N/A
2009	250,823	250,823	–	N/A	N/A
2008	239,039	239,039	–	N/A	N/A

Boston Retirement System
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Schedule of Investment Returns – Last Ten Years

Year Ended December 31, 2017

Annual money-weighted rate of return, net of investment expense

2017	17.75%
2016	7.15%
2015	0.15%
2014	5.72%

Note: Schedule is intended to show information for ten years. Historical information prior to implementation of GASB 67 is not required if the information is not available. Additional years will be displayed as they become available.

Boston Retirement System
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Notes to Required Supplementary Information

December 31, 2017

Changes of Benefit Terms:

As permitted by Section 63 of Chapter 139 of the Acts of 2012, the Plan has increased the Section 101 annual allowance from \$6,000 to \$12,000.

Changes of Assumptions:

The following assumptions were changed effective January 1, 2016:

The salary increase assumption for BRS excluding Teachers was lowered from 4.50% per year for Group 1 members, 4.75% per year for Group 2 members, and 5.00% per year for Group 4 members, including an allowance for inflation of 4.50% per year, to 4.00% per year for Group 1 members, 4.25% per year for Group 2 members, and 4.50% per year for Group 4 members, including an allowance for inflation of 3.25% per year.

The administrative expense assumption was changed from \$8,417,000 for calendar 2014, with 70% or \$5,891,900, assigned to the BRS excluding Teachers, to \$9,500,000 for calendar 2016, with 70%, or \$6,650,000, assigned to the BRS excluding Teachers.

The investment return assumption was lowered from 8.00% to 7.50% for the Teachers.

The percentage of pre-retirement deaths assumed to be job-related accidental deaths was increased from 55% to 75% for the Teachers.

The following assumptions were changed effective January 1, 2018:

BRS excluding Teachers:

The investment rate of return assumption was lowered from 7.75% to 7.5%.

Mortality tables for non-disabled participants were updated from the RP 2000 Employee and Healthy Annuitant Mortality Tables projected generationally using Scale BB2D from 2009 to the RP-2014 Blue Collar Employee and Healthy Annuitant Mortality Tables set forward 1 year for female participants projected generationally using Scale MP-2017.

Mortality tables for disabled participants were updated from the RP-2000 Healthy Annuitant Mortality Table projected generationally using Scale BB2D from 2015 to the RP-2014 Blue Collar Healthy Annuitant Mortality Table set forward 1 year projected generationally using Scale MP-2017.

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Notes to Required Supplementary Information (continued)

Teachers:

The investment rate of return assumption was lowered from 7.50% to 7.35%.

Mortality tables for non-disabled participants were updated from the RP-2014 Employee and Healthy Annuitant Mortality Tables projected generationally using Scale BB2D to the RP-2014 White Collar Employee and Healthy Annuitant Mortality Tables projected generationally with Scale MP-2016.

Changes in Plan Provisions:

The following plan change was reflected in the January 1, 2018 actuarial valuation:

As permitted by Section 19 of the Acts of 2010, the Cost of Living Adjustment base was increased from \$13,000 to \$14,000 effective July 1, 2017.

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Notes to Required Supplementary Information (continued)

Method and Assumptions Used in Calculations of Actuarially Determined Contributions.

The actuarially determined contribution rates presented in the schedule of contributions are calculated as of December 31, 2015. The funding requirements are established for the employers' fiscal year ended June 30, 2017, and later years and are analyzed based on the preceding two years' experience. The following actuarial methods and assumptions were used to determine contribution rates reported in that schedule:

Valuation Date	Actuarially Determined Contribution for 2017 is determined with the January 1, 2016 actuarial valuation.
Actuarial cost method	Entry age normal cost method
Amortization method	Prior year's contribution increased by 8.85% for BRS excluding Boston Teachers; prior year's contribution increased by 8.94% for Boston Teachers
Remaining amortization period	9 years remaining as of January 1, 2016 for BRS excluding Boston Teachers; 20 years remaining as of January 1, 2016 for Boston Teachers
Asset valuation method	Sum of actuarial value at beginning of the year, contributions and investment earnings based on the actuarial interest assumption less benefit payments and operating expenses plus 20% of market value at end of year in excess of that sum, plus additional adjustment toward market value as necessary so that final actuarial value is within 20% of market value.
Inflation	3.25% for BRS (previously, 4.50%)
Salary increases	4.00% for Group 1, 4.25% for Group 2 and 4.50% for Group 4 for BRS excluding Boston Teachers; varies by length of service with ultimate rate of 4.00% for Boston Teachers.
Investment rate of return	7.75% for BRS excluding Boston Teachers; 7.50% for Boston Teachers

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