900 7th Street, NW, 2nd Floor
Washington, DC 20001
www.dcrb.dc.gov

Telephone (202) 343-3200
Facsimile (202) 566-5001
E-mail: dcrb.@dc.gov

TO: **BOARD OF TRUSTEES**

FROM: **ERIC O. STANCHFIELD, EXECUTIVE DIRECTOR**

DATE: **DECEMBER 15, 2016**

SUBJECT: **2016 ACTIVE FIREFIGHTERS' ELECTION RESULTS**

The following report reflects the Executive Department's report on the results of the 2016 Firefighters' election results. The only valid Candidate's Statement received by the Election Administrator, the American Arbitration Association, was submitted by Edward C. Smith, which qualifies as an uncontested election.

Under the District of Columbia Retirement Board's Trustee Election Rules (Section 101.2), if only one qualified voter submits a valid statement of candidacy, the Board shall proceed with the certification of election results pursuant to procedures specified in Section 408 as if the candidate had received the highest number of votes [Section 101.2(b)].

Motion: To certify Edward C. Smith as the winner of the 2016 Active Firefighters 'uncontested election.

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DISTRICT OF COLUMBIA RETIREMENT BOARD

MOTION:

To certify Edward C. Smith as the winner of the 2016 Active Firefighters' uncontested election.

PRESENTED TO THE BOARD ON DECEMBER 15, 2016.

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TO: **BOARD OF TRUSTEES**

FROM: **ERIC O. STANCHFIELD, EXECUTIVE DIRECTOR**

DATE: **DECEMBER 15, 2016**

SUBJECT: **2016 ACTIVE TEACHERS' ELECTION RESULTS**

The following report reflects the Executive Department's report on the results of the 2016 active teacher election results. The American Arbitration Association ("AAA") counted ballots on November 29, 2016 for the election of a Trustee to represent the Active Teachers. Adina Dorch, Johniece Harris, and Joan Passerino of DCRB observed the ballot count.

A total of 421 votes were counted, of which 364 were paper ballots and 57 were telephone votes. AAA submitted the certification of results that states the following:

26 Cubby Brown
115 Deborah Hensley
107 Candi Peterson
145 Nathan Saunders
26 Scott Slay
2 Blanks & Voids

Motion: To certify Nathan Saunders as the winner of the 2016 Active Teachers election.

Categories Per 408.7 of Election Rules	Active Teachers
Number of ballots issued	5,241
Number of replacement ballots issued	0
Number of ballots issued, but not cast	4,820
Number of ballots returned and invalidated	2
Number of mail ballots returned and counted	364
Electronic votes cast	57
Number of ballots unused and returned	0
Number of spoiled ballots and returned	0
Total number of votes cast	421
Certified Winner	**Nathan Saunders**

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DISTRICT OF COLUMBIA RETIREMENT BOARD

MOTION:

To certify Nathan Saunders as the winner of the 2016 Active Teachers election.

PRESENTED TO THE BOARD ON DECEMBER 15, 2016.

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TO: **BOARD OF TRUSTEES**

FROM: **ERIC O. STANCHFIELD, EXECUTIVE DIRECTOR**

DATE: **DECEMBER 15, 2016**

SUBJECT: **2016 RETIRED POLICE OFFICERS ELECTION RESULTS**

The following report reflects the Executive Department's report on the results of the 2016 retired police officer's election results. The American Arbitration Association ("AAA") counted ballots on November 29, 2016 for the election of a Trustee to represent the Retired Police Officers. Adina Dorch, Johniece Harris, and Joan Passerino of DCRB observed the ballot count.

A total of 1982 votes were counted, of which 1781 were paper ballots and 201 were telephone votes. AAA submitted the certification of results that states the following:

1476 Louis Cannon
377 Gary Hankins
125 William J. Lawrence
4 Blanks & Voids

Motion: To certify Gary W. Hankins as the winner of the 2016 Retired Police Officers election.

Categories Per 408.7 of Election Rules	Retired Police Officers
Number of ballots issued	4,676
Number of replacement ballots issued	0
Number of ballots issued, but not cast	2,694
Number of ballots returned and invalidated	4
Number of mail ballots returned and counted	1781
Electronic votes cast	201
Number of ballots unused and returned	0
Number of spoiled ballots and returned	0
Total number of votes cast	1982
Certified Winner	**Gary Hankins**

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DISTRICT OF COLUMBIA RETIREMENT BOARD

MOTION:

To certify Gary W. Hankins as the winner of the 2016 Retired Police Officers election.

PRESENTED TO THE BOARD ON DECEMBER 15, 2016.

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EXECUTIVE DIRECTOR REPORT
December 15, 2016

Activities	Updates
OIG Procurement Letter	In late November, DCRB received a request from KPMG, LLP, which was engaged by the District's Office of the Inspector General (OIG) to assist with the conduct of the District's annual procurement operations audit. Although DCRB's interpretation of the current statutory language exempts DCRB from the authority of the District's Procurement Officer, in the spirit of transparency, DCRB has indicated that we will voluntarily comply with the request.
Budget Update	Information related to DCRB's FY 2018 operational budget will be provided in today's Operations Committee Report.
Actuarial Experience Study	As noted previously, Cavanaugh Macdonald will provide the Board with the results of the actuarial experience study early next year. The study will take into consideration the Board's adoption of the new moderate asset allocation policy.
Compensation & Classification Study	An internal Source Selection Evaluation Board (SSEB) has selected the PRM Consulting Group to conduct a Compensation & Classification Study of DCRB positions. We anticipate that the Study will begin early next year and will conclude about mid-year. The last such study was conducted by Carlson Dettman Consulting in 2008.
Fall DCRB Report	The fall DCRB newsletter was mailed to all active and retired members of the Police/Fire and Teachers' Retirement Plans the week of December 5, 2016. Newsletter articles included: the health care open seasons, calendar year 2016 tax information, the Trustee elections, terminating District employment and DCRB's Member Services Center. A copy of the newsletter is attached for your information.
Staff Holiday Luncheon	DCRB's executive leadership team will host a holiday luncheon for staff on Friday, December 16 at DCRB's offices. As in the past, Trustees are welcome and are encouraged to attend.
Staffing Changes Since the Last Board Meeting	**Hire:** **Giovanni Marshmon,** who worked for the Benefits Department as a contractor since December 2015, joined DCRB as a Retirement Analyst on November 21, 2016. Giovanni has an MBA from the University of Maryland, and over ten years of benefits experience in various technical and supervisory roles.

	Termination: **Neda Boularian,** who served as a Contract Administrator, left DCRB on November 18, 2016.
Recent Retirement-Related Articles (attached)	"10 Years After the Pension Protection Act: Effects on DB and DC Plans," National Institute on Retirement Security, Ilana Boivie, November 2016. "CalPERS Balancing Risks in Review of Lower Return Target," Pensions and Investments, Randy Diamond, November 28, 2016. "New Developments in Social Investing by Public Pensions," Center for Retirement Research at Boston College, Issue Brief, Alicia H. Munnell and Anqi Chen, November 2016.

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November 29, 2016

Mr. Daniel W. Lucas
Office of the Inspector General
717 14th Street, N.W.
Washington, D.C. 20005

Re: Audit of District of Columbia's Procurement System

Dear Mr. Lucas:

This letter responds to Mr. David Gmelich's request for KPMG (the Office of the Inspector General's retained auditor) to audit procurement activities at the District of Columbia Retirement Board ("Board Please note that the Board is an independent agency of the District of Columbia created by Congress i under the Retirement Reform Act ("Reform Act," Pub. L. 96-122, codified at D.C. Code §§ 1-701 *et se* exclusive authority and discretion to manage and control the assets of the Police Officers and Fire Figl Retirement Fund (D.C. Code § 1-712) and the Teachers' Retirement Fund (D.C. Code § 1-713).

The codified provision referenced in the letter dated August 19, 2016, D.C. Code §1-301.115a(a)(3)(E) pertains to the OIG's authority to conduct operational audits of all procurement activities carried out pursuant to the chapter governing specified governmental authorities. Pursuant to D.C. Official Code § 2-352.01, the Board's procurements are exempt from the authority of the Chief Procurement Officer and the Procurement Practices Reform Act and thus are not subject to the KPM audit.

However, in the spirit of transparency, the Board will voluntarily provide the requested information. T Board will work diligently to compile the requested data and transmit it to Mr. Gmelich by 5:00 p.m., Friday, December 16, 2016. We welcome the opportunity to meet with you to discuss the Board's procurement rules, processes and opinion with respect to the request for information. Please do not he to contact Sheila Morgan-Johnson, Chief Operations Officer, at 202.343.3200 to coordinate the meetir

Sincerely,

Eric O. Stanchfield
Executive Director

cc: Mr. David Gmelich, KPMG via dgmelich@kpmg.com
Sheila Morgan-Johnson, DCRB Chief Operations Officer

A Publication of the District of Columbia Retirement Board for Active and Retired Police Officers, Firefighters and Teachers

DCRB Report

FALL 2016

Inside

The District of Columbia Retirement Board's mission is to prudently invest the assets of the Police Officers, Firefighters, and Teachers of the District of Columbia, while providing those employees with total retirement services.

From the Chair of the Board

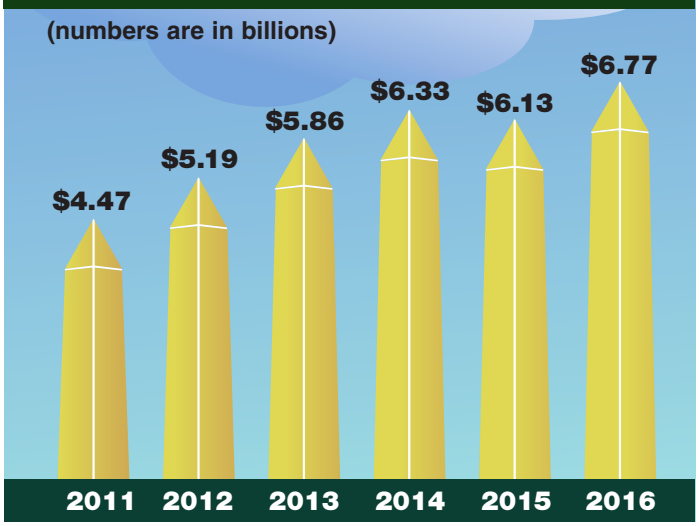
Joseph M. Bress

As the end of another calendar year approaches, I would like to reflect on the changes that 2016 has brought to the District of Columbia Retirement Board ("DCRB" or the "Board"). We have been working on several projects, large and small, with the goal of providing more useful services to you. One such project was the creation and distribution of new, Plan-specific newsletters that have included special information of interest to members of the District of Columbia Police Officers and Firefighters' Retirement Plan and the District of Columbia Teachers' Retirement Plan (the "Plans"). Police Officer and Firefighter members can expect to receive their special-edition newsletter in late winter, and Teacher members should watch their mailboxes (and inboxes) in late summer.

2016 Investment Returns

During the fiscal year ended September 30, 2016, the assets of the D.C. Police Officers and Firefighters' Retirement Fund and the D.C. Teachers' Retirement Fund (collectively referred to as the "Fund") grew by nearly $650 million to a total market value of $6.8 billion, after the payment of all benefits and administrative expenses. Fund investment performance was positively impacted by the recovery in equity and debt markets over the course of the fiscal year, particularly in U.S. and emerging markets equities and emerging markets debt. The Fund generated a gross return of 9.4% (9.3% net of fees), slightly underperforming the Interim Policy Benchmark by 0.7%. The slight underperformance was caused by several investment managers who struggled to keep pace with the changing markets during the year. However, since its inception in October 1982, the Fund has achieved an annualized gross rate of return of 8.7%, exceeding the Board's annual actuarial return target of 6.5%.

Total Market Value of the Fund as of September 30



Awards

I am also pleased to tell you that the Plans continue to be fully funded. In fact, for the eighth consecutive year, DCRB has been presented with the Public Pension Coordinating Council's Recognition Award for Funding for 2016. The award is in recognition of meeting professional standards for plan funding as set forth in the Public Pension Standards. The Council is a confederation of the National Association of State Retirement Administrators (NASRA), the National Conference on Public Employee Retirement Systems (NCPERS), and the National Council on Teacher Retirement (NCTR).

Technology Projects Update

We are currently working on several technology enhancements that will allow us to better serve you. We look forward to announcing them to you as they are completed and come on

Continued on page 2

Health Care Open Season

The District of Columbia Office of Human Resources (DCHR) and the Federal Government's Office of Personnel Management (OPM) have announced that their respective health care open enrollment periods will take place between Monday, November 14 and Monday, December 12, 2016. During this period, members of the Plans who are eligible to participate in the health plans available to District and Federal employees have the opportunity to change their health plan coverage.

Open Enrollment informational packets were mailed to eligible members in early November. The packets contain details about the health plans and dates of health fairs scheduled to take place during the enrollment period. For more information on District and Federal health care plans and open season enrollment, please visit our website homepage at **www.dcrb.dc.gov**, and review the "2017 Open Enrollment" and "Open Enrollment Fairs" announcements. There, you will find information about plans offered and premiums charged, as well as dates and locations of informational fairs.

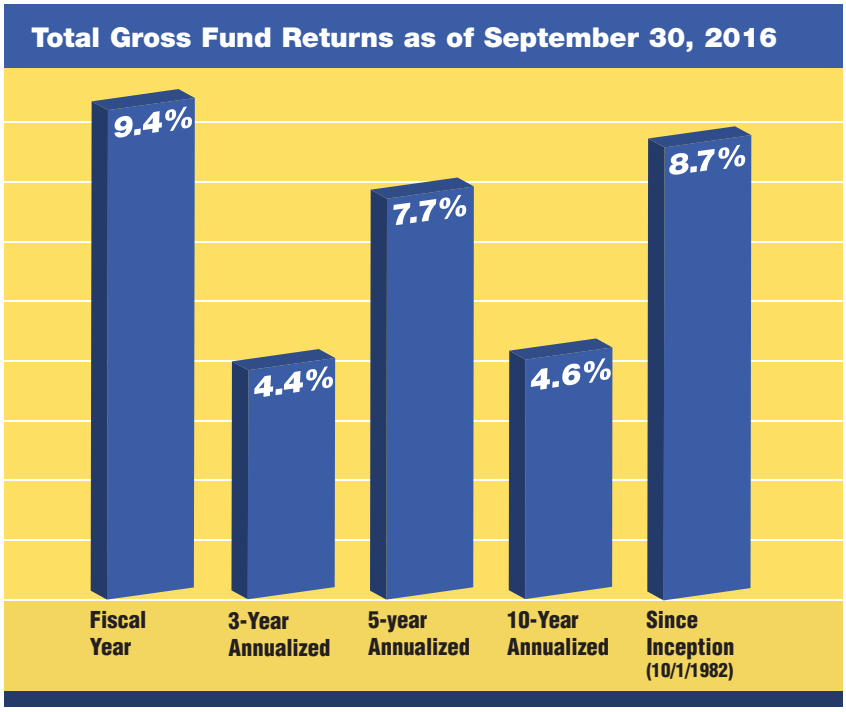
As in past years, the OPM website has a feature that allows eligible participants to enter their Zip Codes, and health plans that have facilities close to where they live will be identified. Participants may also take advantage of a feature that allows them to select plans of interest from a list and to have a comparison chart compiled displaying the plans' provisions, costs, and premiums. The website, **www.opm.gov**, (under "Insurance," then "Compare Plans") also lists the premiums for 2017.

Active District employees should submit any changes online via their PeopleSoft Employee Self-Service portal. Your Human Resources office can assist you with any questions.

Police/Firefighter and Teachers' Plan retiree members who have coverage through District or Federal programs may submit their materials to DCRB in a variety of ways. You may:

- email us at DCRB.benefits@dc.gov
- fax us at (202) 566-5001, or
- mail your completed change forms to the DCRB Member Services Center at the address on page 4.

Please note: all submitted materials must be dated or postmarked no later than the close of business (5:00 pm ET) on December 12, 2016.



From the Chair of the Board

Continued from page 1

line. One is a new, app-based, electronic check-in station at our front desk. If you visit our offices, you will be guided through an easy sign-in process on an iPad. As a bonus, if you make an appointment in advance of your visit, your check-in information will be saved in our system. This process will allow us to better assist you during your appointment and to keep our offices organized and secure.

Finally, we expect our greatly anticipated Pension Information Management System Project to enter the final stages with our planned release of a Request For Proposal (RFP) early next year. We are particularly excited about this project because of the benefits it will provide participants and will keep you up-to-date on its progress throughout next year.

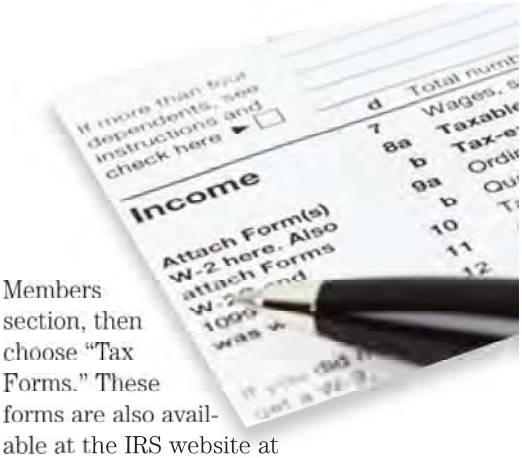
Calendar Year 2016 Tax Information

Distribution of 1099-R Forms

All retirees and survivors who have received taxable pension income from the District of Columbia Teachers' Retirement Plan or the District of Columbia Police Officers and Firefighters' Retirement Plan (the Plans) during tax year 2016 will receive tax form 1099-R. The U.S. Treasury Department's Bureau of the Fiscal Service will distribute these forms near the end of January 2017. Most annuitants will receive only one 1099-R form. However, if you are both a retiree and a survivor, you will receive multiple forms. All 1099-R forms received should be filed with your 2016 tax return.

Check Your Tax Withholding Amounts

This time of the year is an excellent opportunity to look at your earnings statement to verify that the amount of taxes being withheld from your benefit payments will be enough to cover your tax obligations for the 2016 tax year. It is common to receive retirement income from multiple sources. If this is true in your case, you may choose to have no Federal taxes withheld. On the other hand, if you are withholding amounts for your taxes and you find that the withholding is not sufficient, you may need to change the amount being withheld. No matter which option you choose, changing your withholding does not affect the amount of taxes you are required to pay. Retirees who want to update their withholding amount should complete a Form W-4P and mail or bring it to DCRB's Member Services Center (MSC) at the address listed on page 4. Blank forms can be requested from the MSC or found on our website at **www.dcrb.dc.gov**. Please go to the Forms for Members section, then choose "Tax Forms." These forms are also available at the IRS website at **www.irs.gov**. Active District employees who wish to make withholding changes need to file a Form W-4 through their PeopleSoft Employee Self-Service portal.



Three Trustee Elections Taking Place This Year

The terms of the Board's Active Firefighter representative, Active Teacher representative, and Retired Police Officer representative will end on January 27, 2017. Consequently, elections are in progress to fill those seats. The winning candidates in each of the three elections will be certified by the Board at its December 15, 2016 meeting, and the Trustees' terms will begin on January 28, 2017. DCRB will announce the winners on its website at **www.dcrb.dc.gov** under the News Release section following the December Board meeting, and they will be published in the DC Register.

For more information on DCRB's Board of Trustees, including election information, Board election rules, current Trustee biographies, and Board meeting minutes, please visit DCRB's website at **www.dcrb.dc.gov**.

Terminating District Employment

As a member of the Plans, you may request a refund of your member contributions if you:

1) Terminate your employment with DCPS, MPD, or FEMS before you are eligible to retire, or you
2) Transfer to a position that is not covered under the Plan.

In either case, you may request a refund after you have terminated and are no longer on the payroll of your respective agency for at least 31 days. If you terminate employment before becoming vested (with fewer than five years of service), the Plans require that you receive a refund of your member contributions. However, if you terminate employment with at least five years of service, rather than taking a refund, you may choose to leave your contributions in the Plan and to request a deferred retirement annuity, beginning at age 62 (for Teachers) or age 55 (for Police Officers and Firefighters). We have more detailed information on this topic on our website, including links to brochures and forms necessary for submission to DCRB. Please visit **www.dcrb.dc.gov**, and select "Terminating District Employment" under the "Retirement" tab.

DC Retirement Board
900 7th Street, NW
Second Floor
Washington, DC 20001

Inside this DCRB Report

District and Federal Health Care Open Season Enrollment, Trustee Elections, Year End Information, and more

Our Member Services Center Can Help You

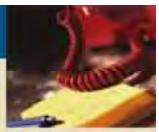
- **Electronic Funds Transfer (EFT):** New annuitants must use EFT to receive annuity payments. For an enrollment for Electronic Funds Transfer Authorization, please visit the DCRB website at **www.dcrb.dc.gov**. You may also contact the Member Services Center to request an enrollment form or ask any questions you may have.
- **Beneficiary Updates:** It is important that you ensure that your beneficiary information is current, especially if you have divorced. To update your beneficiary information related to your pension benefits, you can print out forms from the DCRB website (address indicated above) or you may contact the Member Services Center.
- **Life Events Changes:** Changes in your status may have an effect on your pension benefits or those of your family members. If you get married, divorced, become widowed, or if there is a change in your child's student status, you should report such events to DCRB.

Information on our website can also answer many of your questions. Visit us at **www.dcrb.dc.gov** and click on the "Retirement" tab to view and print useful forms, view the Summary Plan Descriptions (SPDs), and read helpful brochures regarding special topics. Also, for your information and convenience, there is a retirement calculator and a glossary of benefits terms.

DCRB Member Services Center

900 7th Street, NW, Second Floor, Washington, DC 20001• (202) 343-3272
Toll free: (866) 456-3272 • TTY (800) 877-8339 • Fax: (202) 566-5001 •
Email: dcrb.benefits@dc.gov

Useful Contacts



Metropolitan Police Department
Human Resources Office
(202) 727-4261

Department of Fire and Emergency Medical Services Human Resources Office **(202) 673-7580**

Police and Fire Retirement and Relief Board **(202) 442-9622**

D.C. Public Schools Employee Services Division **(202) 442-4090**
dcps.hranswers@dc.gov

Office of Personnel Management (OPM) **(202) 606-1800**
Toll Free (724) 794-2005*
http://www.opm.gov

Social Security Administration
(800) 772-1213
http://www.ssa.gov

*for health and life insurance issues

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Eric O. Stanchfield
Executive Director

Joan M. Passerino
Editor

Issue Brief

10 Years After the Pension Protection Act: Effects on DB and DC Plans

By Ilana Boivie

November 2016

NATIONAL INSTITUTE ON
Retirement Security
Reliable Research. Sensible Solutions.

ABOUT THE AUTHOR

Ilana Boivie is the Senior Policy Analyst with the DC Fiscal Policy Institute, where her work focuses on strengthening job training and adult education, and on improving working conditions for people employed in the District of Columbia. She conducts original research and analysis on these issues, and frequently testifies before policymakers. Previously, she worked as a Research Economist for the Communications Workers of America, where she served as the subject matter expert on retirement policy and provided bargaining and policy support on health care issues. Prior to that, she served as Director of Programs for the National Institute on Retirement Security, where she conducted original research and analysis of national retirement issues, and frequently spoke on retirement and economic matters. Ilana holds an M.A. in Economics from New Mexico State University and a B.A. in English from Binghamton University, where she graduated Magna Cum Laude.

ACKNOWLEDGEMENTS

We are grateful for the thoughtful comments, advice, and assistance provided by a number of individuals, including Michael Kreps and Keith Brainard. Additionally, we would like to thank Jennifer Erin Brown, Kelly Kenneally, and Jake Ramirez for their assistance with this report. The views in this report and any errors and omissions are those of the author alone.

ABOUT NIRS

The National Institute on Retirement Security is a non-profit research institute established to contribute to informed policy making by fostering a deep understanding of the value of retirement security to employees, employers, and the economy as a whole. NIRS works to fulfill this mission through research, education, and outreach programs that are national in scope.

I. EXECUTIVE SUMMARY

The Pension Protection Act of 2006 (PPA) became law in 2006 with two goals regarding defined benefit (DB) pension plans: first, to promote better funding of private sector DB pension plans, and second, to help ensure the solvency of the Pension Benefit Guarantee Corporation (PBGC)—the independent government agency that insures private sector DB plans.

The PPA also made several important changes to defined contribution (DC) plans. The law clarified the use of automatic enrollment in DC plans and created several safe harbors for employers in order to encourage increased employee participation and to make it easier for employees to manage their own personal retirement accounts.

Ten years after the passage of the PPA, this paper analyzes the trends in both DB and DC retirement plans, in order to assess what effects the legislation may have had on these plans. We find that:

- For DB pension plans, an unintended consequence has emerged, in that employers are less and less willing to sponsor these plans and more employers have frozen existing plans.
    - Fewer and fewer employees are covered by traditional DB plans, the culmination of a decades-long trend that was accelerated by the PPA's increased funding requirements. The PPA moved to a market basis for funding, which increased both the plans' annual cost and cost volatility.
    - Congress has implemented several "stop gap" measures to address pension cost and volatility, but this temporary relief has not been enough to change the behavior of employers, who continue to freeze and terminate their plans.

- DC plans with automatic enrollment have seen some increased participation, but the overall changes are not enough to ensure adequate retirement security for most workers. Contribution rates are far too low, and perhaps even lower than they would be without auto-enrollment.
    - The share of working age households covered by any retirement plan fell from the high mark of 57.6 percent in 2001 to 51.3 percent in 2013.[1]
    - Contribution rates tend to be low—by design—and perhaps even lower than they would be without auto-enrollment. Even participants who increase their rates over time through auto-escalation features often do not end up saving enough to ensure an adequate retirement income.
    - Target date funds—the most common investment choice for those who are automatically enrolled—are associated with higher fees and a wide variance in risk exposure.
    - Employers who have replaced frozen DB plans with higher contributions to a DC plan contribute less to overall retirement than they did when they maintained the DB plan, which undermines retirement security.[2]

Thus, even with the "improved" automatic features of DC plans promoted by the PPA, DB pension plans still offer the best path to retirement security. It is unfortunate that the PPA had the unintended consequence of causing more and more DB plans to freeze or shutter. One solution would be to permanently ease the funding requirements—rather than continuing with the stop-gap measures that Congress has passed several times since the PPA[3]—to ensure DB plan sponsors more predictability and less volatility in their funding requirements.

II. GOALS AND INTENTIONS OF THE PENSION PROTECTION ACT

A. Defined Benefit (DB) Pension Plans: The Goal Was Better Funding

The Pension Protection Act of 2006 (PPA) was enacted with two goals regarding defined benefit (DB) pension plans: first, to help ensure the financial solvency of private sector DB pension plans, and second, to help ensure the solvency of the Pension Benefit Guarantee Corporation (PBGC), the independent government agency that oversees and insures private sector DB plans.[4]

First, in order to help ensure that plans would remain financially solvent, the PPA made annual funding requirements much stricter—for all plans, no matter their current funding levels—than they had been in the past. The law increased funding requirements in several ways. Namely:

- Plans' funding targets were increased from 90 to 100 percent;
- Amortization of funding shortfalls was cut from 30 years to seven years;
- More conservative funding assumptions were required; and
- The range of years employers may use to average interest rates to calculate the value of assets and liabilities was shortened from four to five years to just two years.[5]

In other words, the PPA moved private sector DB plans to a "market value" approach for the pension funding rules. These new rules were much stricter than they had been before the change in the law. The idea was that if plans calculate their cost based on current market interest rates, then they will be less likely to be underfunded in any given year. The goals were that: 1) should an employer become insolvent it would be less likely that pension plans would be underfunded and need to get taken over by the PBGC, and 2) should the plans need to be taken over by the PBGC, the stricter funding rules would ease the burden on the PBGC, as plans would be better funded than they would have been pre-PPA.

Since the Deficit Reduction Act of 2005 had increased PBGC premium rates for all plans somewhat substantially—from $19 to $30 per participant for single-employer plans, and from $2.60 to $8 per participant for multiemployer plans[6]—the PPA did not directly increase the premium rates that plan sponsors pay to the PBGC. However, in effect, premiums for many plans increased because the stricter rules made virtually all plans look more underfunded overnight,[7] and the PBGC bases its premiums partially on the level of plan underfunding.

Again, all of these changes were intentional, as policymakers thought that increasing funding requirements and premium rates would help ensure both the plans' and the PBGC's overall financial solvency.[8]

What is the PBGC?

The Pension Benefit Guarantee Corporation (PBGC) is the governmental entity that insures and administers terminations of private sector defined benefit (DB) pension plans. If the employer sponsoring the plan goes bankrupt, and the pension plan is too underfunded for the plan sponsor to pay out all of the benefits promised, the PBGC may take over the plan. When this happens, the PBGC takes all the existing assets of the plan, and is responsible to pay out the insured benefits to participants.

The PBGC is entirely self-funded, and does not rely on taxpayer money. All DB plan sponsors must pay the PBGC an insurance premium, based on the number of participants in the plan and whether the plan is currently underfunded. The only sources of income used to fund the PBGC—both in terms of paying out benefits and the administrative costs of operation—are the premiums collected each year and any interest gained on assets from terminated plans held by PBGC trust fund.

B. Defined Contribution (DC) Plans: The Goal Was Increased Participation and Easier Maintenance for Participants

The PPA also made several important changes to defined contribution (DC) plans. Research had shown that many employees intend to enroll in their company's 401(k) plan, but quite often do not do so, largely due to inertia.[9] The PPA sought to make both enrollment in a DC plan, and continued maintenance of the plan—in terms of increasing contribution rates over time and regularly balancing one's asset allocation—much easier for plan participants. This was done in several ways.

First, the PPA made "automatic enrollment" in a DC plan much easier for plan sponsors by clarifying that state wage withholding laws are preempted.[10] Automatic enrollment means that the default option for employees is that they are enrolled in the plan, rather than employees having to actively choose to enroll on their own. Research had shown that automatic enrollment could increase 401(k) plan participation.[11] However, the nature of automatic enrollment also means that the employer—not the employee—must choose default employee contribution rates, and a default initial asset allocation, since employees do not actively fill out paperwork to make their own choices.

In addition to this clarification, the PPA created two "safe harbors" based on using automatic enrollment for meeting nondiscrimination and fiduciary requirements for DC plans. If employers created DC plans offering specified provisions, they would satisfy all legal requirements. Specifically, the PPA created the following safe harbors for meeting the special nondiscrimination testing of employee and employer contributions in DC plans:

- The automatic contribution level for employees must be at least three percent in the first year, four percent in the second year, five percent in the third year, and six percent in all later years, but no more than 10 percent in any year.

- For employer contributions, employers must provide a 100 percent match on the first one percent of the employee's contribution, plus a 50 percent match on the next five percent, with a maximum match of 3.5 percent. Alternatively, if the employee does not elect to make a contribution, an employer can provide a contribution of three percent of an employee's salary.[12]

In terms of asset allocation, the PPA created another safe harbor, for companies to default participants into a "qualified default investment alternative" (QDIA). The final regulations of the law describe four different types of investment products that could qualify as a QDIA, of which the most commonly used is a "target date fund" (TDF), also called a "lifecycle fund."[13] In this type of fund, the asset mix is determined by the participant's age or anticipated retirement date. Most retirement experts would recommend that participants invest more in riskier investments (such as stocks and other equities) when they are younger and move to more conservative investments (such as bonds) as they get older.[14] TDFs are designed to rebalance automatically as the participant gets closer to retirement. In this way, a target date fund is meant to be easier for the participant to manage over time.

Again, these changes were designed to accomplish two goals: 1) Increase employee participation in DC plans, and 2) nudge employees to make "smarter" choices in their contribution and investment decisions in these plans.

III. 10 YEARS LATER: EFFECTS OF THE PENSION PROTECTION ACT

As discussed above, the PPA had several distinct public policy goals in terms of the financial strength and coverage of DB and DC plans. Ten years later, we can begin to assess how effective the law has been on the ground.

A. Outcome for DB Plans : Fewer and Fewer Employers Are Willing to Sponsor Plans

Unfortunately, for DB plans, the fallout from the PPA has not been very positive.[15] While the law may have had the commendable intention to make plans stronger, it ended up having the unintended consequence of pushing employers out of the system by freezing and terminating their pension plans.

a. **Higher underfunding and more volatility in contribution requirements have led to plan freezes.**

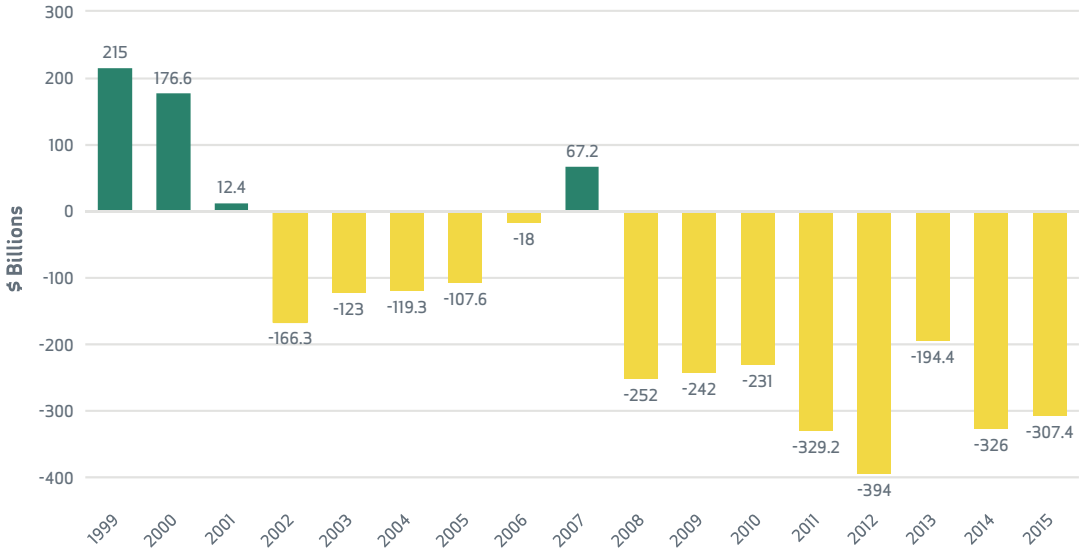
Researchers at Boston College have found that the PPA specifically caused pension funding to be much more volatile and contributions to be much less predictable.[16] Unfortunately, the timing of the law probably could not have been worse—the PPA went into effect just as the economy began to decline with the Great Recession starting in 2008. This immediately and drastically increased funding requirements due to the historical decline in interest rates and market value of DB plan assets.[17]

Yet the increase in liability continued even as the economy began to recover, and plan sponsors are still seeing far higher underfunding than they had in the past. The results are stark. Milliman reports that, since 2002, the only year that the 100 largest U.S. private-sector DB plans have seen an aggregate surplus was 2007; for every other year through 2015, plans have been significantly underfunded.[18] See Figure 1.

Looking at a larger group of employers, Mercer reports similar effects on the S&P 1500 pension plans from 2007 onward.[19] See Figure 2.

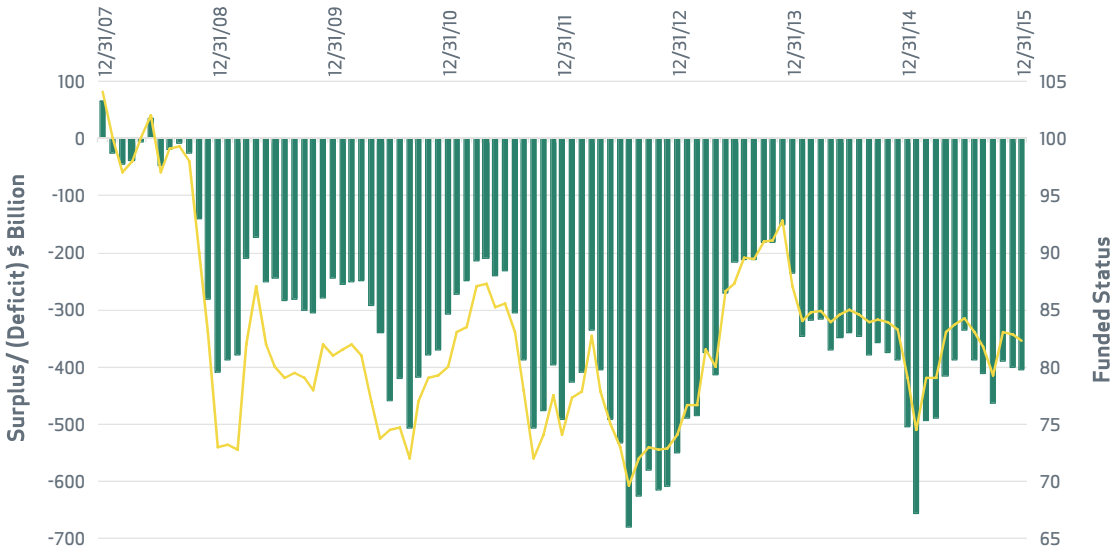
These increases in liability due to lower interest rates drastically increase plan costs across the board—no matter the financial

Figure 1: **Pension Funding Surplus/Deficit of the Milliman 100 Plans, 1999-2015**



Source: Milliman 2016 Corporate Pension Funding Study. http://us.milliman.com/PFS/

Figure 2: **Estimated Aggregate Surplus/Deficit and Funded Status of Plans in the S&P 1500, 2007**



Source: Mercer. 2016. "S&P 1500 Pension Funded Status Increases by only 1 Percent in March Despite Strong Equity Markets Returns."

strength of each individual plan. This made it even more difficult for plan sponsors to continue their commitment to DB plans. Yu finds a distinct correlation between pension freezes and the amount of the plan's projected liabilities under the market-based approach of U.S. Generally Accepted Accounting Principles (GAAP) disclosure rules.[20]

As a result, more and more plan sponsors have decided to freeze and ultimately terminate their plans. While there were close to 29,000 plans in 2006 (the year that PPA passed), by 2014, that number had fallen to just over 22,000. See Figure 3.

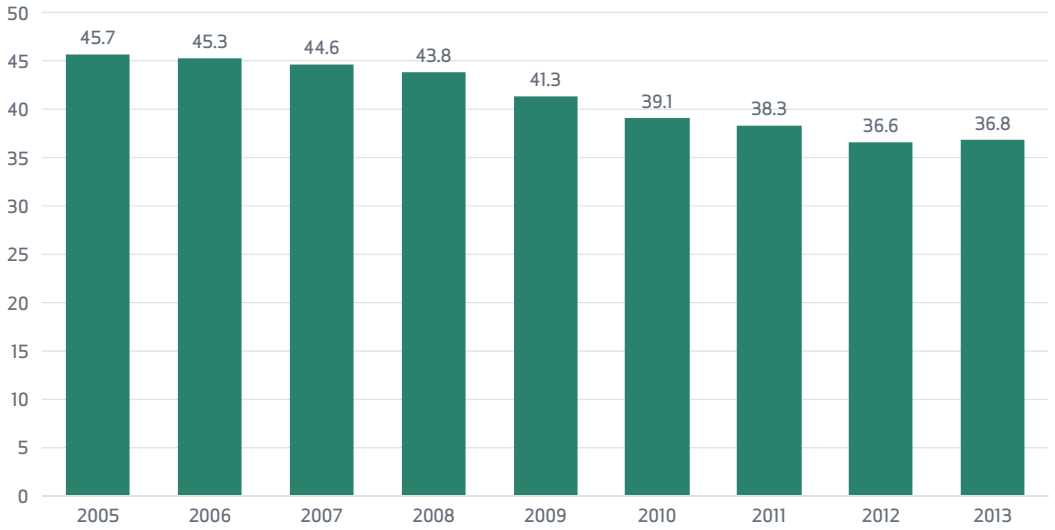
Figure 3: **Total PBGC Insured Plans, 2005-2014**

Source: PBGC 2014 Databook.

Even among plans that still exist, more and more are "frozen," meaning that new hires are not able to participate in the plan, and, in other cases, that active participants can no longer accrue additional benefits even as they remain working. Figure 4 shows that the percentage of plan participants who remain "active" in the plan has consistently declined since the passage of the PPA.

Participants in PBGC insured plans as a percentage of the overall workforce has consistently declined as well. While in 1980, some 37 percent of private sector workers were covered by a pension plan, that number declined to 17.2 percent by 2006 and just 13.6 percent in 2014.[21]

Figure 4: **Percent of Active Participants in PBGC Insured Plans, 2005-2013**



Source PBGC 2014 Data Book

Table 1 shows the number of different ways that companies have been freezing their plans and shows that the trend toward freezing has been increasing over time.

b. Congress has implemented "stop gap" measures every year or two since the PPA.

Acknowledging almost immediately that the funding volatility was becoming a problem, Congress implemented "stop gap" measures to ease funding requirements as early as 2008—just as the PPA funding rules were going into effect. Yet each of the six laws that have eased the market value approach to DB pension funding has been temporary. As a result, Congress continues to revisit the rules, making additional temporary changes nearly every year or two and failing to provide employers a predictable, long-term solution.

Here is a summary of legislation enacted since 2006 to amend the PPA's funding formula:

The Worker, Retiree, and Employer Recovery Act of 2008:[22]

- Gave pension plans additional time to get to 100 percent funding, as PPA required.
- Allowed plans to look one year prior in order to determine whether they must comply with PPA's benefit restriction rules.
- Allowed multiemployer plans that were not in critical or endangered status in the previous year to retain this status for an additional year, and thereby avoid the additional plan funding requirements mandated by the PPA.

Table 1: **PBGC-Insured Plans by Status of Benefit Accruals and Participation Freeze, 2008-2013**

Beginning of Plan Year	With Accrual or Participation Freeze Provision					No Accrual or Participation Freeze
	Total With Provision	Hard-Frozen*	Accruals Continue, But Closed to New Entrants	Partially-Frozen and Closed to New Entrants**	Partially-Frozen and Open to New Entrants**	
2008	27.9%	21.0%	3.6%	2.0%	1.2%	72.1%
2009	33.6%	25.7%	4.2%	2.4%	1.4%	66.4%
2010	37.8%	29.3%	4.4%	2.6%	1.5%	62.2%
2011	39.9%	30.2%	5.3%	2.9%	1.5%	60.1%
2012	40.4%	30.5%	5.7%	2.8%	1.4%	59.6%
2013	39.6%	29.7%	5.8%	2.8%	1.4%	60.4%

* Hard-frozen plans are plans where no participants are receiving new benefit accruals for additional service or higher compensation.
**Includes plans where only service is frozen, or pay and/or service is frozen for some participants.

Source: PBGC 2014 Data Book, Chart S-36

- Allowed multiemployer plans in critical or endangered status an additional three years to improve their funding percentage per their funding improvement or rehabilitation plan.

The Preservation of Access to Care for Medicare Beneficiaries and Pension Relief Act of 2010:[23]

- Allowed plans to elect an extended amortization period of nine or 15 years in order to pay down unfunded liabilities, instead of the seven years required by the PPA.
- Eased minimum required contributions for certain underfunded charity benefit plans.
- Allowed multiemployer plans to elect alternative amortization plans and valuation methods to amortize investment losses incurred between 2008 and 2010.

Moving Ahead for Progress in the 21st Century Act (MAP-21):[24]

- Allowed plans to measure pension liability using the 25-year average of interest rates, plus or minus a corridor.
- Increased pension premium rates for both variable and flat rate premium paid to the PBGC and established a cap on the variable rate premium.

Highway and Transportation Funding Act of 2014 (HATFA):[25]

- Extended the time period for the allowable interest rates to be used under MAP-21 so that the minimum discount rate would not decrease as quickly.

Tax Increase Prevention Act of 2014 (TIPA):[26]

- Extended the automatic extension of amortization periods for multiemployer plans through 2015.
- Extended the multiemployer plan rules relating to funding improvement and rehabilitation plans through 2015.

Bipartisan Budget Act of 2015:[27]

- Adjusted the interest rates used to calculate minimum funding contributions so that they fall within a range based on average interest rates over a 25-year period.
- Increased the PBGC fixed rate premiums for single-employer plans.

Figure 5: **Annual Change from Prior Year in Corporate and Public Sector Pension Contributions, 2005-2013**

Source: Compiled by the National Association of State Retirement Administrators, based on U.S. Department of Labor and U.S. Census Bureau data

Figure 5 illustrates the percent change in the pension contributions from the prior year. For corporate plans, contributions jumped nearly 60 percent in 2008; after that, the temporary fixes to the PPA's funding rules have helped to stabilize and, decrease the volatility of contributions rates. Unfortunately, since all of these laws are temporary in nature—meaning that the funding relief is always time-limited—they have not provided enough permanence or predictability to stop freezes from continuing to occur. Towers Watson, for example, found that the funding relief provided by the Preservation of Access to Care for Medicare beneficiaries and Pension Relief Act of 2010 was "quite modest given the substantial funding obligations ahead."[28]

On the other hand, Figure 5 also shows that public pension contribution rates have remained significantly more stable over this time period, as they were not subject to the same market-based funding rules as private plans.

c. PBGC premiums continue to increase as well.

In addition, since the PPA was passed in 2006, PBGC premiums have continued to increase. See Table 2. Of course, an increase in the premium rate—even if it is small—does increase annual costs to plan sponsors. Unfortunately, PBGC premiums are now often increased to provide a source of offsetting revenue to the federal government when Congress is considering legislation that is entirely unrelated to retirement security. This shifting of budget dollars raises employers' cost to operate a DB plan, but is not directly related to an impending solvency problem for the agency. In addition, PBGC premiums cannot legally be used to fund anything outside of the PBGC itself. The recently introduced bills with the title, The Pension and Budget Integrity Act of 2016[29] seek to change the budget rules to prohibit PBGC premiums from being counted as general revenue.[30]

d. Employers see cost volatility as the biggest barrier to continuing to sponsor DB plans.

There is compelling evidence that employers see cost volatility as the biggest barrier to continuing to sponsor DB plans. In 2008, the Government Accountability Office (GAO) conducted a survey of private plan sponsors who have frozen their DB plans. It

Table 2. **Current and Historical PBGC Premium Rates**

Plan Year	Single Employer Plans			Multi-Employer
		Variable-Rate Premium		
	Flat-Rate Premium	Rate per $1,000 in unfunded benefits	Per participant cap	Flat-Rate Premium
2007	$31	$9	N/A	$8
2008	$33	$9	N/A	$9
2009	$34	$9	N/A	$9
2010	$35	$9	N/A	$9
2011	$35	$9	N/A	$9
2012	$35	$9	N/A	$9
2013	$42	$9	$400	$12
2014	$49	$14	$412	$12
2015	$57	$24	$418	$26
2016	$64	$30	$500	$27

Flat-rate premiums for both single and multi-employer plans are per participant. They are charged to all private sector DB plans, regardless of funding level. Variable rate premiums are only charged to those plans with unfunded benefits.

Source: Pension Benefit Guarantee Corporation.

found that the two most common reasons for companies to freeze their plans were the impact of annual contributions on the firm's cash flows and the unpredictability of plan funding.[31] A December 2010 Towers Watson survey found comparable results among current DB plan sponsors; the three top concerns of DB plan sponsors over the next five years were impact on cash flow, impact on the income statement, and impact on the balance sheet.[32]

Also, a 2009 GAO study found that among some 26 percent of plan sponsors who would consider forming a new DB plan, the vast majority said they would do so if the plan funding requirements had more predictability and less volatility.[33] Finally, a 2009 survey of plan sponsors found that, of those employers who remain committed to their DB plans, a full 70 percent would reconsider this commitment should accounting rules or other regulations become more burdensome than they already are.[34]

In analyses of the possible reasons behind pension freezes, researchers have found mixed reactions to cost savings. Munnell and Soto found that firms are not motivated by any short-term cost savings that may come from freezing a plan.[35] Rauh, Stefanescu, and Zeldes found that firms that froze plans faced on average at least 50 percent higher accruals as a share of the firm than plans that did not freeze.[36] Ultimately, as federal regulations—culminating with the PPA—have made plan funding much more volatile over the years, DB plans have become less and less attractive to plan sponsors.

B. Outcome for DC Plans: Increased Participation, But Effects on Overall Retirement Security Are Questionable

In the ten years since the PPA was adopted, the effect on DC plans has been a mixed bag. While many employers have adopted automatic enrollment,[37] and more plans offer "participant friendly"TDFs,[38] these changes may not be strengthening retirement security overall, or even for individual participants.[39] This is especially true for older workers whose DB plan benefits have been frozen or terminated mid-career, as the replacement DC plan offered does not nearly make up for the loss of the traditional pension.

Employers have been increasingly using automatic enrollment in DC plans and automatic escalation of contribution rates, since the passage of the PPA.[40] On its face, this seems like it would

boost retirement security for participants. However, this is not necessarily the case, for several reasons:

- Overall retirement coverage has not increased.
- Most auto-enrollment plans have very low default contribution rates, and employees tend not to change from the default rate.
- Employees that are automatically enrolled tend to be enrolled into TDFs. Some of these funds are associated with relatively higher fees, and they can vary widely in risk exposure, which can reduce long-term returns.
- While auto-escalation features help to increase contribution rates over time, contribution rates overall are still too low to provide adequate retirement security.
- Companies are not necessarily incentivized to increase default contribution rates and auto-escalation rates, because that would often mean an increase in their own matching contributions, which increases overall costs.
- For companies that froze or terminated their DB plans, the increased contribution rates to the DC plan did not nearly compensate for the loss of the pension income.

a. Overall retirement plan participation has not increased.

Since the PPA, far more employers offer automatic enrollment, especially to new hires. The percentage of plans that used automatic enrollment was just 10 percent in 2006, and increased to 41 percent by 2016. Automatic enrollment does seem to increase participation at the individual employer level—more than 75 percent of eligible employees participated in their plan in 2016, on average, as compared to 66 percent in 2006.[41]

However, overall retirement plan coverage has not increased dramatically since the passage of the PPA. In fact, access to a workplace retirement plan reached its highest rate in 1999, at 61.9 percent of working-age private-sector workers (seven years prior to the PPA), but declined slightly every year since then, to 54.5 percent by 2013 (seven years after the PPA's passage).[42] The decline in access to workplace retirement plans is also reflected in the decline in share of working age households covered by any retirement plan, which fell from the high mark of 57.6 percent in 2001 to 51.3 percent in 2013.[43]

This may be partly due to the fact that many companies who adopt automatic enrollment do so only for newly hired employees[44] —which means that existing employees who have not explicitly opted into the plan largely remain uncovered.

b. Most plans have very low default contribution rates.

Most retirement experts recommend that the DC savings rate should be around 15 percent of salary each year to ensure adequate retirement security.[45] However, the most common initial default automatic enrollment employee contribution rate is three percent; some two-thirds of plans have a default rate of three percent or less.[46] The default contribution rate is significant, because most participants tend to stick with the default rate. This is because many participants see the default rate as implicit advice on how much they should be saving, while this of course is not necessarily the case.[47] In fact, some evidence suggests that many participants who accept the default rate would have chosen a higher savings rate if they had made an active choice to participate in the plan.[48] Moreover, a three percent default contribution limits the number of employees who would be eligible for the full employer match, which in most 401(k) plans is reached when an employee contributes 6 percent of salary (at a 50 percent match).

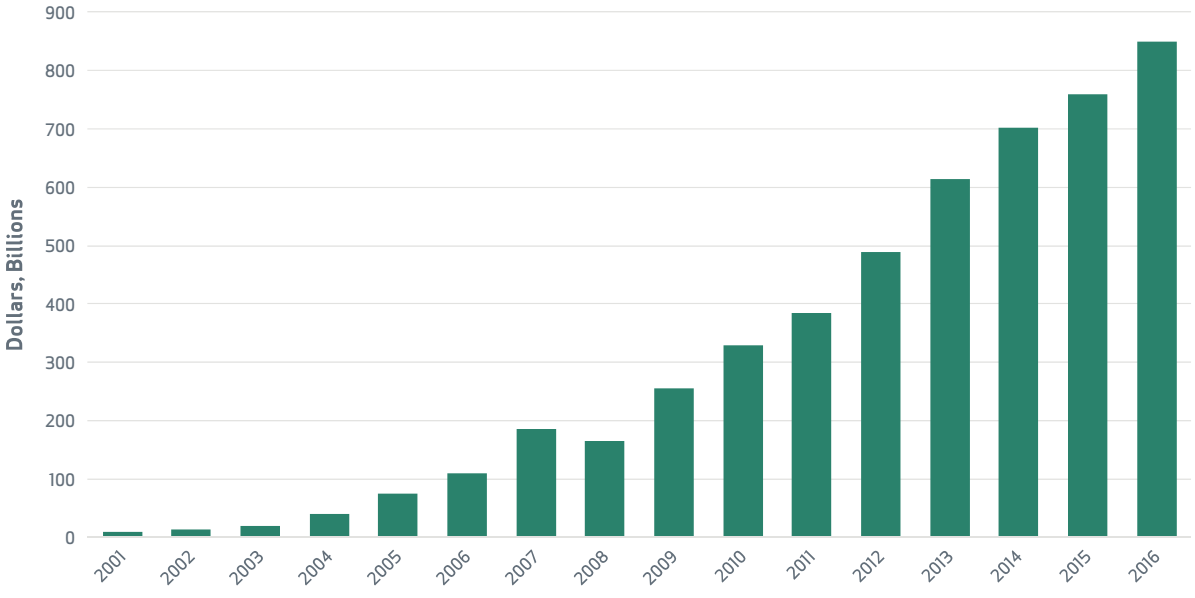
For this reason, some experts are beginning to see automatic enrollment as a "double-edged sword," in the sense that it is effective at getting more people to join the plan but leads to a lower overall average savings rate.[49]

c. Target date funds can limit long-term returns.

Among the several default investment safe harbors (QDIAs) created by the PPA, the most commonly used is a TDF. This type of investment is designed to be diversified in an age-appropriate way—meaning that the younger the participant is, the more they are invested in higher-risk equity funds, and as the participant ages, the fund automatically rebalances towards lower-risk fixed income investments.

In 2016, 73 percent of plans used TDFs, as compared with just 32 percent of plans in 2006.[50] And the vast majority of employees who are automatically enrolled into their retirement plan are invested in a TDF.[51] As mentioned earlier, the default investment is important, because employees tend to stick with the default that they are given.

Figure 6. **Total Assets Under Management in TDFs, 2001-2016**



Source: Morningstar via The Wall Street Journal

Indeed, since the passage of the PPA, the use of TDFs has skyrocketed the value of funds in TDFs from just over $100 billion in 2006 to roughly $850 billion in 2016. See Figure 6.

Yet TDFs are often far from an ideal investment. These funds can be associated with higher fees[52] and can vary widely in risk exposure,[53] which can reduce long-term returns.[54]

Morningstar tracks more than 2,200 TDFs and found that in 2016, the average expense ratio for these funds was 0.903 percent. But fees do not need to be nearly this high—Vanguard, for example, has TDFs with fees of just 0.16 percent.[55]

Fees matter because each additional dollar that is paid out in fees comes out of the participant's plan balance and does not gain compound interest. The Joint Committee on Taxation (JCT) calculates that over the course of 20 years, at a six percent annual return, an employee who contributes $5,000 per year and pays two percent in fees will receive $20,000 less in her retirement account than a participant paying one percent.[56]

Another issue with TDFs is that they can vary widely in risk exposure. As mentioned previously, a fund is chosen based on the participant's age or anticipated retirement date. Presumably, there could be a baseline asset allocation based on the level of risk that is appropriate for that participant at that particular point in their career. But currently, no real baseline exists—so two target date funds can have very different risk exposures for two participants of the same age with the same anticipated retirement date.[57] Therefore, employees defaulted into a TDF may not fully understand the level of investment risk associated with that particular fund.

This is potentially problematic because it can mean that participants far from retirement might be invested more conservatively than they should be, and that participants very close to retirement could be exposed to much higher risk than they should be, or that they are even aware of. For example, when the stock market crashed in 2008, nearly all investments saw a loss, including TDFs. But there was a huge discrepancy in the extent of the losses among TDFs, especially for those close to retirement. TDFs designed for those retiring in 2010 saw losses of anywhere from 3.5 to 41.3 percent.[58] Clearly, these funds had very different risk exposures, which meant very different outcomes for the participants' retirement prospects.

d. Even with auto-escalation, contribution rates are still largely inadequate.

The PPA made it easier for companies to offer auto-escalation of contribution rates in their plan design, and many companies adopted this feature after 2006. T. Rowe Price found that over 90 percent of companies with automatic enrollment, and 75 percent of plans without automatic enrollment, provide an automatic escalation feature. In addition, nearly half of plans that offer an automatic increase automatically enroll participants in the service.[59]

While auto-escalation features help to increase contribution rates over time, contribution rates overall are still too low to provide adequate retirement security for most participants. Nearly all plans that use auto-escalation provide an annual one percent increase in the contribution rate.[60] However, many experts believe that an annual increase of two percent is needed for stronger retirement security, and that a two percent automatic increase could be adopted without disincentivizing participants from continuing in the service.[61]

e. Companies are not incentivized to increase these defaults.

Research shows that participants see the defaults as an implicit employer recommendation of those rates, and are thereby much more likely to stick with them. To that end, companies could strengthen their employees' retirement security by increasing these defaults—both the initial automatic enrollment rate and the rate at which contributions escalate each year. However, most companies have not been doing this, even as more and more research shows that 401(k) contributions are inadequate.

The reason for this may be because companies have no real incentive to increase these defaults. First, employers do not necessarily have a financial interest in ensuring that their employees can fully fund a 20- or 30-year retirement, since once they retire, they are no longer employed by the company. Second, employees do not realize that the default rates are too low, and therefore increasing the rates would not necessarily boost employee morale or company loyalty.

On the other hand, companies could have a significant financial incentive to keep the defaults low—because often, company contributions are tied to the employee contribution rate through a "matching" structure. Under this type of plan design, the more employees that participate in the plan, and the higher their contribution rates are, the more the employer must contribute, so the employer's overall retirement costs increase. The Urban Institute has found that employers with auto-enrollment tend to have lower match rates than employers without auto-enrollment, which they see as a "rational response by profit-maximizing firms" for this reason.[62]

f. Auto-features and even increased contribution rates have not adequately compensated for the decline of DB pensions.

Companies have been freezing and terminating their DB plans for quite some time. Many of these firms have increased contribution rates to their DC plans in order to compensate for the loss of the pension accruals. However, these increased DC contribution rates do not nearly come close to making up for what was lost in pension income.

For example, the Employee Benefits Research Institute (EBRI) has found that firms that froze their DB pension plans between 2005 and 2009 increased their DC contributions by 2.45 percent, and those that closed the plan to new hires increased DC contributions by 3.34 percent.[63] Considering that the average private-sector DB pension contribution had been well above that amount (roughly eight percent of pay in 2006),[64] this is clearly a net loss in terms of overall retirement benefits provided by employers.

Quantifying the reduction in retirement costs private employers have experienced, Ghilarducci and Sun have found that a 10 percent increase in the use of DC plans reduces employer retirement costs per worker by 1.7 to 3.5 percent.[65] When considering the impact of pension plan freezes on employer costs, Rauh, Stefanescu, and Zeldes found that freezing saves firms 3 percent of total payroll in the first year, and the equivalent of 13.5 percent of the long-horizon payroll of current employees, even after adjusting for corresponding increases in contribution DC plans. Specifically, they find that these savings arise in large part because firms renege on implicit contracts to provide older workers the higher pension accruals available under DB pensions later in their careers.[66] Pension freezes hit older and more senior workers especially hard, and their ability to adjust retirement savings levels to compensate for lost benefits can leave a sizeable gap in retirement preparedness.

IV. CONCLUSION: THE PPA'S OVERALL EFFECTS ON RETIREMENT SECURITY ARE NEGATIVE TO MIXED AT BEST; MORE CAN BE DONE TO ENCOURAGE EMPLOYER SPONSORSHIP OF DB PLANS AND MORE ROBUST DC PLANS

Ten years after the passage of the PPA, DB plans still offer the best path to retirement security, even with the "improved" auto features of DC plans. Unfortunately, while the PPA tried to fix some issues in the retirement system, it inadvertently made the problems worse for DB plans without providing a comprehensive solution for DC plans. The end result is a system that is skewed against traditional pensions—which is unfortunate, as these are the only plans that provide real retirement income security.

For example, EBRI finds that the probability of an individual not running out of money in retirement increases by 11.6 percent if they are still able to participate in a DB plan through age 65.[67] In addition, retirees with pensions are nine times less likely to be in poverty than those without DB pension income.[68]

It is extremely unfortunate that more stringent, market value-based DB plan funding rules in the PPA—coupled with the incredibly bad timing of the law going into effect just as the Great Recession hit—fostered the unintended consequence of causing more and more DB plans to freeze and terminate. Meanwhile, the law's best intentions for DC plans have helped to increase enrollment in these plans somewhat, but overall participation in retirement plans by working Americans remains low, and the DC saving rate is significantly less than what is needed to adequately prepare for retirement.[69]

Research by Eriksson concludes that "PPA diverts money away from defined-benefit pension plans and into defined-contribution plans."[70] A number of individuals involved in the crafting of the PPA have even suggested that, in the end, the law may not have struck the correct balance.[71]

Since DB plans are still the best way to achieve retirement security, changes should be made to the PPA and pension funding rules to ensure plan sponsors more predictability and less volatility in their funding costs. These measures should be done permanently—not on a temporary or ad hoc basis, as has been the case since the PPA's passage—so that plan sponsors are able to predict and budget for pension costs on a longer-term basis.

For example, if longer smoothing and amortization periods were reinstated, plans would have more time in which to make up for investment losses due to large market downturns. Weller and Baker find that smoothing asset valuations over a 20-year period would result in lower contributions, less volatility, and higher funding levels.[72]

Indeed, in contrast to the decline of pensions in the private sector, public retirement systems have continued to provide DB pensions for a significant majority of public employees. Because these plans have not been forced to adopt market-value funding parameters like those of the PPA, these systems overall have been able to weather the Great Recession without freezing or terminating their traditional pensions.[73]

Finally, passing The Pension and Budget Integrity Act of 2016 would halt the practice of increasing plan sponsors' pension costs for unrelated reasons, thus eliminating another obstacle in the continuation of private sector pensions.

These measures could help encourage more employers to maintain existing DB plans for their employees, and perhaps even consider establishing new plans.

ENDNOTES

1. N. Rhee and I. Boivie, 2015, "The Continuing Retirement Savings Crisis," National Institute on Retirement Security, Washington, DC.

2. J. Rauh, I. Stefanescu, and S. Zeldes, 2016, Cost Saving and the Freezing of Corporate Pension Plans, Columbia Business School Research Paper No. 16-4, Stanford University Graduate School of Business Research Paper No. 16-4. Available at SSRN: https://ssrn.com/abstract=2706448.

3. Technically, the funding relief in MAP-21 is permanent, because the funding collars never go away. However, over time, they continue to widen to much that they become largely irrelevant.

4. M.P. Patterson, T. Veal, and D.L. Wray, 2006, The Pension Protection Act of 2006: Essential Insights, Thompson Publishing Group, Danvers, MA.

5. I. Boivie, 2011, "Who Killed the Private Sector DB Plan?" National Institute on Retirement Security, Washington, DC.

6. Deficit Reduction Act. Pub. L. 109-171, §§ 6031-33 (2006) codified at 42 U.S.C. § 1396h(a).

7. Willis Towers Watson. 2010. DB Plans Still Face Sizable Funding Obligations Despite Market Run-Up in 2009. London, UK. and J. Gotbaum, 2016, "Losing Ground: Little Reason to Celebrate 10th Anniversary of the Pension Protection Act," Pensions & Investments, August 25.

8. M.P. Patterson, T. Veal, and D.L. Wray, 2006, The Pension Protection Act of 2006: Essential Insights, Thompson Publishing Group, Danvers, MA.

9. S. Bernartzi, and R. Thaler, 2007, Heuristics and Biases in Retirement Savings Behavior, Journal of Economic Perspectives, Vol. 21.

10. T. Rowe Price, 2016, 10 Years Later: Pension Protection Act's Impact On Defined Contribution Plans.

11. Bernartzi and Thaler, op cit. and J. VanDerhei, 2010, The Impact of Automatic Enrollment in 401(k) Plans on Future Retirement Accumulations: A Simulation Study Based on Plan Design Modifications of Large Plan Sponsors, Issue Brief No. 341, Employee Benefit Research Institute, Washington, DC.

12. J. Sammer, and S. Miller... 2010, Automatic Enrollment 'Safe Harbor' 401(k)s: An Exemption from Compliance Testing, Society for Human Resource Management.

13. U.S. Department of Labor, 2008, "Fact Sheet: Regulation Relating to Qualified Default Investment Alternatives in Participant-Directed Individual Account Plans," U.S. DOL, Washington, DC.

14. K. Brecht, 2016, "Time to Rebalance Your Portfolio," U.S. News & World Report, February 2. and I. Polyak, 2015, "Age and Risk Tolerance Key to Mastering Asset Allocation," CNBC, June 10.

15. F. Denmark, 2016, "Ten Years After," Institutional Investor, September 2016, New York, NY.

16. A.H. Munnell, A. Webb, and F. Golub-Sass, 2007, Is There Really a Retirement Savings Crisis? An NRRI Analysis, Issue in Brief No. 7-11, Center for Retirement Research at Boston College, Chestnut Hill, MA.

17. National Institute on Retirement Security, 2010, NIRS Conference Report: Raising the Bar: Policy Solutions for Improving Retirement Security, National Institute on Retirement Security, Washington, DC. and Denmark, 2016, Op cit.

18. Z. Wadia, J. Ehrhardt, A. Perry, and C. Clark, 2016, Corporate Pension Funding Study, Milliman, Seattle, WA.

19. Mercer. 2016. "S&P 1500 Pension Funded Status Increases by only 1 Percent in March Despite Strong Equity Markets Returns," Mercer, New York, NY.

20. K. Yu, 2014, Excess of the PBO over the ABO and hard pension freezes, Review of Quantitative Finance and Accounting, p. 1-28.

21. PBGC 2014 Data Book. Table S-33. http://www.pbgc.gov/documents/2014-data-tables-final.pdf

22. P.L. 109-280, 120 Stat 780 (Aug. 17, 2006).

23. P.L. 111-192, 124 Stat. 1280 (June 25, 2010).

24. P.L. 112-141, 126 Stat. 405 (July 6, 2012).

25. P.L. 113-159, 128 Stat. 1839 (August 8, 2014).

26. PL 113-295, 128 Stat. 4010 (December 19, 2014).

27. P.L. 114-74, 129 Stat. 584 (November 2, 2015).

28. Willis Towers Watson, 2011, Funding Obligations for Single-Employer DB Pension Plans: Updated Projections for 2011-2014, London, UK.

29. S. 3240 and H.R. 4955

30. D. Brandolph, 2016, "Bill Would Halt Use of PBGC Plan Premiums as Budget Tool", Bloomberg/The Bureau of National Affairs, Pension and Benefits Daily.

31. Government Accountability Office, 2008, Plan Freezes Affect Millions of Participants and May Pose Retirement Income

Challenges, GAO 08-817, Government Accountability Office, Washington, DC.

32. Willis Towers Watson, 2010, Towers Watson-Forbes Insights 2010 Pension Risk Survey, Willis Towers Watson, New York, NY.

33. Government Accountability Office, 2009, Defined Benefit Pensions: Survey Results of the Nation's Largest Private Defined Benefit Plan Sponsors, GAO 09-291, Government Accountability Office, Washington, DC.

34. CFO Research Services and Towers Perrin, 2009, A Qualified Commitment to DB Plans: Risk Management amid a Steep Downturn, CFO Publishing Corp, Boston, MA.

35. A.H. Munnell and M. Soto, 2007, Why Are Companies Freezing Their Pensions? Prepared for the 9th Annual Joint Conference of the Retirement Research Consortium, "Challenges and Solutions for Retirement Security," August 9-10, Washington, DC.

36. J. Rauh, I. Stefanescu, and S. Zeldes, 2016, Cost Saving and the Freezing of Corporate Pension Plans, Columbia Business School Research Paper No. 16-4, Stanford University Graduate School of Business Research Paper No. 16-4. Available at SSRN: https://ssrn.com/abstract=2706448.

37. M. Kilroy, 2016, "Vanguard Finds Soaring Use of Auto Enrollment, Target-Date Funds 10 Years after PPA," Pensions & Investments, June 8.

38. J. VanDerhei, S. Holden, L. Alonso, S. Bass, and A.M. Pino, 2014, 401(k) Plan Asset Allocation, Account Balances, and Loan Activity in 2013, No. 408, Employee Benefits Research Institute and the Investment Company Institute, Washington, DC.

39. J. Rauh, I. Stefanescu, and S. Zeldes, 2016. Op.cit.

40. M. Kilroy, 2016, "Vanguard finds soaring use of auto enrollment, target-date funds 10 years after PPA," Pensions & Investments, June 8. and J. DiCenzo, 2009, A Closer Look at Automatic Savings Plan Services: Plan Sponsor and Participant Behavior, T. Rowe Price.

41. M. Kilroy, 2016, "Vanguard Finds Soaring Use of Auto Enrollment, Target-Date Funds 10 Years after PPA," Pensions & Investments, June 8.

42. N. Rhee and I. Boivie, 2015, "The Continuing Retirement Savings Crisis," National Institute on Retirement Security, Washington, DC.

43. N. Rhee, and I. Boivie, 2015, Op.cit.

44. J. DiCenzo, 2009, A Closer Look at Automatic Savings Plan Services: Plan Sponsor and Participant Behavior, T. Rowe Price.

45. A. Munnell, A. Webb, and W. Hou, 2014, How Much Should People Save? No. 14-11, Center for Retirement Research at Boston College, Chestnut Hill, MA.

46. S. Bernartzi and R.H. Thaler, 2013, Behavioral Economics and the Retirement Savings Crisis, Science, Vol. 339. and J.W. Clark, S.P. Utkus, J.A. Young, 2015, Automatic Enrollment: The Power of the Default, Vanguard Research, Valley Forge, PA.

47. C. McKenzie, M. Liersch, and S. Finkelstein, 2006, Recommendations Implicit in Policy Defaults. and J. Choi, D. Laibson, B.C. Madrian, and A. Metrick, 2006, Saving for Retirement on the Path of Least Resistance.

48. S. Bernartzi, and R.H. Thaler, 2013, Behavioral Economics and the Retirement Savings Crisis, Science, Vol. 339.

49. J. DiCenzo, 2009, A Closer Look at Automatic Savings Plan Services: Plan Sponsor and Participant Behavior, T. Rowe Price.

50. T. Rowe Price, 2016, 10 Years Later: Pension Protection Act's Impact On Defined Contribution Plans.

51. M. Kilroy, 2016, "Vanguard finds soaring use of auto enrollment, target-date funds 10 years after PPA," Pensions & Investments, June 8. and J. VanDerhei, S. Holden, L. Alonso, S. Bass, and A.M. Pino, 2014, 401(k) Plan Asset Allocation, Account Balances, and Loan Activity in 2013, No. 408, Employee Benefits Research Institute and the Investment Company Institute, Washington, DC.

52. C.R. Schoenberger, 2016, When Target Date Funds Are Off Target, The Wall Street Journal, Sept. 5.

53. R. Powell, 2009, "Target-date funds missed the target in 2008," MarketWatch, February 4.

54. Employers have a fiduciary responsibility to periodically assess the TDFs offered in the plan, but the Department of Labor does not mandate or even offer specific guidance on aspects such as different glide paths or expense ratios. See https://www.dol.gov/sites/default/files/ebsa/about-ebsa/our-activities/resource-center/fact-sheets/fsTDF.pdf

55. C.R. Schoenberger, 2016, "When Target Date Funds Are Off Target," The Wall Street Journal, Sept. 5.

56. Smart Investor, 2014, One Percent Can Make a Big Difference to Your 401(k) Plan Participants.

57. M. Hicken, 2015, "Is your target-date fund ripping you off?" CNN Money, January 26.

58. R. Powell, 2009, "Target-date funds missed the target in 2008," MarketWatch, February 4.

59. J. DiCenzo, 2009, A Closer Look at Automatic Savings Plan Services: Plan Sponsor and Participant Behavior, T. Rowe Price.

60. J.W. Clark, S.P. Utkus, J.A. Young, 2015, Automatic Enrollment: The Power of the Default, Vanguard Research, Valley Forge, PA.

61. J. DiCenzo, 2009, A Closer Look at Automatic Savings Plan Services: Plan Sponsor and Participant Behavior, T. Rowe Price.

62. B.A. Butricia, and M. Soto, 2010, The Impact of Automatic Enrollment on 401(k) Match Rates: A Methodological Note, The Urban Institute Retirement Policy Program, Washington, DC.

63. J. VanDerhei, 2010, The Impact of Automatic Enrollment in 401(k) Plans on Future Retirement Accumulations: A Simulation Study Based on Plan Design Modifications of Large Plan Sponsors, Employee Benefits Research Institute, Washington, DC.

64. A. Munnell, J. Aubry, and D. Muldoon, 2008, The Financial Crisis and State/Local Defined Benefit Plans, Center for Retirement Research at Boston College, Chestnut Hill, MA.

65. T. Ghilarducci and W. Sun, 2006, How Defined Contribution Plans and 401(k)s Affect Employer Pension Costs, Journal of Pension Economics and Finance, 5(2), 175-96.

66. J. Rauh, I. Stefanescu, and S. Zeldes, 2016, Op.cit.

67. J. VanDerhei, 2014, The Role of Social Security, Defined Benefits, and Private Retirement Accounts in the Face of the Retirement Crisis, EBRI Notes, Vol. 35, No. 1, EBRI, Washington, DC.

68. F. Porell, and D. Oakley, 2012, "The Pension Factor 2012: Assessing the Role of Defined Benefit Plans in Reducing Elder Economic Hardships," National Institute on Retirement Security, Washington, DC.

69. N. Rhee, and I. Boivie, 2015, "The Continuing Retirement Savings Crisis," National Institute on Retirement Security, Washington, DC.

70. E.C. Eriksson, 2007, The Pension Protection Act of 2006: Is It Too Late to Save Traditional Pension Plans? 41 Suffolk UL Rev 133, Suffolk University.

71. F. Denmark, 2016, Op.cit.

72. C. Weller and D. Baker, 2005, Smoothing the Waves of Pension Funding: Could Changes in Funding Rules Help Avoid Cyclical Underfunding? The Journal of Policy Reform, 8(2), p. 131-151. The authors also recommend averaging the benchmark interest rate over 20 years and requiring plan sponsors to fund pensions up to 120% of current liabilities.

73. K. Brainard and A. Brown, 2016, "Spotlight on Reform to State Retirement Systems, National Association of State Retirement System Administrators, Washington, DC.

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CalPERS balancing risks in review of lower return target

By: Randy Diamond

Published: November 28, 2016

David Toerge

Theodore Eliopoulos thinks a 6% rate of return is more realistic.

The stakes are high as the CalPERS board debates whether to significantly decrease the nation's largest public pension fund's assumed rate of return, a move that could hamstring the budgets of contributing municipalities as well as prompt other public funds across the country to follow suit.

But if the retirement system doesn't act, pushing to achieve an unrealistically high return could threaten the viability of the $299.5 billion fund itself, its top investment officer and consultants say.

ï¿½Being aggressive, having a reasonable amount of volatility and (being) wrong could lead to an unrecoverable loss,ï¿½ Andrew Junkin, president of Wilshire Consulting, the system's general investment consultant, told the board at a November meeting. CalPERS' current portfolio is pegged to a 7.5% return and a 13% volatility rate.

The chief investment officer of the California Public Employees' Retirement System and its investment consultants now say that assumed annualized rate of return is unlikely to be achieved over the next decade, given updated capital market assumptions that show a slow-growing economy and continued low interest rates.

Still, cities, towns and school districts that are part of the Sacramento-based system say they can't afford increased contributions they would be forced to pay to provide pension benefits if the return rate is lowered.

A decision could come in February.

Unlike other public plans that have leaned toward modest rate of return reductions, a key CalPERS committee is expected to be presented with a plan in December that's considerably more aggressive.

That was set in motion Nov. 15 at a committee meeting when Mr. Junkin and CalPERS CIO Theodore Eliopoulos said 6% is a more realistic return over the next decade.

At that meeting, it also was disclosed that CalPERS investment staff was reducing the fund's allocation to equities in an effort to reduce risk.

Only a year earlier, CalPERS investment staff and consultants had agreed that CalPERS was on the right track with its 7.5% figure. So confident were they that they urged the board to approve a risk mitigation plan that did lower the rate of return, but over a 20-year period, and only when returns were in excess of the 7.5%

assumption.

Two years of subpar results ï¿½ a 0.6% return for the fiscal year ended June 30 and a 2.4% return in fiscal 2015 ï¿½ reduced views of what CalPERS can earn over the next decade. Mr. Junkin said at the November meeting that Wilshire was predicting an annual return of 6.21% for the next decade, down from its estimates of 7.1% a year earlier.

Indeed, Mr. Junkin and Mr. Eliopoulos said the system's very survival could be at stake if board members don't lower the rate of return. ï¿½Being conservative leads to higher contributions, but you still have a sustainable benefit to CalPERS members,ï¿½ Mr. Junkin said.

The opinions were seconded by the system's other major consultant, Pension Consulting Alliance, which also lowered its return forecast.

Shifting the burden

But a CalPERS return reduction would just move the burden to other government units. Groups representing municipal governments in California warn that some cities could be forced to make layoffs and major cuts in city services as well as face the risk of bankruptcy if they have to absorb the decline through higher contributions to CalPERS.

ï¿½This is big for us,ï¿½ Dane Hutchings, a lobbyist with the League of California Cities, said in an interview. ï¿½We've got cities out there with half their general fund obligated to pension liabilities. How do you run a city with half a budget?ï¿½

CalPERS documents show that some governmental units could see their contributions more than double if the rate of return was lowered to 6%. Mr. Hutchings said bankruptcies might occur if cities had a major hike without it being phased in over a period of years. CalPERS' annual report in September on funding levels and risks also warned of potential bankruptcies by governmental units if the rate of return was decreased.

If the CalPERS board approves a rate of return decrease in February, school districts and the state would see rate increases for their employees in July 2017. Cities and other governmental units would see rate increases beginning in July 2018.

Any significant return reduction by CalPERS, which covers more than 1.5 million workers and retirees in 2,000 governmental units, would cause ripples both in and outside the state. That's because making such a major rate cut in the assumed rate of return is rare.

Mr. Eliopoulos and the consultants are scheduled to make a specific recommendation on the return rate at a Dec. 20 meeting. But they were clear earlier this month that they feel the system won't be able to earn much more than an annualized 6% over the next decade.

Gradual reductions

Thomas Aaron, a Chicago-based vice president and senior analyst at Moody's Investors Services, said in an interview that many public plans have lowered their return assumption because of lower capital market assumptions and efforts to reduce risk. But Mr. Aaron said the reductions have happened ï¿½very gradually, it tends to be in increments of 25 or 50 basis points.ï¿½

Statistics from the National Association of State Retirement Administrators show that 43 of 137 public plans have lowered their return assumption since June 30, 2014. But NASRA statistics show only nine plans out of 127 are below 7% and none has gone below 6.5%.

ï¿½CalPERS is the largest pension system in the country; definitely if CalPERS were to make a significant reduction, other plans would take notice,ï¿½ said Mr. Aaron.

Mr. Aaron said it would be hard to predict whether other public plans would follow. While there has been a

general trend toward reduced return assumptions given capital market forecasts, some plans are sticking to higher assumptions because they believe in more optimistic longer-term investment return forecasts.

Compounding the problem is that CalPERS is 68% funded and cash-flow negative, meaning each year CalPERS is paying out more in benefits than it receives in contributions, Mr. Junkin said. CalPERS statistics show that the retirement system received $14 billion in contributions in the fiscal year ended June 30 but paid out $19 billion in benefits. To fill that $5 billion gap, the system was forced to sell investments.

CalPERS has an unfunded liability of $111 billion and critics have said unrealistic investment assumptions and inadequate contributions from employers and employees have led to the large gap.

Previously, CalPERS officials had said that any return assumption change would not occur until an asset allocation review was complete in February 2018. But Mr. Eliopoulos on Nov. 15 urged the board to act sooner, saying the U.S. could be in a recession by that date.

Richard Costigan, chairman of CalPERS finance and administration committee, said in an interview that he expects a recommendation and vote by the full board meeting in February, adding there is no requirement to wait until 2018 to consider the matter.

Some board members at the Nov. 15 meeting said CalPERS was moving too fast to implement a new assumption. ï¿½I'm a little confused at the panic and expediency that you guys are selling us right now,ï¿½ said board member Theresa Taylor. ï¿½I think that we need to step back and breathe.ï¿½

But other board members suggested CalPERS needs to take immediate action even if it is uncomfortable.

Already adjusting

In a sense the system already has. Even without a formal return reduction, members of the investment staff have embarked on their own plan to reduce overall portfolio risk by reducing equity exposure, a policy supported by the board.

Mr. Eliopoulos said Nov. 15 that a pitfall of CalPERS' current rate of return is the need to invest heavily in equities, taking more risk than might be prudent. He also said the system was reviewing its equity allocation.

The system's latest investment report, issued Aug. 31, shows equity investments made up 51.1% or $155.4 billion of the system's assets, down from 52.7% or $160 billion as of July 30 and down from 54.1% in July 2015.

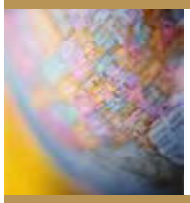
CalPERS took $3.8 billion of the $4.6 billion in equity reduction and increased its cash position and other assets in its liquidity asset class. Liquidity assets grew to $9.6 billion as of Aug. 31 from $5.8 billion at the end of July.

But an even bigger cut in the equity portfolio occurred after the September investment committee meeting, when board members meeting in closed session reduced the allocation even more, sources said. It is unclear how big that cut was, but allocation guidelines allow equity to be cut to 44% of the total portfolio.

Board member J.J. Jelincic at the Nov. 15 meeting disclosed the new asset allocation was made at the September meeting closed session. But Mr. Jelincic said based on revisions the board approved in the system's asset allocation, he felt the most CalPERS could earn was 6.25% a year because it was not taking enough risk.

Mr. Jelincic did not disclose the new asset allocation but said in an interview: ï¿½We are taking too little risk and walking away from the upside by not investing more in equities.ï¿½

Original Story Link: http://www.pionline.com/article/20161128/PRINT/311289986/calpers-balancing-risks-in-review-of-lower-return-target



CENTER for RETIREMENT RESEARCH at BOSTON COLLEGE

STATE AND LOCAL PENSION PLANS NUMBER 53, NOVEMBER 2016

NEW DEVELOPMENTS IN SOCIAL INVESTING BY PUBLIC PENSIONS

*By Alicia H. Munnell and Anqi Chen**

Introduction

Social investing is the pursuit of environmental, social, and governance (ESG) goals through investment decisions. Public pension funds have been active in this arena since the 1970s, when many divested from apartheid South Africa. They have also aimed to achieve domestic goals, such as promoting union workers, economic development, and homeownership.[1] In the mid-2000s, the focus shifted to preventing terrorism and gun violence. This effort included "terror-free" investing in response to the Darfur genocide and to weapons proliferation in Iran. And, after mass shootings in Aurora, CO, and Newtown, CT, some public funds shed their holdings in gun manufacturers. Most recently, states have renewed the call to divest from Iran and have increasingly targeted fossil fuels to combat climate change.[2]

This *brief* provides an update of social investing developments and assesses whether, in this changing environment, public funds should engage in this practice. This assessment addresses two questions: 1) can ESG-screened portfolios meet the same return/risk objectives as non-screened portfolios; and 2) are public plans the right vehicle for advancing ESG goals?

The discussion proceeds as follows. The first section explores trends in social investing and the U.S. Department of Labor's guidance on this activity. The second section examines recent state divestment efforts. The third section analyzes the economics of social investing. The fourth section outlines the economic, political, and legal complications. The final section concludes that although social investing may be worthwhile for private investors, lower returns and fiduciary concerns make public pension funds unsuited for advancing ESG goals.

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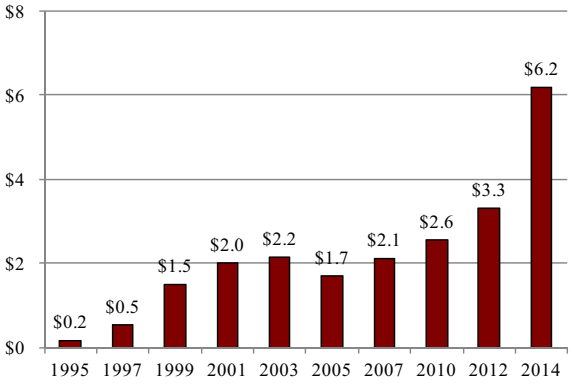
Trends in Social Investing

One of the main forms of social investing is screening (either excluding "bad" companies or including "good" companies).[3] Assets subject to screening have increased significantly in the last 20 years, with a near doubling between 2012 and 2014 (see Figure 1). ESG-managed assets represented over 16 percent of total assets under professional management in the United States in 2014. The financial industry has also noticed the growing importance of ESG factors to investors.[4] In 2016, Morningstar and Sustainalytics launched the industry's first environmental sustainability rating for mutual funds. Additionally, index provider MSCI has developed ESG ratings for equity and fixed-income issuers. And many prominent fund providers, such as Vanguard and TIAA, offer ESG-screened funds.

The bulk of social investing assets are in public pension funds (see Figure 2), and screening in these funds is pervasive. In 2014, their screened assets amounted to $2.7 trillion, more than half of their total assets.[5]

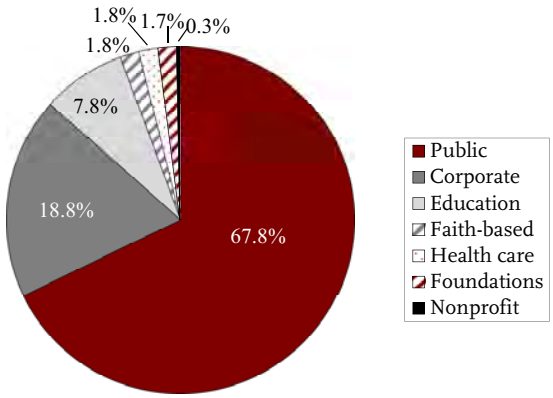
Figure 1. ESG-Screened Assets in the United States, 1995-2014, Trillions of Dollars



Source: The Forum for Sustainable and Responsible Investments (2014).

Interestingly, almost none of the screened money is held by private defined benefit plans. The likely reason is that these plans are generally covered by the Employee Retirement Income Security Act of 1974 (ERISA), and the U.S. Department of Labor (DOL) has stringently interpreted ERISA's duties of loyalty and prudence.[6] In 1980, a key DOL official published an influential article warning that the exclusion of investment options would be very hard to defend under ERISA's prudence and loyalty tests.[7] Thus, ERISA fiduciary law has effectively constrained social investing in the private sector.[8]

Figure 2. ESG-Screened Assets by Investor Type, 2014



Source: The Forum for Sustainable and Responsible Investments (2014).

Since 1980, the DOL has clarified its position on social investing several times in Interpretive Bulletins (see Box, on the next page). Until recently, its guidance clearly stated that plan trustees or other investing fiduciaries may not accept higher risk or lower returns in order to promote social, environmental, or other public policy causes.[9] In 2015, the agency clarified that ESG factors may have a direct impact on the economic value of a plan's investment. As such, these factors should be integrated into quantitative models of risk and return calculations, alongside financial indicators such as liquidity, capital structure, or leverage.

It is important to clarify the relationship between DOL's recent ESG Bulletin and public pension plans. First, DOL rules do not apply to state and local government plans because these plans are not covered by ERISA. Second, while the Bulletin supports integrating ESG factors into any financial assessment of an investment, it says nothing about using ESG factors for screening. Nevertheless, the Bulletin may have an indirect impact on public plan behavior by legitimizing the role of ESG factors in investment decisions.

Box. Evolution of DOL Guidance on ESG Investing, 1994-2015

Since the mid-1990s, the DOL has issued three Interpretive Bulletins on a fiduciary's ability to consider ESG factors under ERISA.

The 1994 Bulletin aimed to "correct the popular misconception" that ESG factors were incompatible with ERISA fiduciary requirements. The Bulletin reiterated that plan fiduciaries may not accept lower expected returns or greater risks in order to promote non-economic benefits; however, ESG goals can be considered as tie-breakers if investment alternatives present equal expected risks and returns.

In 2008, the DOL replaced the 1994 Bulletin with new guidance that the use of non-economic factors in selecting investments should be rare. Fiduciaries considering these non-economic factors must demonstrate their compliance with ERISA.

The 2015 Bulletin withdrew the language from the 2008 Bulletin, reinstating the 1994 Bulletin position. The DOL believed that the 2008 Bulletin unduly discouraged fiduciaries from considering ESG factors. The 2015 Bulletin then went further to clarify that ESG factors may directly affect the economic returns of an investment and may be incorporated when assessing an investment.

Sources: U.S. Department of Labor (1994, 2008, and 2015).

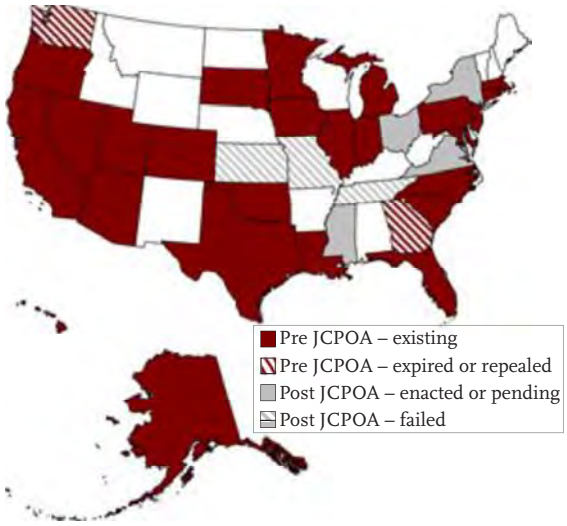
Recent Divestment Proposals

Recent political pressure for public pension divestments has centered on Iran and fossil fuels.

Iran Nuclear Deal

The Joint Comprehensive Plan of Action (JCPOA), commonly known as the Iran Nuclear Deal, removed economic sanctions on Iran when its nuclear program passed the International Atomic Energy Agency inspections in January 2016. Although the JCPOA discourages state and local governments from measures that are inconsistent with U.S. foreign policy, Iran screening by public pension plans is prevalent (see Figure 3).[10] In some cases, states retain sanctions that were imposed on Iran because it is on the State Department's list of countries that sponsor terrorism. The JCPOA does not remove Iran from the list and thus allows these state laws to remain. In other cases, legislatures that opposed the Iran Nuclear Deal have proposed new legislation to screen companies doing business with Iran. Currently, 32 states plus the District of Columbia have either divestiture or contracting statutes, or both.

Figure 3. States with Iran-screening Requirements, Before and After Iran Nuclear Deal



Sources: National Conference of State Legislatures (2016); Garcia and Garvey (2013); and Watson Institute for International and Public Affairs (2016).

Interestingly, in some instances, politics and economics have conflicted. For example, Mississippi initially passed a version of the Iran Divestment Act, which would have prohibited the state from doing business with firms that have certain financial investments in Iran. However, after discovering that the divestment bill would adversely affect Toyota Tsusho – which owns a manufacturing plant in Mississippi – the state Senate killed the bill.[11] The bill was then amended so that Toyota Tsusho would not be impacted.

Fossil Fuels

Another movement that has gained strong momentum is divestment from fossil fuels. This push has largely been driven by student activism over investments held by university endowments. Most notably, in 2014, a group of Harvard students sued the university for its investments in fossil-fuel companies. The

movement then spilled over into the public pension fund arena. Currently, four states plus the District of Columbia have some form of pending or enacted fossil fuel divestment legislation.[12]

Most of the fossil fuel legislation covers a very limited scope. For example, California only requires its public pension funds to divest from thermal coal. Similarly, the Washington, DC retirement fund is only divesting from "direct holdings," so its investments in private equity firms that focus on the oil and energy sector are not affected.

Regardless, divestments from Iran and fossil fuels involve a substantial amount of public pension fund assets. Thus, it is useful to consider the likely impact of such activity on target companies and on the pension funds themselves.

Economics of Social Investing

The academic literature suggests that ESG screening is likely to have very little impact on the target company and that the impact on the pension fund depends on the scale of the screening.

Impact on Target Company

According to standard finance theory, the price of any stock equals the present discounted value of expected future cash flows. Thus, the stock of a particular firm has many close substitutes, which makes the demand curve for a particular stock, in economists' terms, almost perfectly elastic.[13] That is, even a big change in demand for a firm's stock will lead to only a small change in its price because investors in similar companies will view it as a profitable opportunity and move in to buy the shares.[14]

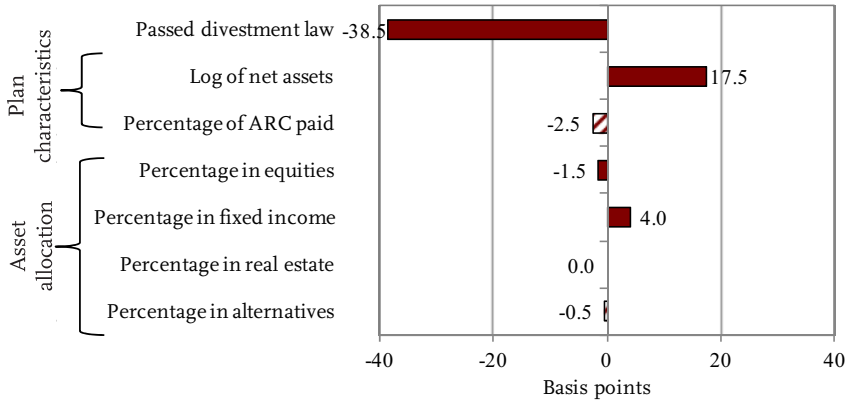
Indeed, in practice, investors are standing by to exploit these lower prices for higher returns. For example, the Barrier Fund (formerly known as the "Vice Fund") was established in 2002 and specializes in only four sectors – alcohol, tobacco, defense, and gambling – and stands ready to buy the stocks screened out of standard portfolios. Empirical studies have found that these vice industries provide relatively high returns, with results staying consistent across countries.[15]

Impact on Pension Funds

In addition to social investing's impact on targeted companies, it is also important to understand how it affects pension funds. Modern portfolio theory states that investors should diversify their asset holdings over a variety of securities so that their returns do not move in lockstep. The question is how many securities are needed for a diversified portfolio? The answer is that an investor needs only 20-30 stocks for a portfolio that reflects the whole market.[16] The small number of required stocks suggests that eliminating, say, tobacco, which accounts for about 1 percent of the S&P 500's market capitalization, should leave enough securities to get very close to the full market index. As the number excluded increases, though, it would become increasingly difficult to duplicate the market.[17]

The following analysis looks at how divestment laws affect rates of return on public pension assets. It uses a fixed-effects regression to compare returns in states with and without divestment laws, controlling for plan characteristics and asset allocation. The results in Figure 4 show that the average annual returns

Figure 4. Impact of Divestment Laws and Other Factors on Annual Average Geometric Returns of State-Administered Plans, in Basis Points, 2001-2015



Notes: Controls were included for each individual state trend, as well as state and year fixed effects. Solid bars are statistically significant at least at the 5-percent level.
Source: Authors' calculations from *Public Plans Database* (2001-2015).

of plans in states with divestment requirements are estimated to be 40 basis points lower than plans in states without such requirements.[18]

Another way to measure the impact of screening is to compare the returns of screened funds to unrestricted funds. The Forum for Sustainable and Responsible Investments provides investment returns for over 200 ESG-screened mutual funds from institutional member firms. Table 1 matches a selection of these ESG funds with comparable Vanguard mutual funds for five asset classes. In most cases, the Vanguard funds outperform their ESG counterparts, often by a considerable margin. Part of the reason is that the fees in the ESG funds are roughly 100 basis points higher than their Vanguard counterparts, which may reflect the additional resources required to perform the screening.

Complexities of Social Investing

The question of whether ESG issues should play a role in public fund investing goes beyond returns. Social investing introduces a host of economic, political, and legal complications. Important issues include whether state legislators and fund managers can act in the best interests of pension beneficiaries, the difficulty in even determining what those interests are, and potential constitutional conflicts between state and federal laws.

Decision Makers Are Not Stakeholders

Social investing in public plans highlights a classic principal-agent problem in economics. The principals in this case are tomorrow's pension beneficiaries and/or taxpayers: the people with skin in the game. The agents are the fund boards or state legislatures that make investment decisions on behalf of the principals. In theory, agents are supposed to act solely in the interests of the principals. In reality, especially in public plans, conflicts of interest may arise if state legislatures make investing decisions for political reasons. If social investing produces losses, tomorrow's taxpayers will have to ante up or future retirees will receive lower benefits. The welfare of these future actors is not well represented in the decision-making process.

Difficulty of Pricing Preferences

Even if decision makers always acted in the best interests of beneficiaries, it is still very difficult to determine how different beneficiaries value ESG factors.[19] For example, one beneficiary may accept lower returns for fossil-free but not firearms-free investments, while a second one may accept lower returns for terror-free but not fossil-free investments, and a third may not accept lower returns at all. Given different preferences, it would be difficult for public pension funds to fully incorporate the value of ESG factors of

Table 1. Average Net Returns of ESG Mutual Funds and Comparable Vanguard Mutual Funds, 2016

Asset class	Type	1-yr	5-yr	10-yr	Assets (billions)	Benchmark index
Equity (large)	ESG	8.4%	12.1%	6.9%	$30.0	S&P 500 Comp Total
	Vanguard	12.5	14.7	7.5	255.7	
Equity (mid)	ESG	5.8	13.5	7.0	4.6	Russell Midcap Value
	Vanguard	5.7	13.1	7.7	9.0	
Equity (intl)	ESG	9.5	7.8	4.9	0.4	MSCI ACWI
	Vanguard	7.4	9.8	4.4	4.4	
Bond (long)	ESG	14.1	6.7	8.3	0.1	Barclays US Long-A
	Vanguard	18.2	8.7	8.2	15.8	
Bond (short)	ESG	3.2	2.1	3.3	4.1	Barclays US 1-5
	Vanguard	3.6	2.4	3.5	57.3	

Note: Data as of August 31, 2016. Comparable funds are both from the same asset class and have the same benchmark index. Funds with less than 10 years of returns history are excluded. Returns are net of fees.
Sources: Authors' calculations from The Forum for Sustainable and Responsible Investments (2016); Bloomberg's ESG Data Service (2016); and Vanguard Mutual Funds (2016).

all beneficiaries. Additionally, these preferences may change over time as social values and political views shift.[20]

Potential Constitutional Conflicts

Recent state-level divestment legislation against Sudan and Iran has prompted debate over the constitutionality of state and local economic sanctions.[21] While some experts claim that states can enact such laws, others argue that these efforts conflict with federal trade and foreign policy objectives. In several instances, federal courts have ruled that state legislation on social investment was unconstitutional on grounds that it overlapped with federal foreign policy or commerce (see Table 2). The implementation of the Iran Nuclear Deal (the JCPOA) in 2016 has revived the debate. Paragraph 25 of the JCPOA states that "If a law at the state or local level in the United States is preventing the implementation of the sanctions lifting as specified in this JCPOA, the United States will take appropriate steps, taking into account all available authorities, with a view to achieving such implementation." As previously discussed, however, since many Iran or terror-free divestment laws are linked to the Federal State Sponsors of Terrorism list, which the JCPOA does not change, it is unclear whether these state-level divestments are unconstitutional.

Table 2. Federal Court Rulings on State-level Divestments, 2000-2012

Court case	Year	Ruling
Crosby v. National Foreign Trade Council[1]	2000	Federal law preempted Massachusetts law limiting transactions with firms involved in Burma.
American Insurance Assoc. v. Garamendi[2]	2003	Federal policy preempted California law on disclosures of Holocaust-era insurance policies sold in Europe.
National Foreign Trade Council v. Giannoulias[3]	2007	Illinois's Sudan sanctions found to be unconstitutional.
Odebrecht Constr., Inc. v. Prasad[4]	2012	Federal law preempted Florida law barring government contracts for firms operating in Cuba.

[1] Stephen Crosby was Secretary of Admin. & Finance of MA.
[2] John Garamendi was Insurance Commissioner of CA.
[3] Alexi Giannoulias was State Treasurer of IL.
[4] Amanth Prasad was Secretary of Transportation of FL.
Source: Garcia and Garvey (2013).

Conclusion

While social investing raises complex issues, public pension funds are not suited for this activity. The effectiveness of social investing is limited, and it distracts plan sponsors from the primary purpose of pension funds – providing retirement security for their employees. Additionally, such activity involves a principal-agent problem since decision makers do not bear the risk of potential losses; rather, any losses will accrue to future beneficiaries and/or taxpayers. Even if a principal-agent problem did not exist, it would still be difficult to price how each beneficiary values each specific ESG goal. Finally, state and local divestment legislation may interfere with federal trade, commerce, or foreign policy goals.

In contrast with public pension funds, social investing should not be discouraged for private investors. With the growing prevalence of ESG-screened products, private investors have an avenue to direct investments away from activities they wish to discourage. Public pension funds, however, should remain focused on providing retirement security for public employees.

Endnotes

1 Two books were instrumental in broadening the social investing debate – Rifkin and Barber (1978) and Litvak (1981).

2 State divestment legislation since 2012 has also targeted firearms manufacturers, companies that boycott Israel, companies that produce songs using lyrics considered racist or obscene, predatory lending companies, and Turkish investment vehicles.

3 Other forms of social investing include shareholder advocacy and community investing. Munnell and Sundén (2001) provide a discussion on how public pension funds have used different forms of social investing.

4 The growth in demand for ESG-screened assets has been attributed to the creation and growth of ESG indices, which make social investing easily accessible, as well as to the emerging millennial investor and shareholder campaigns, among other factors.

5 The $2.7 trillion figure is from The Forum for Sustainable and Responsible Investments (2014). The Federal Reserve's "Flow of Funds" data report total assets for state and local pension plans of $5.0 trillion in 2014.

6 ERISA requires a fiduciary to act "solely in the interests of the [plan] participants and beneficiaries... for the exclusive purpose" of providing benefits to them. A fiduciary must also act "with the care, skill, prudence, and diligence" of the traditional "prudent man." See Langbein, Stabile, and Wolk (2006).

7 Lanoff (1980).

8 Some companies with defined contribution plans offer their employees one or more mutual fund options that pursue social investing criteria. Such an option does not raise any fiduciary concerns because the decision is left entirely to the participant.

9 U.S. Department of Labor (1988, 1994, 2008).

10 Under the JCPOA, the U.N. Security Council's permanent members and Germany are now permitted to engage in trade with Iran in previously prohibited energy, shipbuilding, auto, and financial services sectors. The United States, however, retains its unilateral human rights and terrorism-related sanctions.

11 Toyota Tsusho purchases Iranian crude oil through a special exclusion under the U.S. National Defense Authorization Act.

12 Hawaii and Connecticut considered fossil fuel divestment, but the legislation did not pass.

13 For an in-depth discussion, see Munnell and Sundén (2005) and Munnell (2007).

14 The caveat is, of course, that potential buyers must not think the sale reflects a negative assessment of the firm's financial condition or business prospects. If potential purchasers believe that the seller is disposing of the stock because he knows something adverse that they do not, they will revise down their assessment of the stock's value, and the transaction will reduce the price of the stock.

15 See Fabozzi, Ma, and Oliphant (2008), Hong and Kacperczyk (2009), and Statman and Glushkov (2009).

16 See Brealey and Myers (1988). Campbell et al. (2001) conclude that the number of stocks needed to achieve a given level of diversification has increased over time and may be as high as 50. Statman (2004) suggests the number could be even higher. A greater number of stocks required to achieve diversification implies a greater level of difficulty in replicating the market when screening occurs.

17 Rudd (1981) and Grossman and Sharpe (1986) argue that the investor will not be able to exactly duplicate the market portfolio, because the screened portfolio will have relatively greater covariance in returns. Rudd also argues that social investing will introduce size and other biases into the portfolio, which will lead to deterioration in long-run performance.

18 Brown, Pollet, and Weisbenner (2015) examined the investment behavior and performance of 27 state pension plans that manage their own equity portfolios. Interestingly, the authors found that both overweighting the equity of firms headquartered within the state and the presence of political influence on stock selection yielded excess returns for pension funds. Their sample, however, represented 12 percent of the total state plans or 50 percent of total public pension assets.

19 Social investing can be viewed as a form of value-driven investing – which is dependent on personal preferences – rather than returns-driven investing. Some stakeholders may be willing to risk lower returns because they believe the incorporation of ESG components increases the value in intangible ways that may not be reflected in price growth alone.

20 For example the California Public Employees Retirement System (CalPERS) divested from the tobacco industry at the end of 2000. However, as part of a broader review of its fiduciary obligations, CalPERS is currently considering reinvesting in tobacco after a report (Wilshire Associates 2015) estimated that it took losses for the majority of its divestments. Additionally, CalPERS continues to develop loss threshold policies that would trigger an automatic review of divested assets when losses exceed a certain level.

21 Garcia and Garvey (2013) explain that state and local economic sanctions raise three constitutional issues: 1) whether they violate the Foreign Commerce Clause and, if so, whether protections exist under the market participant exception to the Clause; 2) whether they interfere with the federal government's exclusive power to conduct foreign affairs; and 3) whether they are preempted by federal law.

References

Bloomberg LP. "Environmental, Social and Governance (ESG) Data Service." New York, NY. Available at: https://www.bloomberg.com/bcause/customers-using-esg-data

Brealey, Richard A. and Stewart C. Myers. 1988. *Principles of Corporate Finance*. McGraw-Hill Education – Europe.

Brown, Jeffrey R., Joshua M. Pollet, and Scott J. Weisbenner. 2015. *The In-State Equity Bias of State Pension Plans*. Working Paper 21020. Cambridge, MA: National Bureau of Economic Research.

Campbell, John Y., Martin Lettau, Burton G. Malkiel, and Yexiao Xu. 2001. "Have Individual Stocks Become More Volatile? An Empirical Exploration of Idiosyncratic Risk." *The Journal of Finance* 56(1): 1-43.

Fabozzi, Frank J., K. C. Ma, and Becky J. Oliphant. 2008."Sin Stock Returns." *Journal of Portfolio Management* 35:82.

Garcia, Michael John, and Todd Garvey. 2013. *State and Local Economic Sanctions: Constitutional Issues*. Report RL33948. Washington, DC: Congressional Research Service, Library of Congress.

Grossman, Blake R. and William Sharpe. 1986. "Financial Implications of South African Divestment." *Financial Analysts Journal* 42(4): 15-29.

Hong, Harrison, and Marcin Kacperczyk. 2009. "The Price of Sin: The Effects of Social Norms on Markets." *Journal of Financial Economics* 93(1): 15-36.

Langbein, John, Susan J. Stabile, and Bruce A. Wolk. 2006. *Pension and Employee Benefit Law*. New York, NY: Foundation Press.

Lanoff, Ian. 1980. "The Social Investment of Private Pension Fund Assets: May It Be Done Lawfully Under ERISA?" *Labor Law Journal* 31(7): 387-392.

Litvak, Lawrence. 1981. "Pension Funds and Economic Renewal." Washington, DC: Council of State Planning Agencies.

Munnell, Alicia H. 2007. "Should Public Plans Engage in Social Investing." *Issue in Brief* 7-12. Chestnut Hill, MA: Center for Retirement Research at Boston College.

Munnell, Alicia H. and Annika Sundén. 2005. "Social Investing: Pension Plans Should Just Say 'No'," in Jon Entine, ed., *Pension Fund Politics: The Dangers of Socially Responsible Investing*, 13-55. Washington, DC: AEI Press.

Munnell, Alicia H. and Annika Sundén. 2001. "Investment Practices of State and Local Pension Plans," in Olivia S. Mitchell and Edwin C. Hustead, eds. *Pensions in the Public Sector*, 153-194. Philadelphia, PA: The Pension Research Council and University of Pennsylvania Press.

National Conference of State Legislatures. 2016. "State Divestment Legislation." Washington,DC. Available at: http://www.ncsl.org/research/fiscal-policy/pension-legislation-database.aspx

Public Plans Database. 2001-2015. Center for Retirement Research at Boston College, Center for State and Local Government Excellence, and National Association of State Retirement Administrators.

Rifkin, Jeremy and Randy Barber. 1978. *The North Will Rise Again: Pensions, Politics and Power in the 1980s*. Boston, MA: Beacon Press.

Rudd, Andrew. 1981. "Social Responsibility and Portfolio Performance." *California Management Review* 23: 55-61.

Statman, Meir. 2004. "The Diversification Puzzle." *Financial Analysts Journal* 60 (4): 44-53.

Statman, Meir, and Denys Glushkov. 2009. "The Wages of Social Responsibility." *Financial Analysts Journal* 65(4): 33-46.

The Forum for Sustainable and Responsible Investments. 2016. Washington, DC. "Sustainable & Responsible Mutual Fund Chart." Available at: http://charts.ussif.org/mfpc/?SortBy=FundTenYear

The Forum for Sustainable and Responsible Investments. 2014. "US Sustainable, Responsible and Impact Investing Trends 2014." Washington, DC. Available at: https://www.sec.gov/comments/disclosure-effectiveness/disclosureeffectiveness-18.pdf

U.S. Board of Governors of the Federal Reserve System. 2016. Financial Accounts of the United States: Flow of Funds, Balance Sheets, and Integrated Macroeconomic Accounts. Washington, DC.

U.S. Department of Labor. 1988. *ERISA Advisory Opinion* 88-16A. Washington, DC.

U.S. Department of Labor. 1994. *Interpretive Bulletin* IB 94-1. Washington, DC.

U.S. Department of Labor. 2008. *Interpretive Bulletin* IB 08-1. Washington, DC.

U.S. Department of Labor. 2015. *Interpretive Bulletin* IB 2015-1. Washington, DC.

Vanguard. "Vanguard Mutual Funds." Valley Forge, PA. Available at: https://investor.vanguard.com/mutual-funds/list#/mutual-funds/asset-class/month-end-returns

Wilshire Associates. 2015. "Comprehensive Divestment Analysis." Santa Monica, CA.

Watson Institute for International and Public Affairs at Brown University. 2016."Iran State Sanctions Project." Providence, RI.

APPENDIX

Appendix Table. Impact of Divestment Laws and Other Factors on Annual Average Geometric Returns of State-Administered Plans, 2001-2015

Variable	Coefficient
Passed divestment law	-0.385**
	(0.167)
Plan characteristics	
Log of net assets	0.175***
	(0.0446)
Percentage of ARC paid	-0.0253
	(0.0780)
Asset allocation	
Percentage in equities	-0.0149***
	(0.00471)
Percentage in fixed income	0.0404***
	(0.00556)
Percentage in real estate	-0.000491
	(0.0157)
Percentage in alternatives	-0.00470
	(0.00774)
Constant	-1569.1***
	(37.38)
Observations	1,551
Adjusted R-squared	0.869

Notes: Controls were included for each individual state trend as well as state and year fixed effects. Statistically significant at 5-percent (**), or 1-percent level (***). Robust standard errors in parentheses.
Source: Authors' calculations from *Public Plans Database* (2001-2015).

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The mission of the Center for Retirement Research at Boston College is to produce first-class research and educational tools and forge a strong link between the academic community and decision-makers in the public and private sectors around an issue of critical importance to the nation's future. To achieve this mission, the Center sponsors a wide variety of research projects, transmits new findings to a broad audience, trains new scholars, and broadens access to valuable data sources. Since its inception in 1998, the Center has established a reputation as an authoritative source of information on all major aspects of the retirement income debate.

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NO WRITTEN REPORT PROVIDED

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CONSULTING, LLC
The experience and dedication you deserve

The District of Columbia Retirement Board 10/1/2016 Actuarial Valuation Results

Table of Contents

Key Findings

- A 9.2% investment return on a Market Value basis for fiscal year ending September 30, 2015 and a 6.5% return on an Actuarial Value basis due to smoothing of asset returns over 7 year period.
- Funded status increased for all plans. Police and Fire are both over 100% funded based on both Actuarial Value of Assets (AVA) and Market Value of Assets (MVA). Teachers are around 90% funded based on both AVA and MVA.
- Teachers Retirement Plan Contribution for 2018 fiscal year is estimated at $59.0 million (up from $ 56.8 for the 2017 fiscal year).
- Police Officers' and Firefighters' Retirement Plan Contribution for 2018 fiscal year is estimated at $105.6 million (down from $145.6 million for the 2017 fiscal year).
- Total contribution is estimated at $164.6 million for 2018 fiscal year (down from $202.4 million for the 2017 fiscal year).

Funding Policy

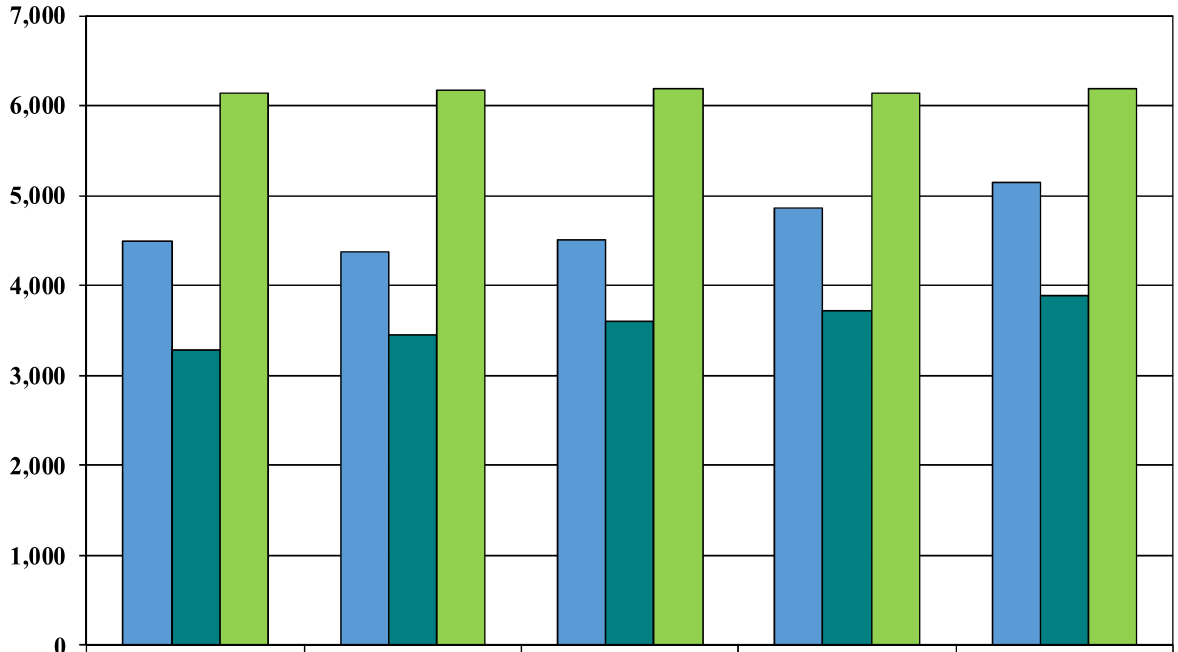
- Adopted in 2012 by the Board
- Objectives and Goals
  - 100% Funded Ratio
  - Stable or Decreasing Contribution Rates
- Assumptions
  - Entry Age Normal Cost Method
  - 7 year smoothing
  - Level dollar amortization
  - Closed 20 year period beginning in 2012 valuation; now have 16 years remaining

Funded Status as of October 1

Plan	Actuarial Value of Assets		Market Value of Assets	
	2016	2015	2016	2015
Teachers	90.9%	88.7%	89.8%	85.6%
Police	113.5	111.3	112.7	107.6
Fire	104.8	99.4	104.4	96.5
Police and Fire	110.8	107.6	110.1	104.2
Total	104.6	101.7	103.8	98.3

DCRB Pension Results

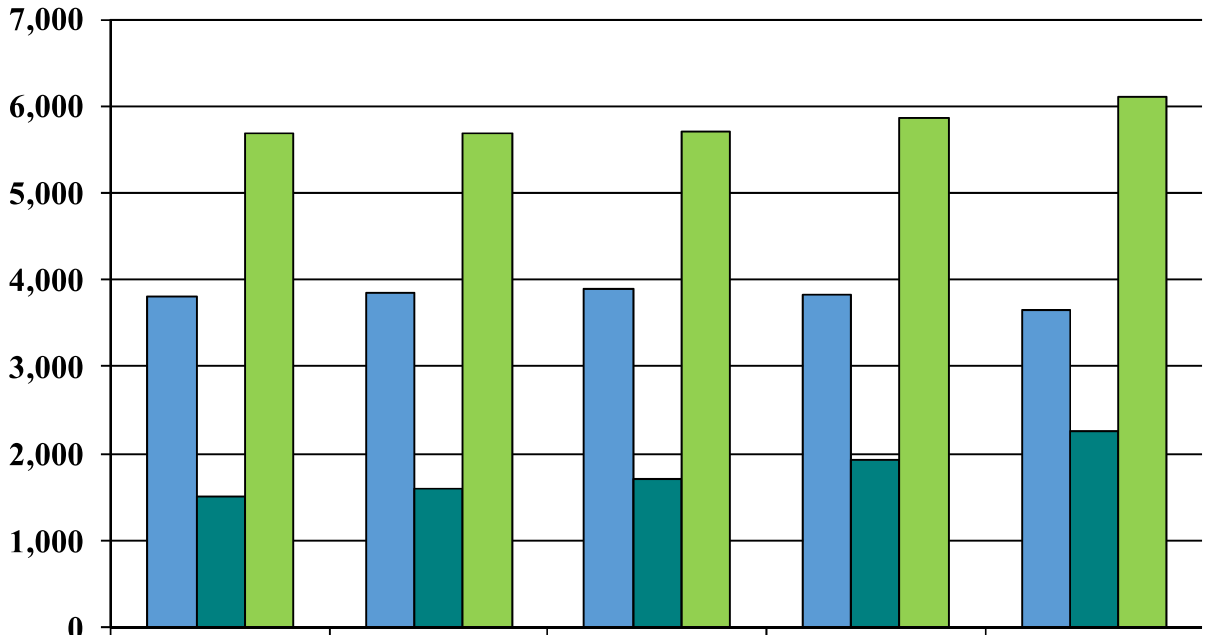
Total Active & Retired Teachers



	2012	2013	2014	2015	2016
Active Members	4,495	4,379	4,499	4,866	5,141
Retired District Members	3,285	3,448	3,601	3,718	3,882
Retired Total Members	6,130	6,172	6,189	6,137	6,183

3.4% average increase for active members since 2012; 5.7% increase for 2016
4.3% average increase for retired district members since 2012; 4.4% increase for 2016
0.2% average increase for retired total members since 2012; 0.7% increase for 2016

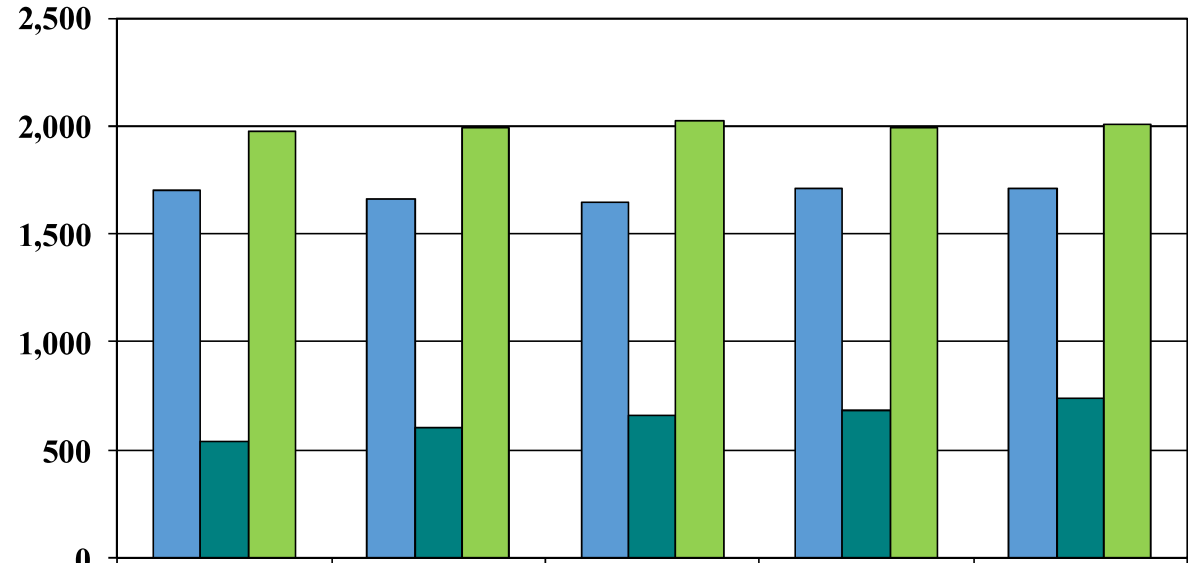
Total Active & Retired Police



	2012	2013	2014	2015	2016
Active Members	3,810	3,846	3,902	3,829	3,651
Retired District Members	1,498	1,584	1,707	1,923	2,265
Retired Total Members	5,703	5,695	5,717	5,861	6,110

1.1% average decrease for active members since 2012; 4.6% decrease for 2016
10.9% average increase for retired district members since 2012; 17.8% increase for 2016
1.7% average increase for retired total members since 2012; 4.2% increase for 2016

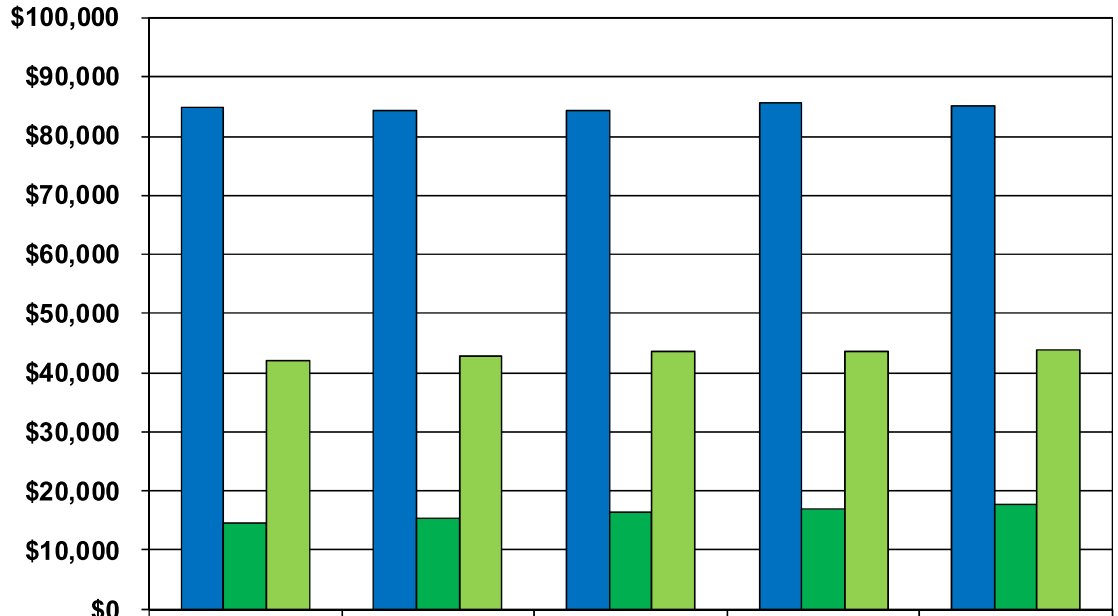
Total Active & Retired Fire



	2012	2013	2014	2015	2016
Active Members	1,700	1,664	1,649	1,708	1,708
Retired District Members	541	599	658	686	738
Retired Total Members	1,974	1,994	2,026	1,993	2,008

0.1% average increase for active members since 2012; 0.0% increase for 2016
8.1% average increase for retired district members since 2012; 7.6% increase for 2016
0.4% average increase for retired total members since 2012; 0.8% increase for 2016

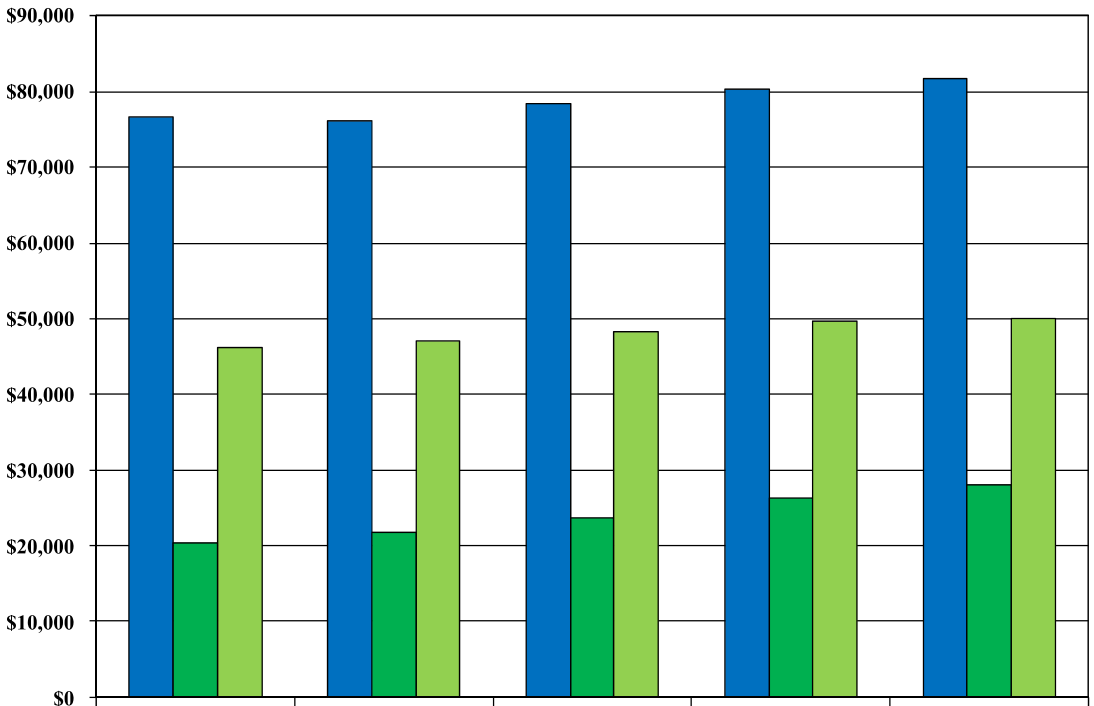
Average Teacher Salary & Benefits



	2012	2013	2014	2015	2016
Average Annual Salary	$84,813	$84,282	$84,225	$85,715	$85,213
Average Annual District Benefits	$14,431	$15,361	$16,297	$16,917	$17,720
Average Annual Total Benefits	$41,931	$42,724	$43,576	$43,601	$43,701

0.1% average increase in salary since 2012; 0.6% decrease for 2016
5.3% average increase in district benefit since 2012; 4.7% increase for 2016
1.0% average increase in total benefit since 2012; 0.2% increase for 2016

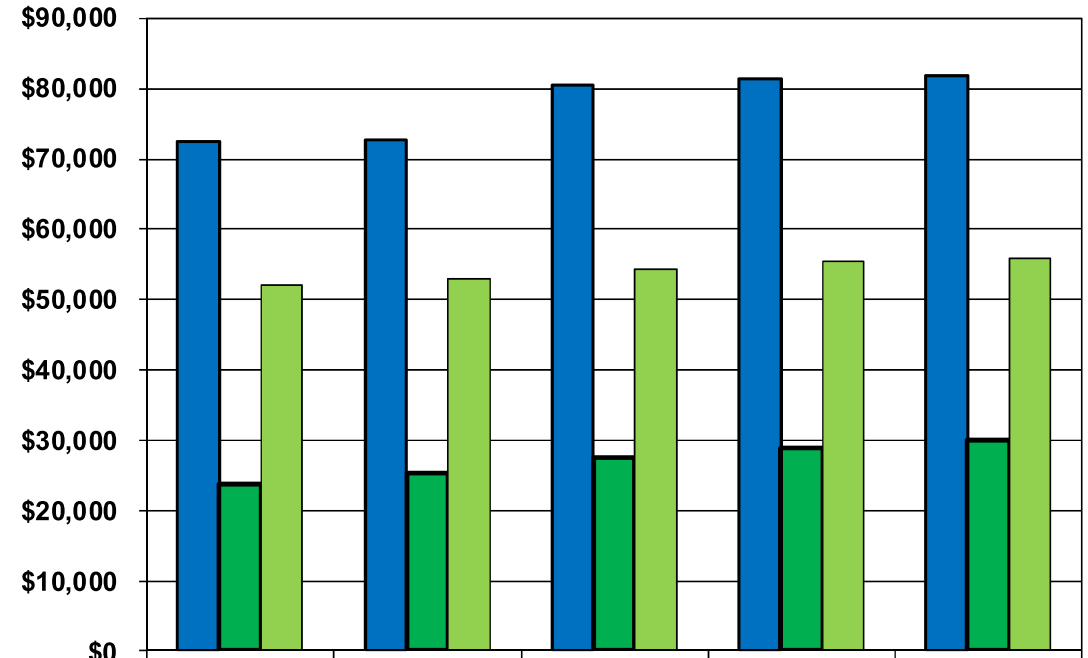
Average Police Salary & Benefits



	2012	2013	2014	2015	2016
Average Annual Salary	$76,583	$76,051	$78,361	$80,275	$81,743
Average Annual District Benefits	$20,422	$21,712	$23,592	$26,243	$28,074
Average Annual Total Benefits	$46,152	$46,971	$48,245	$49,635	$49,962

1.6% average increase in salary since 2012; 1.8% increase for 2016
8.3% average increase in district benefit since 2012; 7.0% increase for 2016
2.0% average increase in total benefit since 2012; 0.7% increase for 2016

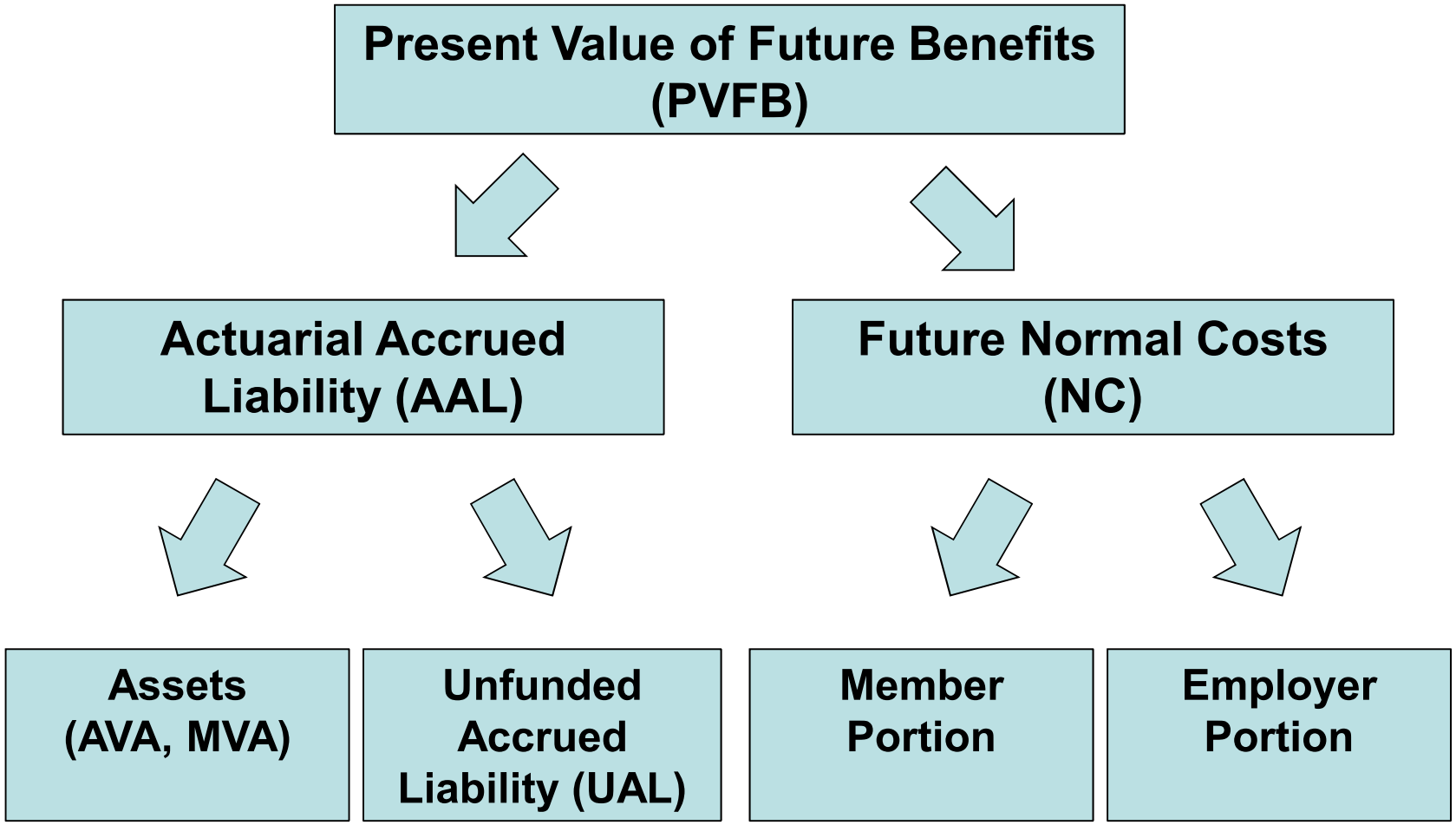
Average Fire Salary & Benefits



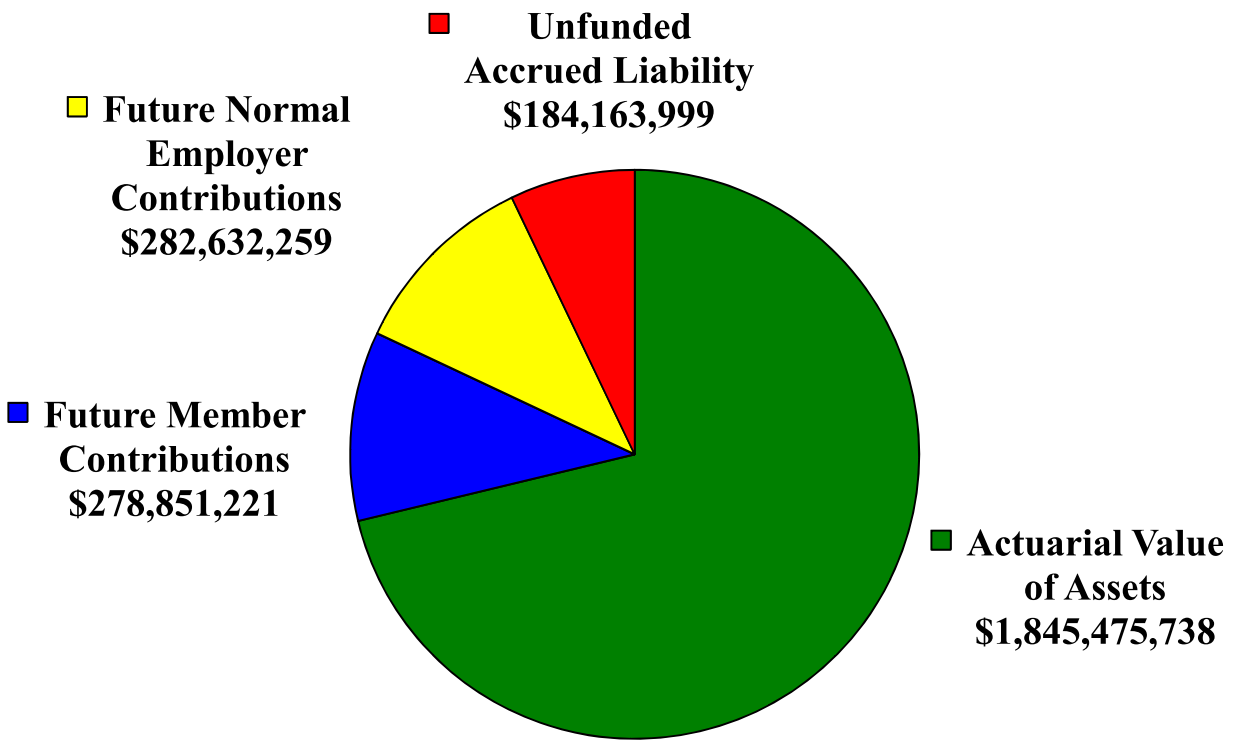
	2012	2013	2014	2015	2016
Average Annual Salary	$72,410	$72,648	$80,443	$81,281	$81,775
Average Annual District Benefits	$23,729	$25,272	$27,628	$28,865	$30,015
Average Annual Total Benefits	$52,060	$52,919	$54,294	$55,506	$55,894

3.1% average increase in salary since 2012; 0.6% increase for 2016
6.1% average increase in district benefit since 2012; 4.0% increase for 2016
1.8% average increase in total benefit since 2012; 0.7% increase for 2016

Funding Valuation Process

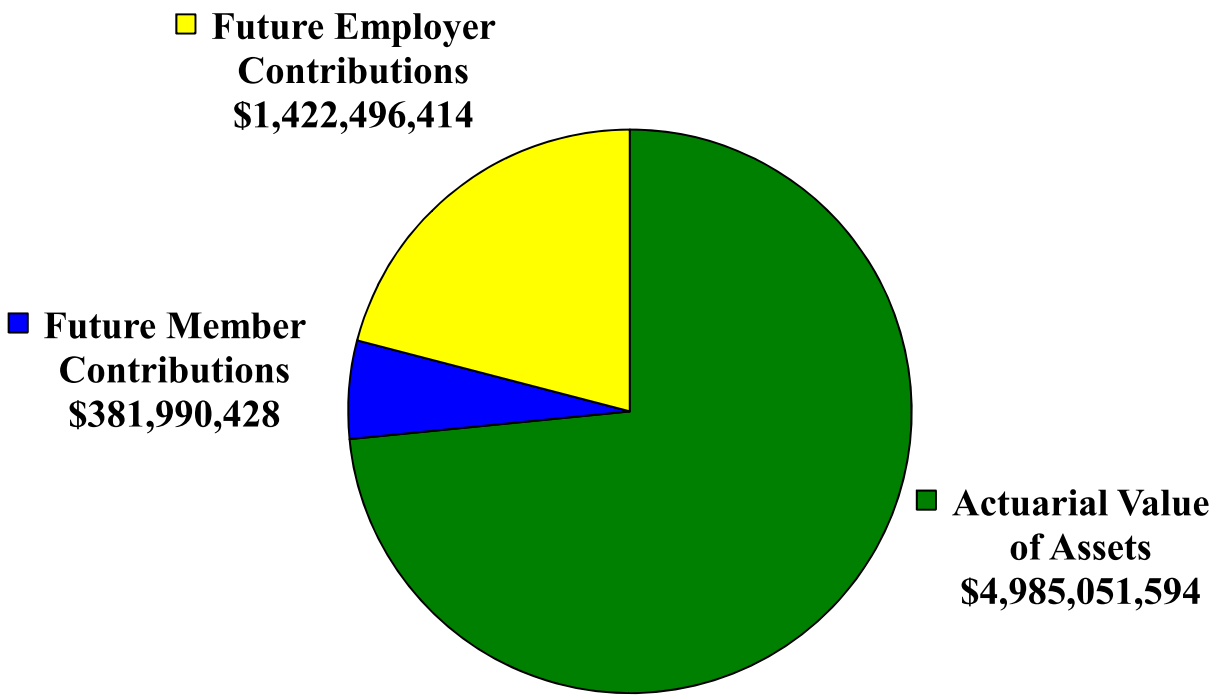


Present Value of Future Benefits by Funding Type - Teachers



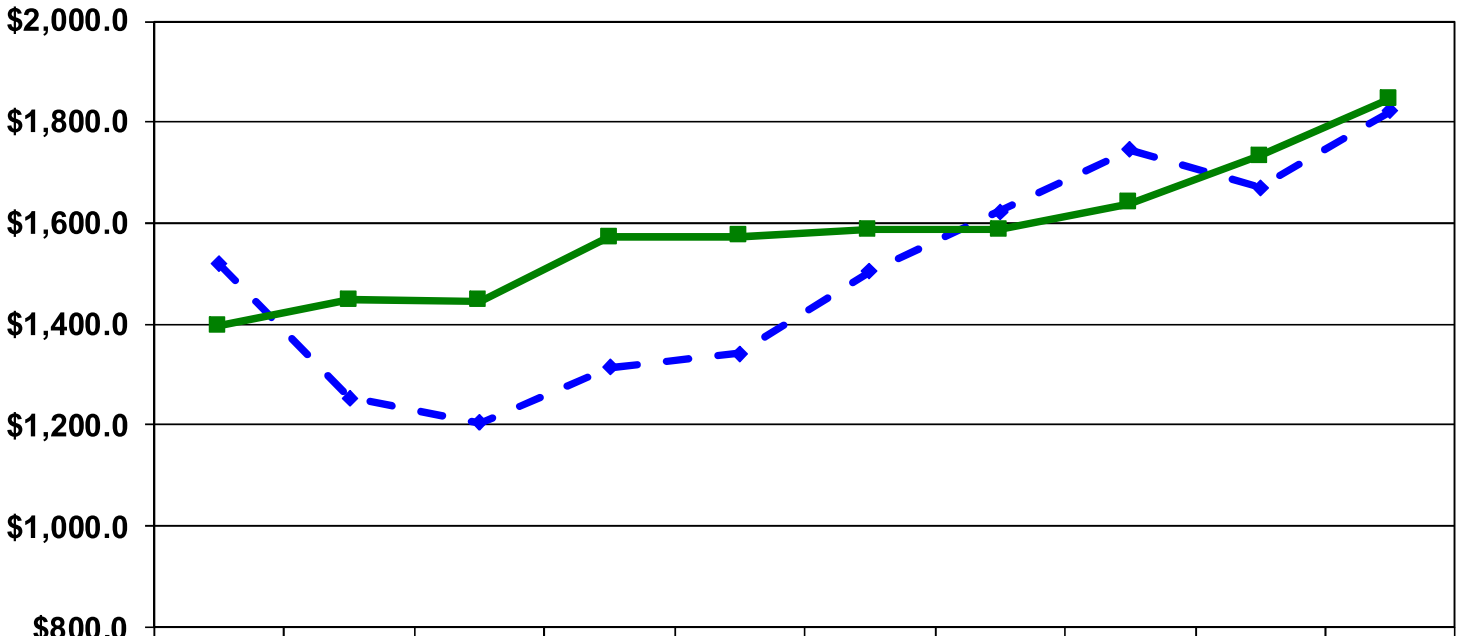
Total - $2,591,123,217

Present Value of Future Benefits by Funding Type – Police & Fire



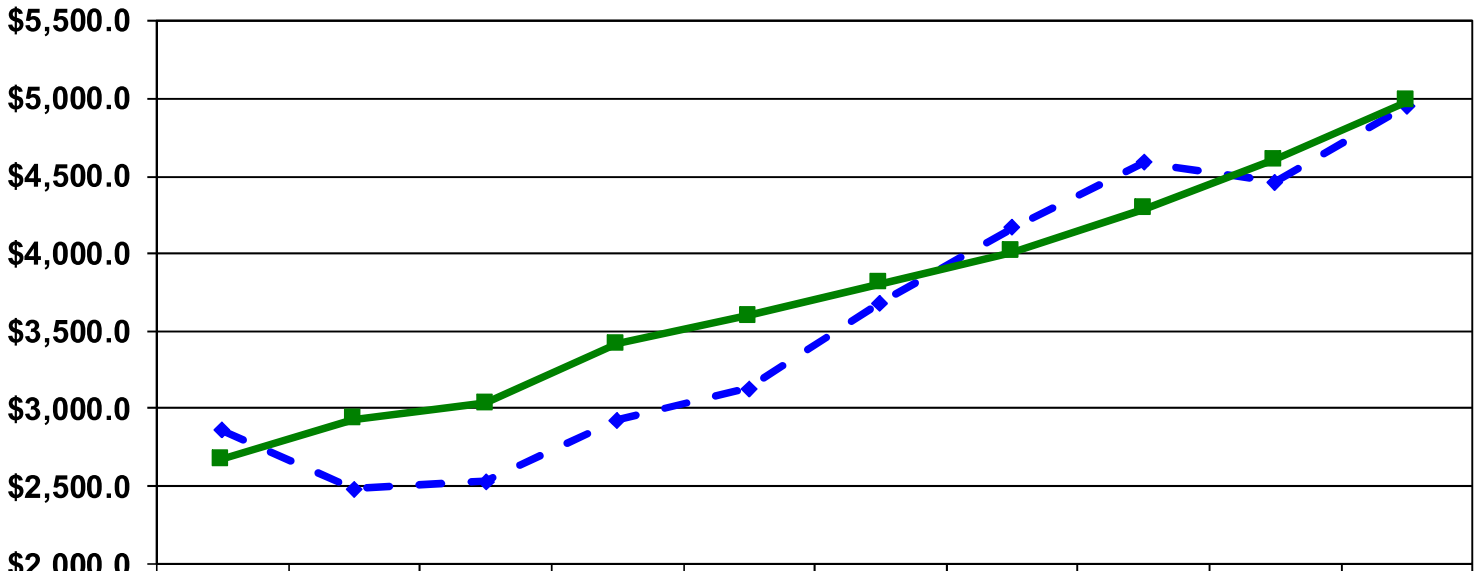
Total - $6,789,538,436

Teacher Assets ($ Millions)



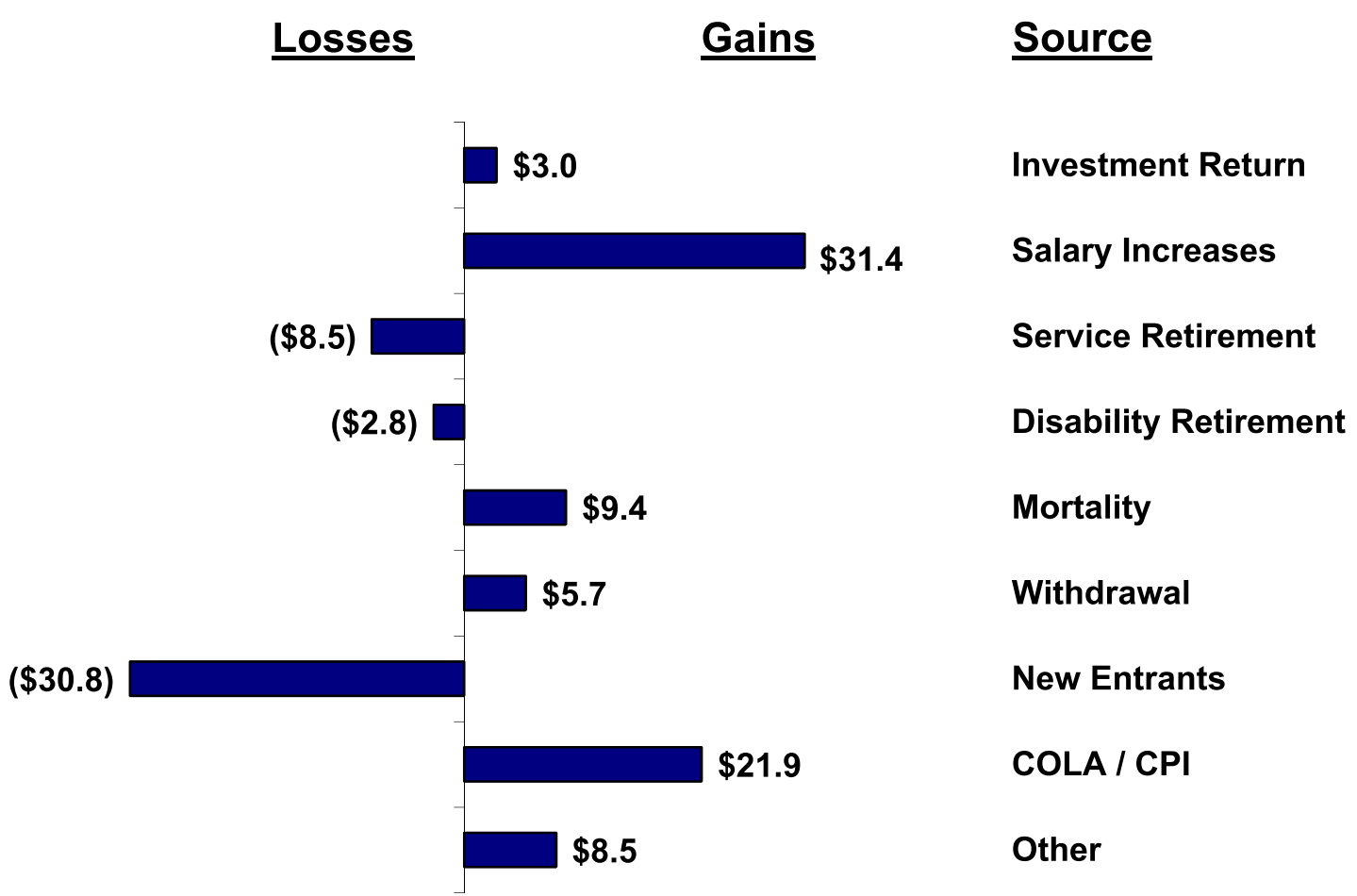
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Market Value	$1,519.4	$1,253.5	$1,204.4	$1,314.4	$1,340.7	$1,503.3	$1,622.4	$1,746.0	$1,671.0	$1,822.1
Actuarial Value	$1,396.0	$1,447.6	$1,445.0	$1,571.0	$1,573.7	$1,585.6	$1,585.8	$1,638.6	$1,732.0	$1,845.5

Police & Fire Assets
($ Millions)

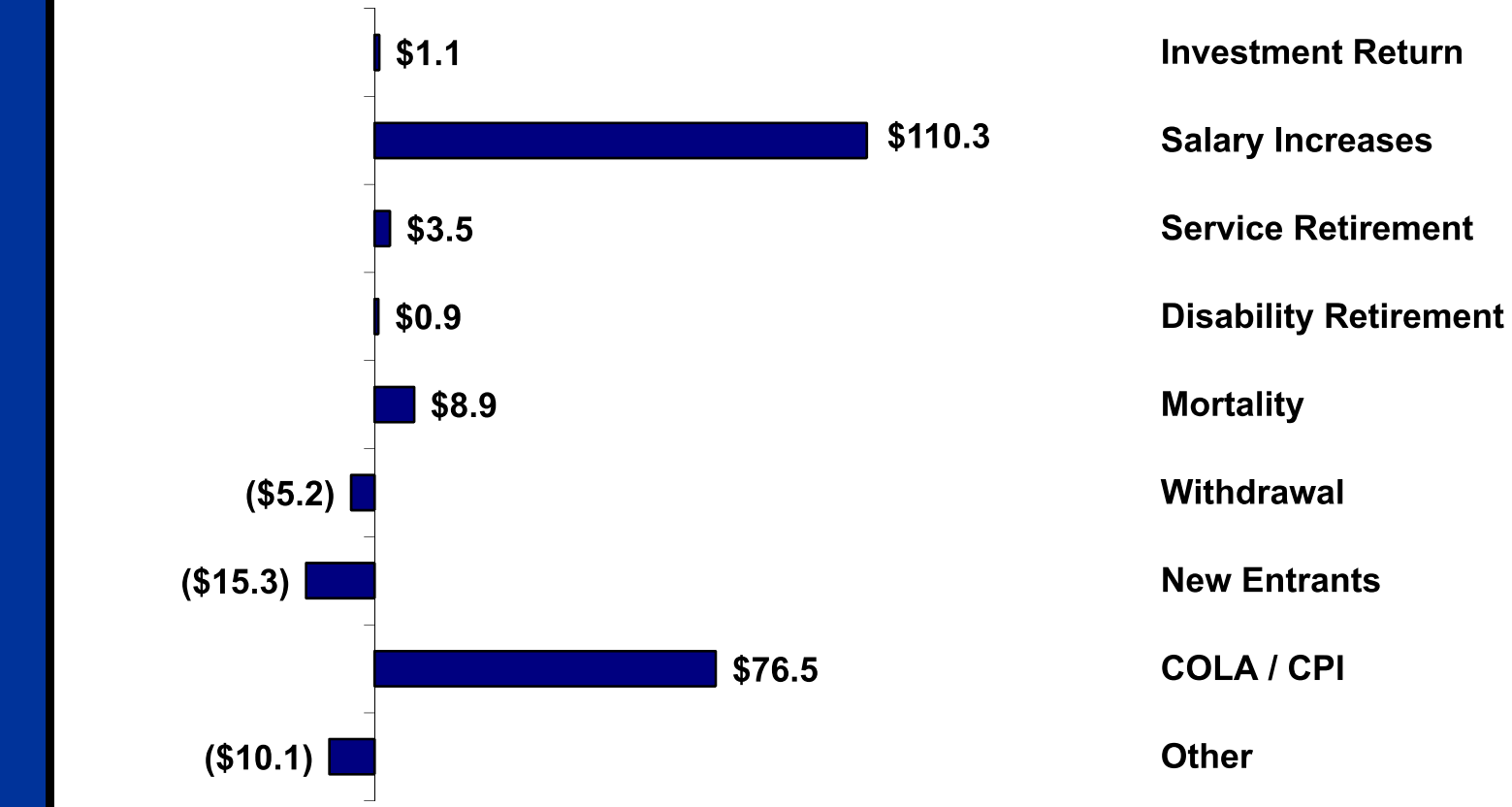


	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Market Value	$2,857.2	$2,481.2	$2,525.0	$2,920.8	$3,127.5	$3,681.5	$4,168.5	$4,588.3	$4,462.2	$4,954.5
Actuarial Value	$2,672.9	$2,932.1	$3,032.1	$3,418.8	$3,593.7	$3,804.9	$4,013.5	$4,288.7	$4,607.3	$4,985.1

Teachers Actuarial Gain/Loss Analysis
($ millions)



Police & Fire Actuarial Gain/Loss Analysis
($ millions)



Contribution Results for FY 2018

	Teachers	Police	Fire	Total
Employer Normal Cost Rate	7.47%	34.22%	38.84%	20.49%
Total Accrued Liability	$2,029.6	$3,108.5	$1,389.9	$6,528.0
Actuarial Value of Assets	$1,845.5	$3,528.5	$1,456.5	$6,830.5
Unfunded Accrued Liability	$184.1	$(420.0)	$(66.6)	$(302.5)
Amortization of UAL (Level $, 16 years)	$17.7	$(40.4)	$(6.4)	$(29.1)
UAL Rate	4.04%	(13.53)%	(4.58)%	(2.24)%
Total Employer Contribution Rate (Employer Normal Cost Rate plus UAL Rate)	11.51%	20.69%	34.26%	18.25%
Estimated 2018 Fiscal Year Payroll	$456.7	$311.1	$145.6	$913.4
Employer Contributions in Dollars	$52.5	$64.4	$49.8	$166.7
Shortfall/Overpayment	$6.5	$(4.4)	$(4.2)	$(2.1)
Final Employer Contributions in Dollars	$59.0	$60.0	$45.6	$164.6
Funded Ratio based on AVA	90.93%	113.51%	104.79%	104.60%
Funded Ratio based on MVA	89.78%	112.70%	104.39%	103.80%

Reconciliation of Contribution Requirement

Source	Increase/(Decrease) in Contribution	Cumulative Employer Contribution
October 1, 2015 Valuation (2017 FYE)		$202.4
Anticipated Normal Cost Increase due to Inflation	$9.7	$212.1
Section 1-907.02(c) Contribution Adjustment from 2015 Valuation*	($16.8)	$195.3
Actuarial Value of Assets Investment Gain	($0.4)	$194.9
Net Demographic Experience	($18.7)	$172.0
Net COLA Experience	($9.4)	$166.8
Section 1-907.02(c) Contribution Adjustment from 2016 Valuation*	($2.2)	$164.6
October 1, 2016 Valuation (2018 FYE)		$164.6

*Section 1-907.02(c) requires that City contributions based on expected pay amounts be trued up after the actual pay amounts are known. The true-up calculation decreased the contribution requirement by $19.0 million.

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DISTRICT OF COLUMBIA RETIREMENT BOARD
DCRB

Report on the Actuarial Valuations of the District of Columbia Retirement Board

Teachers' Retirement Plan and Police Officers' & Firefighters' Retirement Plan

Prepared as of October 1, 2016

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December 12, 2016

The Board of Trustees
District of Columbia Retirement Board
900 7th Street, NW, 2nd Floor
Washington, DC 20001

Dear Trustees:

We are pleased to submit the results of the annual actuarial valuations of the District of Columbia Retirement Board Teachers' Retirement Plan and Police Officers' & Firefighters' Retirement Plan, prepared as of October 1, 2016.

The purpose of this report is to provide a summary of the funded status of each Plan as of October 1, 2016, and to recommend rates of contribution to be paid by the District in the 2018 fiscal year. The information needed for this Plan under the new Governmental Accounting Standards Board Statement No. 67 was provided in a separate report. However, for informational purposes only, we have also provided accounting information under GASB 25 and 27 in Section VII of the report. While not verifying the data at source, the actuary performed tests for consistency and reasonability.

The promised benefits are included in the actuarially calculated contribution rates which are developed using the entry age normal cost method. Seven-year smoothed market value of assets is used for actuarial valuation purposes. The assumptions recommended by the actuary and adopted by the Board are reasonably related to the experience under the Fund and to reasonable expectations of anticipated experience under the Fund.

The funding policy adopted by the Board in 2012 includes the following funding goals:

- To maintain an increasing or stable ratio of Plan assets to actuarial accrued liabilities and reach a 100 percent minimum funded ratio;
- To develop a pattern of stable or declining contribution rates when expressed as a percentage of member payroll as measured by valuations prepared in accordance with the principles of practice prescribed by the Actuarial Standards Board, with a minimum employer contribution equal to the lesser of the normal cost determined under the Entry Age Normal funding method or the current active member contribution rate.

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The funding policy not only states the overall funding goals and benchmarks for the Plan, but sets the methods and assumptions. The level dollar amortization period was set to 20 years in 2012 and will decline one year each year until a funded ratio of 100 percent is reached. Therefore, the amortization period this year is 16 years.

Future actuarial results may differ significantly from the current results presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements; and changes in plan provisions or applicable law. Since the potential impact of such factors is outside the scope of a normal annual actuarial valuation, an analysis of the range of results is not presented herein.

The undersigned are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

The Table of Contents, which immediately follows, outlines the material contained in the report.

Respectfully submitted,

Edward J. Koebel, EA, FCA, MAAA
Principal and Consulting Actuary

Jonathan T. Craven, ASA, EA, FCA, MAAA
Senior Actuary

EJK/JTC:kc

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SECTION I – SUMMARY OF PRINCIPAL RESULTS

1. For convenience of reference, the principal results of the valuation and a comparison with the preceding year's results for the Teachers' Retirement Plan and Police Officers' and Firefighters' Retirement Plan are summarized below in the tables that follow.

SUMMARY OF PRINCIPAL RESULTS FOR TEACHERS' RETIREMENT PLAN
($ IN THOUSANDS)

VALUATION DATE	October 1, 2016	October 1, 2015
Number of Active Members	5,141	4,866
Annual Covered Payroll	$438,079	$417,090
Number of Retired Members and Survivors	3,882	3,718
Annual Retirement Benefits	$68,790	$62,899
Assets:		
Actuarial Value	$1,845,476	$1,732,017
Market Value	$1,822,113	$1,670,976
Liabilities:		
Actuarial Accrued Liability	$2,029,640	$1,953,305
Unfunded Actuarial Accrued Liability (UAAL)	$184,164	$221,288
Funding Ratios:		
Based on Actuarial Value	90.93%	88.67 %
Based on Market Value	89.78%	85.55 %
Amortization Period:	16 years	17 years
CONTRIBUTION FOR FISCAL YEAR ENDING	**09/30/2018**	**09/30/2017**
Employer Normal Cost Rate*	7.47%	7.24%
Amortization of UAAL Rate	4.04	4.93
Actuarially Determined Contribution Rate (ADC)	11.51%	12.17%
Estimated Fiscal Year End Covered Payroll	$456,697	$434,816
Fiscal Year District Payment before 1-907.02(c)	$52,566	$52,917
Shortfall/(Overpayment)	6,480	3,864
Fiscal Year District Payment	$59,046	$56,781

*The normal cost rate includes the administrative expense rate of 1.20%.

SUMMARY OF PRINCIPAL RESULTS FOR POLICE OFFICERS' RETIREMENT PLAN
($ IN THOUSANDS)

VALUATION DATE	October 1, 2016	October 1, 2015
Total Number of Active Members	3,651	3,829
Total Annual Covered Payroll	$298,442	$307,373
Number of Retired Members and Survivors	2,265	1,923
Annual Retirement Benefits	$63,587	$50,412
Total Assets:		
Actuarial Value	$3,528,543	$3,283,847
Market Value	$3,503,500	$3,177,374
Liabilities:		
Actuarial Accrued Liability	$3,108,582	$2,951,895
Unfunded Actuarial Accrued Liability (UAAL)	($419,961)	($331,952)
Funding Ratios:		
Based on Actuarial Value	113.51%	111.25 %
Based on Market Value	112.70%	107.64 %
Amortization Period:	16 years	17 years
CONTRIBUTION FOR FISCAL YEAR ENDING	**09/30/2018**	**09/30/2017**
Employer Normal Cost Rate*	34.22%	33.78 %
Amortization of UAAL Rate	(13.53)	(10.03)
Actuarially Determined Contribution Rate (ADC)	20.69%	23.75 %
Estimated Fiscal Year End Covered Payroll	$311,126	$320,436
Fiscal Year District Payment before 1-907.02(c)	$64,372	$76,104
Shortfall/(Overpayment)	(4,420)	591
Fiscal Year District Payment	$59,952	$76,695

*The normal cost rate includes the administrative expense rate of 1.20%.

SUMMARY OF PRINCIPAL RESULTS FOR FIREFIGHTERS' RETIREMENT PLAN
($ IN THOUSANDS)

VALUATION DATE	October 1, 2016	October 1, 2015
Total Number of Active Members	1,708	1,708
Total Annual Covered Payroll	$139,672	$138,828
Number of Retired Members and Survivors	738	686
Annual Retirement Benefits	$22,151	$19,802
Total Assets:		
Actuarial Value	$1,456,508	$1,323,453
Market Value	$1,450,964	$1,284,854
Liabilities:		
Actuarial Accrued Liability	$1,389,931	$1,331,198
Unfunded Actuarial Accrued Liability (UAAL)	($66,577)	$7,745
Funding Ratios:		
Based on Actuarial Value	104.79%	99.42 %
Based on Market Value	104.39%	96.52 %
Amortization Period:	16 years	17 years
CONTRIBUTION FOR FISCAL YEAR ENDING	**09/30/2018**	**09/30/2017**
Employer Normal Cost Rate*	38.84%	38.59%
Amortization of UAAL Rate	(4.58)	0.52
Actuarially Determined Contribution Rate (ADC)	34.26%	39.11%
Estimated Fiscal Year End Covered Payroll	$145,608	$144,728
Fiscal Year District Payment before 1-907.02(c)	$49,885	$56,603
Shortfall/(Overpayment)	(4,241)	12,333
Fiscal Year District Payment	$45,644	$68,936

*The normal cost rate includes the administrative expense rate of 1.20%.

SUMMARY OF PRINCIPAL RESULTS FOR POLICE OFFICERS' & FIREFIGHTERS' RETIREMENT PLAN
($ IN THOUSANDS)

VALUATION DATE	October 1, 2016	October 1, 2015
Number of Active Police Officers	3,651	3,829
Annual Covered Payroll	$298,442	$307,373
Number of Active Firefighters	1,708	1,708
Annual Covered Payroll	$139,672	$138,828
Total Number of Active Members	5,359	5,537
Total Annual Covered Payroll	$438,114	$446,201
Number of Retired Members and Survivors	3,003	2,609
Annual Retirement Benefits	$85,738	$70,214
Assets:		
Actuarial Value	$4,985,051	$4,607,300
Market Value	$4,954,464	$4,462,228
Liabilities:		
Actuarial Accrued Liability	$4,498,513	$4,283,093
Unfunded Actuarial Accrued Liability (UAAL)	($486,538)	($324,207)
Funding Ratios:		
Based on Actuarial Value	110.82%	107.57 %
Based on Market Value	110.14%	104.18 %
Amortization Period:	16 years	17 years
CONTRIBUTIONS FOR FISCAL YEAR ENDING	**09/30/2018**	**09/30/2017**
Employer Normal Cost Rate*	35.69%	35.28 %
Amortization of UAAL Rate	(10.68)	(6.75)
Actuarially Determined Contribution Rate (ADC)	25.01%	28.53 %
Estimated Fiscal Year End Covered Payroll	$456,734	$465,164
Fiscal Year District Payment before 1-907.02(c)	$114,257	$132,707
Shortfall/(Overpayment)	(8,661)	12,924
Fiscal Year District Payment	$105,596	$145,631

*The normal cost rate includes the administrative expense rate of 1.20%.

2. The valuation balance sheet showing the results is given in Schedule A.

3. Comments on the valuation results as of October 1, 2016 are given in Section IV and further adjustments of the contribution amounts are set out in Section V.

4. Schedule B of this report shows the development of the actuarial value of assets. Schedule D outlines the full set of actuarial assumptions and methods employed.

5. The funding policy adopted by the Board in 2012 includes the following funding goals:

   - To maintain an increasing or stable ratio of Plan assets to actuarial accrued liabilities and reach a 100 percent minimum funded ratio;

   - To develop a pattern of stable or declining contribution rates when expressed as a percentage of member payroll as measured by valuations prepared in accordance with the principles of practice prescribed by the Actuarial Standards Board, with a minimum employer contribution equal to the lesser of the normal cost determined under the Entry Age Normal funding method and the current active member contribution rate.

   The funding policy not only states the overall funding goals and benchmarks for the Plan, but sets the methods and assumptions. The level dollar amortization period was set to 20 years in 2012 and will decline one year each year until a funded ratio of 100 percent is reached. The amortization period this year is 16 years.

6. The valuation takes into account the effect of amendments to DCRB through the valuation date. The Main Provisions of DCRB, as summarized in Schedule E, were taken into account in the current valuation. No changes were made to the main provisions since the previous valuation.

7. Membership and asset data was provided by DCRB staff and was reviewed for reasonableness and consistency with data from prior valuations. Where data was incomplete but thought to be credible, assumptions were made for missing items. The valuation results depend on the integrity of the data. If any of this information is inaccurate our results may differ and our calculations may need to be revised. All membership data was collected as of July 1, 2016 but for valuation purposes (e.g. age, service) all members were treated as if remaining in the System as of October 1, 2016.

SECTION II – MEMBERSHIP DATA

1. Data regarding the membership of DCRB for use as a basis of the valuation were furnished by the District Government. The following table shows the number of active members and their annual compensation as of October 1, 2016 on the basis of which the valuation was prepared.

TABLE 1

THE NUMBER AND ANNUAL COMPENSATION OF ACTIVE MEMBERS AS OF OCTOBER 1, 2016 ($ IN THOUSANDS)

GROUP	NUMBER	COMPENSATION
Teachers	5,141	$438,079
Police Officers	3,651	298,442
Firefighters	1,708	139,672
Total	10,500	$876,193

2. The following table shows a five-year history of active member valuation data.

TABLE 2

SCHEDULE OF TOTAL ACTIVE MEMBER VALUATION DATA

VALUATION DATE	NUMBER	ANNUAL PAYROLL ($ IN THOUSANDS)	ANNUAL AVERAGE PAY	% CHANGE IN AVERAGE PAY
10/01/2016	10,500	$ 876,193	$ 83,447	0.56 %
10/01/2015	10,403	863,291	82,985	2.04
10/01/2014	10,050	817,341	81,327	2.79
10/01/2013	9,889	782,451	79,123	(0.56)
10/01/2012	10,005	796,112	79,571	1.81

3. The following table shows the number and annual retirement benefits payable to retired members and survivors on the roll of DCRB as of the valuation date.

TABLE 3

THE NUMBER AND ANNUAL RETIREMENT BENEFITS OF RETIRED MEMBERS AND SURVIVORS OF DECEASED MEMBERS* ON THE ROLL AS OF OCTOBER 1, 2016 ($ IN THOUSANDS)

DISTRICT ONLY

TYPE OF RETIREMENT	GROUP			
	TEACHERS	POLICE OFFICERS	FIREFIGHTERS	TOTAL
Service:				
Number	3,617	1,593	529	5,739
Annual Benefits	$65,038	$48,955	$17,574	$131,567
Disability:				
Number	116	310	84	510
Annual Benefits	$2,666	$9,103	$2,186	$13,955
Survivors:				
Number	149	362	125	636
Annual Benefits	$1,086	$5,529	$2,391	$9,006
Total:				
Number	3,882	2,265	738	6,885
Annual Benefits	$68,790	$63,587	$22,151	$154,528

*In addition, there are 1,469 deferred vested participants with annual deferred benefits of $19,506,167.

TABLE 4

THE NUMBER AND ANNUAL RETIREMENT BENEFITS OF RETIRED MEMBERS AND SURVIVORS OF DECEASED MEMBERS ON THE ROLL AS OF OCTOBER 1, 2016 ($ IN THOUSANDS)

FEDERAL PLUS DISTRICT

TYPE OF RETIREMENT	GROUP			
	TEACHERS	POLICE OFFICERS	FIREFIGHTERS	TOTAL
Service:				
Number	5,431	3,682	1,114	10,227
Annual Benefits	$251,380	$220,261	$77,828	$549,469
Disability:				
Number	315	999	366	1,680
Annual Benefits	$9,939	$43,525	$18,284	$71,748
Survivors:				
Number	437	1,429	528	2,394
Annual Benefits	$8,885	$41,483	$16,123	$66,491
Total:				
Number	6,183	6,110	2,008	14,301
Annual Benefits	$270,204	$305,269	$112,235	$687,708

4. Tables 4 through 6 of Schedule F show the distribution by age and service of the number and annual compensation of active members for each plan included in the valuation. Tables 7 through 12 of Schedule F show the distribution by age of the number and annual benefits of retired members for each plan included in the valuation.

SECTION III - ASSETS

1. Schedule C shows the additions and deductions of DCRB for the year preceding the valuation date and a reconciliation of the fund balances at market value. As of October 1, 2016, the market value of assets used to determine the actuarial value of assets for each plan is shown below:

TABLE 5

COMPARISON OF MARKET VALUE OF ASSETS AT OCTOBER 1, 2016 AND OCTOBER 1, 2015 ($ IN THOUSANDS)

FUND	OCTOBER 1, 2016 MARKET VALUE	OCTOBER 1, 2015 MARKET VALUE
Teachers	$1,822,113	$1,670,976
Police Officers and Firefighters	4,954,464	4,462,228
Total Market Value of Assets	$6,776,577	$6,133,204

2. The seven-year market related actuarial value of assets used for the current valuation was $6,830,527,332. Schedule B shows the development of the actuarial value of assets as of October 1, 2016. The following table shows the actuarial value of assets allocated among each plan.

TABLE 6

COMPARISON OF ACTUARIAL VALUE OF ASSETS AT OCTOBER 1, 2016 AND OCTOBER 1, 2015 ($ IN THOUSANDS)

FUND	OCTOBER 1, 2016 ACTUARIAL VALUE	OCTOBER 1, 2015 ACTUARIAL VALUE
Teachers	$1,845,476	$1,732,017
Police Officers and Firefighters	4,985,051	4,607,300
Total Actuarial Value of Assets	$6,830,527	$6,339,317

SECTION IV - COMMENTS ON VALUATION

Teachers' Retirement Plan

1. The total valuation balance sheet on account of benefits shows that the Teachers' Retirement Plan has total prospective benefit liabilities of $2,591,123,217, of which $980,894,546 is for the prospective benefits payable on account of present retired members and survivors of deceased members, $127,137,589 is for the prospective benefits payable on account of present inactive members, and $1,483,091,082 is for the prospective benefits payable on account of present active members. Against these benefit liabilities the Teachers' Retirement Plan has a total present actuarial value of assets of $1,845,475,738 as of October 1, 2016. The difference of $745,647,479 between the total liabilities and the total present actuarial value of assets represents the present value of contributions to be made in the future on account of benefits.

2. The contributions to the Plan consist of normal cost contributions and actuarial accrued liability contributions. The valuation indicates the normal contributions at a rate of 14.13% of payroll are required under the entry age method. Of this amount 7.86% will be paid by the members (at the rate of 7.0% of salary for members hired before November 1, 1996 and 8.0% of salary for members hired on or after November 1, 1996), in 2018 and the remaining 6.27% is payable by the District.

3. Beginning with the October 1, 2012 valuation, estimated budgeted administrative expenses are included in the normal rates. The expenses for the fiscal year ending September 30, 2018 are estimated to be 1.20% of payroll.

4. Prospective normal cost contributions (excluding administrative expenses) at the rate of 14.13% have a present value of $561,483,480. When this amount is subtracted from $745,647,479, which is the present value of total future contributions to be made, there remains $184,163,999 as the amount of unfunded actuarial accrued liability contributions. The development of the unfunded actuarial accrued liability is shown in Schedule A.

5. The unfunded actuarial accrued liability (UAAL) decreased approximately $37.1 million for the plan year ending September 30, 2016 and the funding ratio increased from 88.67% to 90.93%. This decrease in the UAAL was primarily due to lower salary increases for active members than was expected. In addition, there was a gain due to the COLA increases for retirees being less than expected. There were losses due to more new entrants than expected that partially offset these gains. See Schedule H for a complete breakdown of the experience of the Plan.

Police Officers' and Firefighters' Retirement Plan

1. The total valuation balance sheet on account of benefits shows that the combined Police Officers' and Firefighters' Retirement Plan has total prospective benefit liabilities of $6,789,538,436, of which $1,590,952,329 is for the prospective benefits payable on account of present retired members and survivors of deceased members, $59,243,088 is for the prospective benefits payable on account of present inactive members, and $5,139,343,019 is for the prospective benefits payable on account of present active members. Against these benefit liabilities the Police Officers' and Firefighters' Retirement Plan has a total present actuarial value of assets of $4,985,051,594 as of October 1, 2016. The difference of $1,804,486,842 between the total liabilities and the total present actuarial value of assets represents the present value of contributions to be made in the future on account of benefits.

2. The contributions to the Plan consist of normal cost contributions and actuarial accrued liability contributions. The valuation indicates the normal contributions at a rate of 42.14% of payroll are required under the entry age method. Of this amount 7.65% will be paid by the members (at the rate of 7.0% of salary for members hired before November 1, 1996 and 8.0% of salary for members hired on or after November 1, 1996), in 2018 and the remaining 34.49% is payable by the District.

3. Beginning with the October 1, 2012 valuation, estimated budgeted administrative expenses are included in the normal rates. The expenses for the fiscal year ending September 30, 2018 are estimated to be 1.20% of payroll.

4. Prospective normal cost contributions (excluding administrative expenses) at the rate of 42.14% have a present value of $2,291,024,645. When this amount is subtracted from $1,804,486,842, which is the present value of total future contributions to be made, there remains ($486,537,803) as the amount of unfunded actuarial accrued liability contributions. The development of the unfunded actuarial accrued liability is shown in Schedule A.

5. The unfunded actuarial accrued liability (UAAL) decreased approximately $162.3 million for the plan year ending September 30, 2016 and the funding ratio increased slightly from 107.57% to 110.82%. This decrease in the UAAL was primarily due to smaller pay increases than expected for active members. There was also a gain due to the COLA increases for retirees being less than expected. These gains were partially offset by a loss due to more new entrants than expected. See Schedule H for a complete breakdown of the experience of the Plan.

SECTION V - §1-907.02(c) ADJUSTMENT TO FISCAL YEAR 2018 DISTRICT PAYMENT

1. Beginning in fiscal year 2001, the District payment was adjusted pursuant to D.C. Code §1-907.02(c). This section stipulates that "…the enrolled actuary shall determine whether the amount appropriated for the applicable fiscal year resulted in an overpayment or a shortfall based upon the actual covered payroll."

2. The D.C. Code §1-907.02(c) adjustment to the fiscal year 2018 District payment is calculated by taking the actual fiscal year 2016 covered payroll for each employee class (which is provided by the District) and multiplying by the corresponding fiscal year 2016 contribution rates, which were determined as of October 1, 2014. This result is the fiscal year 2016 contribution that was required to be made by the District, based on actual payroll. The required contribution is then compared to the actual contribution that was paid by the District based on projected payroll. The difference between the required and actual contributions is the D.C. Code §1-907.02(c) adjustment. Any adjustment amount that cannot be used in a given year is carried forward to the next fiscal year.

ADJUSTMENT TO DISTRICT PAYMENT
AS OF OCTOBER 1, 2016
($ IN THOUSANDS)

	Teachers	Police	Fire
(1) Actual FY 2016 Covered Payroll	$438,079	$298,442	$139,672
(2) FY 2016 Contribution Rate	11.63%	24.15%	39.65%
(3) Actual FY 2016 Contribution Required	$50,949	$72,074	$55,380
(4) Actual FY 2016 Contribution Paid	$44,469	$76,494	$59,621
(5) Preliminary D.C. Code §1-907.02(c) Adjustment to FY 2017 Payment [(3) - (4)]	$6,480	($4,420)	($4,241)
(6) FY 2016 Unrecognized Amount	$0	$0	$0
(7) Final D.C. Code §1-907.02(c) Adjustment to FY 2017 Payment [(5) + (6) if applicable]	$6,480	($4,420)	($4,241)
(8) Applicable Adjustment	$6,480	($4,420)	($4,241)
(9) Carryover Adjustment [(7) - (8)]	$0	$0	$0

SECTION VI – CONTRIBUTIONS PAYABLE

1. The following tables summarize the employer contribution rates, which were determined by the October 1, 2016 valuation and recommended for use for the fiscal year ending September 30, 2018.

TEACHERS' RETIREMENT PLAN
ACTUARIAL DETERMINED CONTRIBUTIONS (ADC)
FOR FISCAL YEAR ENDING SEPTEMBER 30, 2018

	PERCENTAGE OF ACTIVE MEMBERS' COMPENSATION	EMPLOYER ACTUARIAL DETERMINED CONTRIBUTION (ADC)
Normal Cost	6.27%	$28,635,000
Expense Load	1.20	5,480,000
Accrued Liability	4.04	18,451,000
Sub-Total	11.51%	$52,566,000
DC Code Adjustment		6,480,000
Total		$59,046,000

POLICE OFFICERS' AND FIREFIGHTERS' RETIREMENT PLAN
ACTUARIAL DETERMINED CONTRIBUTIONS (ADC)
FOR FISCAL YEAR ENDING SEPTEMBER 30, 2018

	PERCENTAGE OF ACTIVE MEMBERS' COMPENSATION	EMPLOYER ACTUARIAL DETERMINED CONTRIBUTION (ADC)
Normal Cost	34.49%	$157,541,000
Expense Load	1.20	5,481,000
Accrued Liability	(10.68)	(48,765,000)
Sub-Total	25.01%	$114,257,000
DC Code Adjustment		(8,661,000)
Total		$105,596,000

SECTION VII - ACCOUNTING INFORMATION

1. Governmental Accounting Standards Board Statements 67 and 68 are now used to determine the accounting results for the plans and are provided in a separate report. GASB 25 and 27 results are provided for informational purposes only. One such item is a distribution of the number of employees by type of membership, as follows:

NUMBER OF ALL MEMBERS
AS OF OCTOBER 1, 2016

GROUP	RETIREMENT PLAN			
	Teachers	Police Officers	Firefighters	Total
Retirees and survivors currently receiving benefits	3,882	2,265	738	6,885
Terminated employees entitled to benefits but not yet receiving benefits	1,176	197	96	1,469
Inactive Members	1,898	119	49	2,066
Active Members				
Vested	2,406	2,739	1,473	6,618
Non-vested	2,735	912	235	3,882
Total Active Members	5,141	3,651	1,708	10,500
Totals	12,097	6,232	2,591	20,920

2. Another such item is the schedule of funding progress as shown below.

SCHEDULE OF FUNDING PROGRESS
($ IN THOUSANDS)

Actuarial Valuation Date	Actuarial Value of Plan Assets (a)	Actuarial Accrued Liability (AAL) Entry Age (b)	Unfunded AAL (UAAL) (b - a)	Funded Ratio (a / b)	Covered Payroll (c)	UAAL as a Percentage of Covered Payroll ((b – a) / c)
			TEACHERS' RETIREMENT PLAN			
10/1/2012	$1,585,626	$1,680,548	$94,922	94.4 %	$381,235	24.9 %
10/1/2013	1,585,775	1,759,043	173,268	90.1 %	369,071	46.9 %
10/1/2014	1,638,583	1,849,230	210,647	88.6 %	378,926	55.6 %
10/1/2015	1,732,017	1,953,305	221,288	88.7 %	417,090	53.1 %
10/1/2016	1,845,476	2,029,640	184,164	90.9 %	438,079	42.0 %
			POLICE OFFICERS' AND FIREFIGHTERS' RETIREMENT PLAN			
10/1/2012	$3,804,853	$3,456,976	($347,877)	110.1 %	$414,877	(83.9)%
10/1/2013	4,013,534	3,644,085	(369,449)	110.1 %	413,380	(89.4)%
10/1/2014	4,288,727	3,998,537	(290,190)	107.3 %	438,415	(66.2)%
10/1/2015	4,607,300	4,283,093	(324,206)	107.6 %	446,201	(72.7)%
10/1/2016	4,985,051	4,498,513	(486,538)	110.8 %	438,114	(111.1)%
			TOTAL			
10/1/2012	$5,390,479	$5,137,524	($252,955)	104.9 %	$796,112	(31.8)%
10/1/2013	5,599,309	5,403,128	(196,181)	103.6 %	782,451	(25.1)%
10/1/2014	5,927,310	5,847,767	(79,543)	101.4 %	817,341	(9.7)%
10/1/2015	6,339,317	6,236,398	(102,918)	101.7 %	863,291	(11.9)%
10/1/2016	6,830,527	6,528,153	(302,374)	104.6 %	876,193	(34.5)%

3. The information presented in the required supplementary schedules was determined as part of the actuarial valuation at October 1, 2016.

	Teachers	Police Officers & Firefighters
Valuation Date	10/1/2016	10/1/2016
Actuarial cost method	Entry Age Normal	Entry Age Normal
Amortization method	Level Dollar Closed	Level Dollar Closed
Remaining amortization period	16 years	16 years
Asset valuation method	7 year smoothed Market	7 year smoothed Market
Actuarial assumptions:		
Investment rate of return*	6.50%	6.50%
Projected salary increases**	4.45 – 8.25%	4.25 – 9.25%
Cost of living adjustments:	3.50% (COLA limited to 3.00% for those hired after 11/1/1996)	3.50% (COLA limited to 3.00% for those hired after 11/10/1996)

* Includes inflation of 3.50%.
** Includes wage inflation of 4.25%.

SECTION VIII – EXPERIENCE

Actual experience will never (except by coincidence) coincide exactly with assumed experience. It is assumed that gains and losses will be in balance over a period of years, but sizable year to year fluctuations are common. Detail on the derivation of the experience gain/(loss) for the year ended September 30, 2016 is shown below.

Teachers' Retirement Plan

			$ Thousands
(1)	UAAL* as of October 1, 2015	$	221,288
(2)	Total normal cost from last valuation		62,844
(3)	Total actual contributions		78,061
(4)	Interest accrual: [[(1) + (2)] x .065] – [(3) x .0325]		15,932
(5)	Expected UAAL before changes: (1) + (2) – (3) + (4)	$	222,002
(6)	Change due to plan amendments		0
(7)	Change due to actuarial assumptions or methods		0
(8)	Expected UAAL after changes: (5) + (6) + (7)	$	222,002
(9)	Actual UAAL as of October 1, 2016	$	184,164
(10)	Gain/(loss): (8) – (9)	$	37,838
(11)	Gain/(loss) as percent of actuarial accrued liabilities at start of year ($1,953,305)		1.9%

*Unfunded actuarial accrued liability.

Valuation Date September 30	Actuarial Gain/(Loss) as a % of Beginning Accrued Liabilities
2013	(2.2)%
2014	(2.3)
2015	(0.5)
2016	1.9

Police Officers' and Firefighters' Retirement Plan

			$ Thousands
(1)	UAAL* as of October 1, 2015	$	(324,206)
(2)	Total normal cost from last valuation		191,288
(3)	Total actual contributions		168,900
(4)	Interest accrual: [[(1) + (2)] x .065] – [(3) x .0325]		(14,129)
(5)	Expected UAAL before changes: (1) + (2) – (3) + (4)	$	(315,947)
(6)	Change due to plan amendments		0
(7)	Change due to actuarial assumptions or methods		0
(8)	Expected UAAL after changes: (5) + (6) + (7)	$	(315,947)
(9)	Actual UAAL as of October 1, 2016	$	(486,538)
(10)	Gain/(loss): (8) – (9)	$	170,590
(11)	Gain/(loss) as percent of actuarial accrued liabilities at start of year ($4,283,094)		4.0%

*Unfunded actuarial accrued liability.

Valuation Date September 30	Actuarial Gain/(Loss) as a % of Beginning Accrued Liabilities
2013	1.4%
2014	(2.2)
2015	1.9
2016	4.0

SCHEDULE A

VALUATION BALANCE SHEET
SHOWING THE PRESENT AND PROSPECTIVE ASSETS AND LIABILITIES OF THE DISTRICT OF COLUMBIA RETIREMENT BOARD
AS OF OCTOBER 1, 2016

TEACHERS' RETIREMENT PLAN

PRESENT AND PROSPECTIVE ASSETS		
Actuarial Value of Present Assets		1,845,475,738
Present value of future members' contributions		278,851,221
Present value of future employer contributions		
Normal contributions	$282,632,259	
Unfunded accrued liability contributions	184,163,999	
Total prospective employer contributions		466,796,258
Total Present and Prospective Assets		$2,591,123,217
ACTUARIAL LIABILITIES		
Present value of benefits payable on account of retired members and survivors of deceased members now drawing retirement benefits		$980,894,546
Present value of prospective benefits payable on account of inactive members		127,137,589
Present value of prospective benefits payable on account of present active members:		
Service retirement benefits	$1,269,384,848	
Disability retirement benefits	42,883,670	
Survivor benefits	28,400,528	
Separation benefits	142,422,036	
Total		1,483,091,082
Total Actuarial Liabilities		$2,591,123,217

SCHEDULE A
(Continued)

VALUATION BALANCE SHEET
SHOWING THE PRESENT AND PROSPECTIVE ASSETS AND LIABILITIES OF
THE DISTRICT OF COLUMBIA RETIREMENT BOARD
AS OF OCTOBER 1, 2016

POLICE OFFICERS' & FIREFIGHTERS' RETIREMENT PLAN

PRESENT AND PROSPECTIVE ASSETS		
Actuarial Value of Present Assets		4,985,051,594
Present value of future members' contributions		381,990,428
Present value of future employer contributions		
Normal contributions	$1,909,034,217	
Unfunded accrued liability contributions	(486,537,803)	
Total prospective employer contributions		1,422,496,414
Total Present and Prospective Assets		$6,789,538,436
ACTUARIAL LIABILITIES		
Present value of benefits payable on account of retired members and survivors of deceased members now drawing retirement benefits		$1,590,952,329
Present value of prospective benefits payable on account of inactive members		59,243,088
Present value of prospective benefits payable on account of present active members:		
Service retirement benefits	$4,674,658,483	
Disability retirement benefits	305,383,679	
Survivor benefits	86,427,666	
Separation benefits	72,873,191	
Total		5,139,343,019
Total Actuarial Liabilities		$6,789,538,436

SCHEDULE A
(continued)

SOLVENCY TEST
($ IN THOUSANDS)

Valuation Date	Aggregate Accrued Liabilities For (1) Active Member Contributions	(2) Retirees, Survivors and Inactive Members	(3) Active Members (Employer Financed Portion)	Reported Assets	Portion of Accrued Liabilities Covered by Reported Asset (1)	(2)	(3)
TEACHERS' RETIREMENT PLAN							
10/1/2012	$137,698	$819,842	$723,008	$1,503,346	100%	100.0%	75.5%
10/1/2013	141,792	883,495	733,756	1,622,376	100%	100.0%	81.4%
10/1/2014	141,943	968,446	738,841	1,746,030	100%	100.0%	86.0%
10/1/2015	144,927	1,053,078	755,300	1,670,976	100%	100.0%	62.6%
10/1/2016	152,459	1,108,032	769,149	1,822,113	100%	100.0%	73.0%
POLICE OFFICERS' AND FIREFIGHTERS' RETIREMENT PLAN							
10/1/2012	$235,924	$849,982	$2,371,070	$3,681,526	100%	100.0%	100.0%
10/1/2013	247,202	966,862	2,430,021	4,168,457	100%	100.0%	100.0%
10/1/2014	255,735	1,149,515	2,593,287	4,588,319	100%	100.0%	100.0%
10/1/2015	262,674	1,388,908	2,631,511	4,462,228	100%	100.0%	100.0%
10/1/2016	260,786	1,650,195	2,587,532	4,954,464	100%	100.0%	100.0%

SCHEDULE B

DEVELOPMENT OF THE OCTOBER 1, 2016 ACTUARIAL VALUE OF ASSETS

TEACHERS' RETIREMENT PLAN

(1)	Actuarial Value Beginning of Year*	$	1,732,017,312
(2)	Market Value End of Year	$	1,822,113,000
(3)	Market Value Beginning of Year	$	1,670,976,000
(4)	Cash Flow		
	a. Contributions	$	78,061,000
	b. Benefit Payments, Refunds, and Transfers		(75,298,000)
	c. Administrative Expenses		(4,811,000)
	d. Net Cash Flow: [(4)a + (4)b + (4)c]	$	(2,048,000)
(5)	Investment Income		
	a. Market total: (2) – (3) – (4)d	$	153,185,000
	b. Assumed Rate		6.50%
	c. Amount of Immediate Recognition	$	108,546,880
	d. Amount for Phased-in Recognition: (5)a – (5)c	$	44,638,120
(6)	Phased-In Recognition of Investment Income		
	a. Current Year: (1/7) x (5)d	$	6,376,874
	b. First Prior Year		(26,487,916)
	c. Second Prior Year		3,896,963
	d. Third Prior Year		10,404,433
	e. Fourth Prior Year		13,523,532
	f. Fifth Prior Year		(6,589,080)
	g. Sixth Prior Year		5,834,740
	h. Total Recognized Investment Gain	$	6,959,546
(7)	Preliminary Actuarial Value End of Year: (1) + (4)d + (5)c + (6)h	$	1,845,475,738
(8)	Actuarial Value End of Year with 20% Corridor Applied:	$	1,845,475,738
(9)	Rate of Return on Actuarial Value of Assets		6.67%

*Prior to any corridor restraints.

SCHEDULE B
(Continued)

DEVELOPMENT OF THE OCTOBER 1, 2016
ACTUARIAL VALUE OF ASSETS

POLICE OFFICERS' & FIREFIGHTERS' RETIREMENT PLAN

(1)	Actuarial Value Beginning of Year*	$	4,607,300,443
(2)	Market Value End of Year	$	4,954,464,000
(3)	Market Value Beginning of Year	$	4,462,228,000
(4)	Cash Flow		
	a. Contributions	$	168,900,000
	b. Benefit Payments, Refunds, and Transfers		(81,316,000)
	c. Administrative Expenses		(12,853,000)
	d. Net Cash Flow: [(4)a + (4)b + (4)c]	$	74,731,000
(5)	Investment Income		
	a. Market total: (2) – (3) – (4)d	$	417,505,000
	b. Assumed Rate		6.50%
	c. Amount of Immediate Recognition	$	292,473,578
	d. Amount for Phased-in Recognition: (5)a – (5)c	$	125,031,422
(6)	Phased-In Recognition of Investment Income		
	a. Current Year: (1/7) x (5)d	$	17,861,632
	b. First Prior Year		(69,501,417)
	c. Second Prior Year		9,469,805
	d. Third Prior Year		26,331,813
	e. Fourth Prior Year		32,104,476
	f. Fifth Prior Year		(18,159,945)
	g. Sixth Prior Year		12,440,209
	h. Total Recognized Investment Gain	$	10,546,573
(7)	Preliminary Actuarial Value End of Year: (1) + (4)d + (5)c + (6)h	$	4,985,051,594
(8)	Actuarial Value End of Year with 20% Corridor Applied:	$	4,985,051,594
(9)	Rate of Return on Actuarial Value of Assets		6.52%

*Prior to any corridor restraints.

SCHEDULE C

SUMMARY OF CHANGES IN NET ASSETS
FOR THE YEAR ENDING OCTOBER 1, 2016

TEACHERS' RETIREMENT PLAN

Additions for the Year		
Contributions:		
Members (including purchased service)	$ 33,592,000	
Employers	44,469,000	
Total		$ 78,061,000
Net Investment Income		153,185,000
TOTAL		$ 231,246,000
Deductions for the Year		
Benefit Payments (including refunds and transfers)	$ (75,298,000)	
Administrative Expenses	(4,811,000)	
TOTAL		$ (80,109,000)
Excess of Additions Over Deductions		$ 151,137,000
Reconciliation of Asset Balances		
Market Value of Assets as of 9/30/2015		$ 1,670,976,000
Excess of Additions over Deductions		151,137,000
Market Value of Assets as of 9/30/2016*		$ 1,822,113,000
Rate of Return on Market Value of Assets		9.17%

* The Market Value of Assets shown above is used in the determination of the Actuarial Value of Assets (Schedule B).

SCHEDULE C
(Continued)

SUMMARY OF CHANGES IN NET ASSETS
FOR THE YEAR ENDING OCTOBER 1, 2016

POLICE OFFICERS' & FIREFIGHTERS' RETIREMENT PLAN

Additions for the Year		
Contributions:		
Members (including purchased service)	$ 32,785,000	
Employers	136,115,000	
Total		$ 168,900,000
Net Investment Income		417,505,000
TOTAL		$ 586,405,000
Deductions for the Year		
Benefit Payments (including refunds and transfers)	$ (81,316,000)	
Administrative Expenses	(12,853,000)	
TOTAL		$ (94,169,000)
Excess of Additions Over Deductions		$ 492,236,000
Reconciliation of Asset Balances		
Market Value of Assets as of 9/30/2015		$ 4,462,228,000
Excess of Additions over Deductions		492,236,000
Market Value of Assets as of 9/30/2016*		$ 4,954,464,000
Rate of Return on Market Value of Assets		9.28%

* The Market Value of Assets shown above is used in the determination of the Actuarial Value of Assets (Schedule B).

SCHEDULE D

OUTLINE OF ACTUARIAL ASSUMPTIONS AND METHODS
(DEMOGRAPHIC ASSUMPTIONS ADOPTED ON OCTOBER 20, 2011)
(ECONOMIC ASSUMPTIONS ADOPTED ON NOVEMBER 15, 2012)

VALUATION DATE: All assets and liabilities are computed as of October 1, 2016. Demographic information was collected as of June 30, 2016.

INVESTMENT RATE OF RETURN: 6.50% per annum, compounded annually (net of investment expenses).

INFLATION ASSUMPTION: 3.50% per annum.

PAYROLL GROWTH ASSUMPTION: 4.25% per annum.

PERCENT MARRIED: 64% of Teachers are assumed to be married and 80% of Police Officers and Firefighters are assumed to be married, with the wife 3 years younger than the husband. Active members are assumed to have one dependent child aged 10.

ACTUARIAL METHOD: Entry Age Normal Cost Method. The amortization of the unfunded actuarial accrued liability uses a level dollar basis.

ASSETS: The method of valuing assets is intended to recognize a "smoothed" market value of assets. Under this method, the difference between actual return on market value from investment experience and the expected return on market value is recognized over a seven-year period. The actuarial value of assets is constrained to an 80% to 120% corridor around market value of assets.

WITHDRAWAL ASSUMPTION: For Teachers, it was assumed that 35% of the vested members who terminate elect to withdraw their contributions while the remaining 65% elect to leave their contributions in the plan in order to be eligible for a benefit at their retirement date. For Police Officers and Firefighters, it was assumed that 80% of the vested members who terminate elect to withdraw their contributions while the remaining 20% elect to leave their contributions in the plan.

OTHER ASSUMPTIONS: To value the pre-retirement death benefit for Police Officers and Firefighters, the benefit form for all retirements (normal or disabled) is assumed to be a 67.8% Joint and Survivor annuity for all participants (based on 40% of average pay survivor benefits). One-fourth of all Police Officer and Firefighter active deaths are assumed to occur in the line of duty.

COST OF LIVING ADJUSTMENT: The cost of living as measured by the Consumer Price Index (CPI) will increase at the rate of 3.5% per year.

MILITARY SERVICE: All Police and Fire members assumed to have 0.40 years of military service at retirement.

ADMINISTRATIVE EXPENSES: Budgeted administrative expenses of 1.20% of payroll are added to the normal cost rate.

SCHEDULE D
(Continued)

TEACHERS

SALARY INCREASES: Representative values of the assumed annual rates of future salary increases are as follows and include inflation at 4.25% per annum:

Pay Increase Assumptions for an Individual Member			
Years of Service	Merit & Seniority	Inflation & Productivity (Economy)	Total Increase (Next Year)
5	4.00%	4.25%	8.25%
10	3.00	4.25	7.25
15	0.50	4.25	4.75
20	0.20	4.25	4.45
25	0.20	4.25	4.45
30	0.20	4.25	4.45
35	0.20	4.25	4.45

SEPARATIONS FROM ACTIVE SERVICE: Representative values of the assumed annual rates of withdrawal, service retirement, and disability are shown in the following tables:

Percent of Members Separating Within the Next Year						
	Withdrawal			Service Retirement		
Sample Ages	0 to 3 yrs of service	4 to 9 yrs of service	10 & up yrs of service	Under 30 yrs service	30 & up yrs service	Disability Retirement
20	25.0%	20.0%	0.00%			0.03%
25	23.5	20.0	0.00			0.03
30	22.0	16.0	3.75			0.05
35	20.5	14.0	3.75			0.07
40	19.0	12.0	3.75			0.09
45	17.5	10.0	3.75			0.15
50	16.0	10.0	3.75	2.5%	2.5%	0.22
55	14.5	10.0	3.75	6.0	33.0	0.32
60	13.0	10.0	3.75	27.0	25.0	0.40
62	0.0	0.0	0.00	25.0	25.0	
65				20.0	25.0	
70				30.0	30.0	
71				25.0	40.0	
75				100.0	100.0	

MORTALITY: The RP-2000 Combined Mortality Table projected with Scale AA to 2015, set back 3 years for females is used for healthy active members, retirees, and beneficiaries. The RP-2000 Disabled Mortality Table set back 1 year for males and set back 5 years for females is used for disabled retirees. Mortality improvement is anticipated under these assumptions as recent mortality experience shows actual deaths are approximately 7-8% greater for healthy lives and 9% greater for disabled lives than expected under the selected tables.

SCHEDULE D
(Continued)

POLICE OFFICERS

SALARY INCREASES: Police Officers are assumed to receive a longevity increase of 5%, 10%, 15%, and 20% applied to individual base pay after 15, 20, 25, and 30 years of service. These are approximated by increases of 3.5% to final average salary. Representative values of the assumed annual rates of future salary increases before longevity increases are as follows and include inflation at 4.25% per annum:

Pay Increase Assumptions for an Individual Member			
Years of Service	Merit & Seniority	Inflation & Productivity (Economy)	Total Increase (Next Year)
5	3.56%	4.25%	7.81%
10	2.58	4.25	6.83
15	2.31	4.25	6.56
20	2.50	4.25	6.75
25	1.10	4.25	5.35
30	0.50	4.25	4.75
35	0.00	4.25	4.25

SEPARATIONS FROM ACTIVE SERVICE: Representative values of the assumed annual rates of withdrawal, service retirement, and disability are shown in the following tables:

Percent of Members Separating Within the Next Year						
	Withdrawal		Disability Retirement[2]			
Sample Ages	(3 years of service & up)[1]				Years of Service	Service Retirement[3]
	Males	Females	Males	Females		
20	6.00%	2.50%	0.02%	0.04%	20	12.5%
25	6.00	2.50	0.05	0.08	25	22.0
30	4.25	3.50	0.10	0.12	30	15.0
35	2.50	2.00	0.22	0.28	35	20.0
40	1.75	1.50	0.25	0.40	40	20.0
45	1.25	1.25	0.30	0.62		
50	1.25	1.25	0.40	0.70		
55	1.25	1.25	0.60	0.75		
60	0.00	0.00	0.80	0.90		

[1] Members of any age with less than 3 years of service have a 10% withdrawal assumption.
[2] It is assumed that 75% of the disabilities are due to accidents in the line of duty and the "percent of disability" is assumed to be 100%.
[3] 100% of active members are assumed to retire at age 65, regardless of service.

MORTALITY: The RP-2000 Combined Mortality Table projected with Scale AA to 2015 set forward 1 year for females is used for healthy active members, retirees and beneficiaries. The following disability mortality table is used for disabled retirees.

Disabled Retiree Mortality		
Sample Ages	Males	Females
20	0.80%	0.50%
30	0.80	0.50
40	0.80	0.50
50	0.80	0.50
60	1.16	0.74
70	2.35	1.55
80	5.78	3.76
90	13.95	10.87
100	51.48	49.93

Mortality improvement is anticipated under these assumptions as recent mortality experience shows actual deaths are approximately 7% greater for healthy lives and 6% greater for disabled lives than expected under the selected tables.

SCHEDULE D
(Continued)

FIREFIGHTERS

SALARY INCREASES: Firefighters are assumed to receive a longevity increase of 5%, 10%, 15%, and 20% applied to individual base pay after 15, 20, 25, and 30 years of service. These are approximated by increases of 3.5% to final average salary. Representative values of the assumed annual rates of future salary increases before longevity increases are as follows and include inflation at 4.25% per annum:

Pay Increase Assumptions for an Individual Member			
Years of Service	Merit & Seniority	Inflation & Productivity (Economy)	Total Increase (Next Year)
5	2.50%	4.25%	6.75%
10	2.50	4.25	6.75
15	2.50	4.25	6.75
20	2.50	4.25	6.75
25	2.50	4.25	6.75
30	2.50	4.25	6.75
35	2.50	4.25	6.75

SEPARATIONS FROM ACTIVE SERVICE: Representative values of the assumed annual rates of withdrawal, service retirement, and disability are shown in the following tables:

Percent of Members Separating Within the Next Year				
Sample Ages	Withdrawal (2 years of service & up)[1]	Disability Retirement[2]	Years of Service	Service Retirement[3]
20	3.50%	0.01%	20	12.5%
25	3.50	0.02	25	12.5
30	2.00	0.15	30	20.0
35	1.00	0.20	35	40.0
40	1.00	0.35	40	40.0
45	1.50	0.45		
50	1.50	0.52		
55	0.00	0.60		
60	0.00	0.70		

[1]Members of any age with less than 2 years of service have a 9% withdrawal assumption.

[2]It is assumed that 75% of the disabilities are due to accidents in the line of duty and the "percent of disability" is assumed to be 100%.

[3]100% of active members are assumed to retire at age 60, regardless of service.

MORTALITY: The RP-2000 Combined Mortality Table projected with Scale AA to 2015 set forward 1 year for females is used for healthy active members, retirees and beneficiaries. The following disability mortality table is used for disabled retirees.

Disabled Retiree Mortality		
Sample Ages	Males	Females
20	0.59%	0.37%
30	0.59	0.37
40	0.59	0.37
50	0.59	0.37
60	0.85	0.54
70	1.72	1.13
80	4.22	2.75
90	10.19	7.94
100	37.60	36.47

Mortality improvement is anticipated under these assumptions as recent mortality experience shows actual deaths are approximately 7% greater for male and 1% greater for female healthy lives and 8% greater for disabled lives than expected under the selected tables. Police and Fire are combined in the valuation results and the female healthy life population is much greater for Police than Fire so the smaller margin under Fire is not an issue at this time.

SCHEDULE E

SUMMARY OF DISTRICT OF COLUMBIA TEACHERS' RETIREMENT PLAN PROVISIONS AS INTERPRETED FOR VALUATION PURPOSES

Effective Date	Established on July 1, 1997. The Treasury Department is responsible for paying all benefits accrued before this date.

DEFINITIONS

Affiliated Employers	District of Columbia Public Schools, Public Charter Schools
Covered Members	Permanent, temporary, and probationary teachers for the District of Columbia public day schools become members automatically on their date of employment. Other employees covered by the Retirement of Public School Teachers Act – including librarians, principals, and counselors – also become members on their date of employment. Substitute teachers and employees of the Department of School Attendance and Work Permits are not covered. Some former D.C teachers working at charter schools are eligible to remain in the Program.
Service Credit	One year of school service is given for each year of employment with DCPS. After five years of service are accrued, additional service may be purchased or credited for service outside of DCPS. For purposes of eligibility and benefit accrual, Federal service is included in the calculation of the normal retirement benefit.
Average Salary	Highest 36 consecutive months of pay, divided by three.
Vested	Members who accrue five or more years of Service Credit are vested for benefits. If these members leave service they may leave their Member Contribution Accounts with the Plan for a future benefit when reaching eligibility (deferred vested in this report).

CONTRIBUTIONS

Member Contributions	Members hired before November 1, 1996 are required to contribute 7% of annual pay. Members hired on or after November 1, 1996 contribute 8% of annual pay. Interest is not credited to each Member's accumulated contributions.
Refund of Member Contributions	In the event a member leaves service for a reason other than death or retirement, member contribution accounts are refunded upon request.

SERVICE RETIREMENT

Eligibility

The Age and Service Credit requirements to be eligible for a full Service Retirement are listed below:

- **Members hired before November 1, 1996**

Age	Service Credit
55	30, including 5 years school service
60	20, including 5 years school service
62	5 years school service

- **Members hired on and after November 1, 1996**

Age	Service Credit
Any Age	30, including 5 years school service
60	20, including 5 years school service
62	5 years school service

Benefit

For members hired before November 1, 1996:

- 1.5% of Average Salary times service up to 5 years, plus
- 1.75% of Average Salary times service between 5 and 10 years, plus
- 2.0% of Average Salary times service over 10 years.

For members hired on or after November 1, 1996:

- 2.0% of Average Salary times service.

All members receive a minimum benefit of 1.0% of Average Salary plus $25 for each year of service.

INVOLUNTARY SERVICE RETIREMENT

Eligibility

The Age and Service Credit requirements to be eligible for a Reduced Service Retirement are listed below:

- **All Members, regardless of date of hire**

Age	Service Credit
Any Age	25, including 5 years school service
50	20, including 5 years school service

Benefit	Service Retirement Benefit reduced by 1/6% per month (or 2% per year) that date of retirement precedes age 55.

DISABILITY RETIREMENT

Eligibility	Active members with five or more years of school service credit are covered (vested) for disability retirement. To be eligible, the member must be found to be incapable of satisfactorily performing the duties of his/her position.
Benefit	Equal to Service Retirement benefit. Minimum benefit is the lesser of a) or b): a) 40% of Average Salary b) Calculated benefit amount by projecting service to age 60.

SURVIVOR BENEFITS

LUMP SUM

Eligibility	Death before completion of 18 months of school service or death without an eligible spouse, child or parent.
Benefit	Refund of member contributions.

SPOUSE ONLY

Eligibility	Death before retirement and married for at least two years, or have a child by the marriage.
Benefit	55% of Service Retirement benefit. Minimum benefit is the lesser of a) or b): a) 55% of 40% of Average Salary b) 55% of the calculated benefit amount by projecting service to age 60.

SPOUSE & DEPENDENT CHILDREN

Eligibility	Death before retirement and married for at least two years, or have a child by the marriage. Children must be unmarried and under age 18, or 22 if full-time student. Also, any dependent child because of a disability incurred before age 18. Death does not have to occur before retirement for the children's benefit.
Spouse Benefit	55% of Service Retirement benefit. Minimum benefit is the lesser of a) or b): a) 55% of 40% of Average Salary b) 55% of the calculated benefit amount by projecting service to age 60.
Child Benefit	A benefit per child equal to the smallest of a) or b) or c): a) 60% of Average Salary divided by the number of eligible children b) $6,795* (if hired before 1/1/1980), $6,562* (if hired between 1/1/1980 and 10/31/1996), or $6,390* (if hired on or after 11/1/1996) per child

c) $20,548* (if hired before 1/1/1980), $19,843* (if hired between 1/1/1980 and 10/31/1996), or $19,324* (if hired on or after 11/1/1996) divided by the number of children.

DEPENDENT CHILDREN ONLY

Eligibility Children must be unmarried and under age 18, or 22 if full-time student. Also, any dependent child because of a disability incurred before age 18. Death does not have to occur before retirement for the children's benefit.

Benefit A benefit per child equal to the smallest of a) or b) or c):

d) 75% of Average Salary divided by the number of eligible children
e) $8,304* (if hired before 1/1/1980), $7,997* (if hired between 1/1/1980 and 10/31/1996), or $7,752* (if hired on or after 11/1/1996) per child
f) $25,110* (if hired before 1/1/1980), $24,183* (if hired between 1/1/1980 and 10/31/1996), or $23,441* (if hired on or after 11/1/1996) divided by the number of children.

PARENTS ONLY

Eligibility Death before retirement and no eligible spouse or children, and parents must receive at least one-half of their total income from member.

Benefit 55% of Service Retirement benefit. Minimum benefit is the lesser of a) or b):

a) 55% of 40% of Average Salary
b) 55% of the calculated benefit amount by projecting service to age 60.

*Survivor benefit amounts are as of 2016, and are subject to annual inflation adjustments.

DEFERRED VESTED RETIREMENT

Eligibility Active members with five or more years of school service credit .

Benefit Benefit is calculated in the same manner as Service Retirement benefit and may be collected starting at age 62.

OPTIONS

Retirement and disability benefits are payable for the life of the retired member. Optional reduced benefits may be elected at the time of retirement to provide for continuation of a reduced benefit amount to a designated beneficiary. Optional forms include:

a) **Reduced Annuity with a Maximum Survivor Annuity (to Spouse or Registered Domestic Partner)**
Reduced benefit paid to member so that upon member's death, the spouse will receive 55% of the unreduced normal life annuity. Member's benefit is reduced by 2.5% of retirement benefit, up to $3,600, plus 10% of any retirement benefit over $3,600.

b) Reduced Annuity with a Partial Survivor Annuity (to Spouse or Registered Domestic Partner)
Reduced benefit paid to member so that upon member's death, the spouse will receive a partial annuity that can range from $1 up to any amount less than 55% of the unreduced normal life annuity amount. Member's benefit is reduced by the same amount as option a, multiplied by the ratio of the chosen benefit percent to the maximum benefit percent (55%).

c) Reduced Annuity with a Life Insurance Benefit
Member elects a life insurance amount, payable in a lump sum to designated beneficiary upon member's death.

d) Reduced Annuity with a Survivor Annuity to a Person with an Insurable Interest
A 55% joint and survivor annuity where the original benefit is reduce by 10% plus an additional 5% for each full 5 years, up to 25 years, that the designated beneficiary is younger than the member. Maximum reduction is 40% for any beneficiary who is 25 or more years younger than the member.

COST OF LIVING ADJUSTMENTS

Each year on March 1st, benefits which have been paid for at least twelve months preceding March 1st may be increased. The increase is equal to the annual CPI. COLA's are included in benefit payments on and after April 1st. If member's retirement is effective after March 1 of the preceding year, the COLA amount will be prorated.

For members hired on or after November 1, 1996, the cost of living increase is limited to 3% per year. In addition, cost of living adjustments do not apply to retirement benefit payments resulting from voluntary contributions.

SCHEDULE E
(Continued)

SUMMARY OF DISTRICT OF COLUMBIA POLICE OFFICERS' & FIREFIGHTERS' RETIREMENT PLAN PROVISIONS AS INTERPRETED FOR VALUATION PURPOSES

Effective Date	Established on July 1, 1997. The Treasury Department is responsible for paying all benefits accrued before this date.

DEFINITIONS

Affiliated Employers	District of Columbia Police Officers and Firefighters, except Police cadets.
Covered Members	Employees of DC Police Department and Fire Department become members on their first day of active duty. Membership is not automatic for uniformed EMT Firefighters.
Service Credit	One year of service is given for each year of employment with MPD or FEMS. Additional service may be purchased or credited for lateral transfer service, EMT service, prior military service, and certain civilian service. For purposes of eligibility and benefit accrual, Federal service is included in the calculation of the normal retirement benefit.
Average Salary	For members hired before February 15, 1980, the highest 12 consecutive months of pay. For members hired on or after February 15, 1980, the highest 36 consecutive months of pay, divided by 3.
Vested	Members who accrue five or more years of Service Credit are vested for benefits. If these members leave service they may leave their Member Contribution Accounts with the Plan for a future benefit when reaching eligibility (deferred vested in this report).

CONTRIBUTIONS

Member Contributions	Members hired before November 10, 1996 contribute 7.0% of salary. Members hired on or after November 10, 1996 contribute 8.0% of salary. Member contributions, together with any purchased service credit payments, are credited to individual Member Contribution Accounts. No interest is accrued on contributions.
Refund of Member Contributions	In the event a member leaves service for a reason other than death or retirement, member contribution accounts are refunded upon request.

SERVICE RETIREMENT

Eligibility

The Age and Service Credit requirements to be eligible for a full Service Retirement are listed below:

- **Members hired before November 10, 1996**

Age	Service Credit
Any age	20 (only if hired before 2/15/1980)
50	25 years departmental service
60	5 years departmental service

- **Members hired on and after November 10, 1996**

Age	Service Credit
Any Age	25 years departmental service
60	

Benefit

For members hired before November 10, 1996:

- 2.5% of Average Salary times departmental service up to 25 years (20 years if hired before 2/15/1980), plus
- 3.0% of Average Salary times departmental service over 25 years (or 20), plus
- 2.5% of Average Salary times purchased or credited service.

For members hired on or after November 10, 1996:

- 2.5% of Average Salary times total service.

All members are subject to a maximum benefit of 80% of Average Salary.

SERVICE-RELATED DISABILITY RETIREMENT

Eligibility

Disabled as a result of an injury or disease that permanently disables him/her for the performance of duty.

Benefit

For members hired before February 15, 1980:
2.5% of Average Salary times total years of service, subject to a minimum of 66-2/3% of Average Salary and a maximum of 70% of Average Salary.

For members hired on or after February 15, 1980:
70% of final pay times percentage of disability, subject to a minimum of 40% of final pay.

NONSERVICE-RELATED DISABILITY RETIREMENT

Eligibility

Active members with five or more years of departmental service are covered (vested) for disability retirement. The member is eligible if found that the disability precludes further service with his/her department.

Benefit

For members hired before February 15, 1980:
2.0% of Average Salary times total years of service, subject to a minimum of 40% of Average Salary and a maximum of 70% of Average Salary.

For members hired on or after February 15, 1980:
70% of final pay times percentage of disability, subject to a minimum of 30% of final pay.

SURVIVOR BENEFITS

LUMP SUM

Eligibility

Death before retirement without an eligible spouse or child.

Benefit

Refund of member contributions according to plan order of precedence.

LUMP SUM – DEATH IN LINE OF DUTY

Eligibility

Death occurring in the line of duty, not resulting from willful misconduct.

Benefit

$50,000

SPOUSE ONLY – DEATH IN LINE OF DUTY

Eligibility

Member killed in line of duty, after December 29, 1993.

Benefit

100% of final pay.

SPOUSE ONLY – DEATH NOT IN LINE OF DUTY

Eligibility

Member death, not in line of duty, after December 29, 1993. If retired, must be married for at least one year or have a child by the marriage.

Benefit

40% of the greater of a) or b):

a) Average Salary
b) Salary for step 6 salary class 1 of the DC Police and Fireman's Salary Act in effect, adjusted for cost-of-living increases if death occurs after retirement.

Benefit cannot be higher than rate of pay at death (or retirement if death occurs after retirement).

SPOUSE & DEPENDENT CHILDREN

Eligibility	Member death, not in line of duty, after December 29, 1993. If retired, must be married for at least one year or have a child by the marriage. Children must be unmarried and under age 18, or 22 if full-time student. Also, any dependent child because of a disability incurred before age 18. Death does not have to occur before retirement for the children's benefit.
Spouse Benefit	40% of the greater of a) or b): a) Average Salary b) Salary for step 6 salary class 1 of the DC Police and Fireman's Salary Act in effect, adjusted for cost-of-living increases if death occurs after retirement. Benefit cannot be higher than rate of pay at death (or retirement if death occurs after retirement).
Child Benefit	A benefit per child equal to the smallest of a) or b) or c): a) 60% of Average Salary divided by the number of eligible children b) $3,993* (if hired before 11/1/1996) or $3,907* (if hired on or after 11/1/1996) per child c) $11,980* (if hired before 11/1/1996) or $11,720* (if hired on or after 11/1/1996) divided by the number of children.

DEPENDENT CHILDREN ONLY

Eligibility	Children must be unmarried and under age 18, or 22 if full-time student. Also, any dependent child because of a disability incurred before age 18. Death does not have to occur before retirement for the children's benefit.
Benefit	75% of Average Salary divided by the number of eligible children, adjusted for cost-of-living increases.

*Survivor benefit amounts are as of 2016, and are subject to annual inflation adjustments.

DEFERRED VESTED RETIREMENT

Eligibility	Active members with five or more years of departmental service.
Benefit	Benefit is calculated in the same manner as Service Retirement benefit and may be collected starting at age 55.

OPTIONS

Retirement and disability benefits are payable for the life of the retired member. This includes an unreduced joint and survivor annuity as defined above in the "Survivor Benefits – Spouse and Dependent Children" section.

An optional reduced benefit may be elected at the time of retirement to provide for an additional survivor benefit to a designated beneficiary. Member's original annuity is reduced by 10% and that amount is added to the survivor's benefit. If the designated beneficiary is more than five years younger than the member, the additional amount will be reduced by 5% for each full five years that the beneficiary is younger than the member, subject to a maximum of 40%.

COST OF LIVING ADJUSTMENTS

Each year on March 1st, benefits which have been paid for at least twelve months preceding March 1st may be increased. The increase is equal to the annual CPI. COLA's are included in benefit payments on and after April 1st. If member's retirement is effective after March 1 of the preceding year, the COLA amount will be prorated.

For members hired on or after November 10, 1996, the cost of living increase is limited to 3% per year. Members (not beneficiaries) hired before February 15, 1980, will receive equalization pay, which is defined as the percentage increase as active employees' salary increases.

SCHEDULE F

SCHEDULES OF MEMBER DATA

TABLE 1

RECONCILIATION OF MEMBER DATA
AS OF OCTOBER 1, 2016

TEACHERS' RETIREMENT PLAN

	Actives	Retirees	Disabled	Beneficiaries	Vested Terms	Total
1. Headcounts as of October 1, 2015	4,866	3,489	98	131	1,152	9,736
2. Change in status during the year:						
a. Death	(2)	(52)	(4)	(1)	(3)	(62)
b. Disabled	(4)		5		(1)	
c. Retired	(113)	186			(73)	
d. Vested Termination	(169)				169	
e. Nonvested Termination	(376)					(376)
f. Benefits Expired/Refund	(148)				(38)	(186)
3. New member due to:						
a. New Hire	1,015					1,015
b. Rehire	72				(30)	42
c. Death of Participant				18		18
d. Adjustments		(6)	17	1		12
4. Headcounts as of October 1, 2016	5,141	3,617	116	149	1,176	10,199

SCHEDULE F

SCHEDULES OF MEMBER DATA

TABLE 2

RECONCILIATION OF MEMBER DATA
AS OF OCTOBER 1, 2016

POLICE OFFICERS' RETIREMENT PLAN

	Actives	Retirees	Disabled	Beneficiaries	Vested Terms	Total
1. Headcounts as of October 1, 2015	3,829	1,291	299	333	222	5,974
2. Change in status during the year:						
a. Death	(2)	(24)	(7)	(2)	(1)	(36)
b. Disabled	(14)		15		(1)	
c. Retired	(262)	319			(57)	
d. Vested Termination	(49)				49	
e. Nonvested Termination	(48)					(48)
f. Benefits Expired/Refund	(39)			(5)	(12)	(56)
3. New member due to:						
a. New Hire	228					228
b. Rehire	8				(3)	5
c. Death of Participant				36		36
d. Adjustments		7	3			10
4. Headcounts as of October 1, 2016	3,651	1,593	310	362	197	6,113

SCHEDULE F

SCHEDULES OF MEMBER DATA

TABLE 3

RECONCILIATION OF MEMBER DATA
AS OF OCTOBER 1, 2016

FIREFIGHTERS' RETIREMENT PLAN

	Actives	Retirees	Disabled	Beneficiaries	Vested Terms	Total
1. Headcounts as of October 1, 2015	1,708	487	77	122	97	2,491
2. Change in status during the year:						
a. Death	(4)	(5)		(2)		(11)
b. Disabled	(5)		7		(2)	
c. Retired	(39)	47			(8)	
d. Vested Termination	(18)				18	
e. Nonvested Termination	(10)					(10)
f. Benefits Expired/Refund	(4)			(1)	(3)	(8)
3. New member due to:						
a. New Hire	73					73
b. Rehire	7				(6)	1
c. Death of Participant				6		6
d. Adjustments						0
4. Headcounts as of October 1, 2016	1,708	529	84	125	96	2,542

SCHEDULE F

TABLE 4

SCHEDULE OF ACTIVE MEMBER DATA
AS OF OCTOBER 1, 2016

TEACHERS' RETIREMENT PLAN

Attained Age	Completed Years of Service								
	Under 5	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30+	Total	Payroll
Under 20	0	0	0	0	0	0	0	0	$ 0
20 to 24	89	0	0	0	0	0	0	89	$ 4,909,938
25 to 29	740	72	1	0	0	0	0	813	$ 50,620,287
30 to 34	713	284	27	1	0	0	0	1,025	$ 77,059,036
35 to 39	457	210	115	15	0	0	0	797	$ 69,798,235
40 to 44	321	157	96	98	9	0	0	681	$ 63,510,657
45 to 49	191	113	89	115	51	8	0	567	$ 54,395,747
50 to 54	98	64	43	63	30	61	9	368	$ 36,209,879
55 to 59	61	40	54	65	41	63	37	361	$ 36,192,090
60 to 64	48	31	43	53	25	58	44	302	$ 31,000,075
65 to 69	13	11	16	21	10	17	19	107	$ 11,078,272
70 & Over	4	3	1	6	1	8	8	31	$ 3,304,509
Total	2,735	985	485	437	167	215	117	5,141	$ 438,078,725

Average Age: 40.73
Average Service: 7.83

SCHEDULE F

TABLE 5

SCHEDULE OF ACTIVE MEMBER DATA
AS OF OCTOBER 1, 2016

POLICE OFFICERS' RETIREMENT PLAN

Attained Age	Completed Years of Service								
	Under 5	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30+	Total	Payroll
Under 20	0	0	0	0	0	0	0	0	$ 0
20 to 24	102	0	0	0	0	0	0	102	$ 5,940,648
25 to 29	440	27	2	0	0	0	0	469	$ 29,394,923
30 to 34	250	259	71	0	0	0	0	580	$ 40,787,293
35 to 39	82	128	268	40	0	0	0	518	$ 40,034,573
40 to 44	26	58	148	218	56	0	0	506	$ 43,183,270
45 to 49	5	42	109	187	153	294	0	790	$ 73,390,624
50 to 54	6	22	44	75	87	282	10	526	$ 50,411,315
55 to 59	0	5	10	31	16	50	22	134	$ 12,808,539
60 to 64	1	1	4	7	2	3	8	26	$ 2,491,109
65 to 69	0	0	0	0	0	0	0	0	$ 0
70 & Over	0	0	0	0	0	0	0	0	$ 0
Total	912	542	656	558	314	629	40	3,651	$ 298,442,294

Average Age: 40.46
Average Service: 13.97

SCHEDULE F

TABLE 6

SCHEDULE OF ACTIVE MEMBER DATA
AS OF OCTOBER 1, 2016

FIREFIGHTERS' RETIREMENT PLAN

Attained Age	Completed Years of Service								
	Under 5	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30+	Total	Payroll
Under 20	0	0	0	0	0	0	0	0	$ 0
20 to 24	93	18	0	0	0	0	0	111	$ 6,014,529
25 to 29	65	37	4	0	0	0	0	106	$ 6,282,464
30 to 34	62	185	100	0	0	0	0	347	$ 23,856,475
35 to 39	10	129	117	23	1	0	0	280	$ 20,794,819
40 to 44	3	28	94	76	37	0	0	238	$ 20,126,816
45 to 49	2	2	51	95	85	87	0	322	$ 30,686,936
50 to 54	0	0	7	26	79	58	29	199	$ 20,729,347
55 to 59	0	1	3	12	11	38	32	97	$ 10,188,566
60 to 64	0	0	0	0	0	0	8	8	$ 991,572
65 & Over	0	0	0	0	0	0	0	0	$ 0
Total	235	400	376	232	213	183	69	1,708	$ 139,671,524

Average Age: 40.02
Average Service: 14.59

SCHEDULE F

TABLE 7

SCHEDULE OF RETIREE MEMBER DATA
AS OF OCTOBER 1, 2016

TEACHERS' RETIREMENT PLAN
DISTRICT ONLY

Attained Age	Service Retirement		Disability Retirement		Survivors and Beneficiaries		Total	
	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
Under 20	0	$0	0	$0	7	$34,611	7	$34,611
20 to 24	0	$0	0	$0	2	$3,500	2	$3,500
25 to 29	0	$0	0	$0	0	$0	0	$0
30 to 34	0	$0	0	$0	1	$12,792	1	$12,792
35 to 39	0	$0	0	$0	1	$3,744	1	$3,744
40 to 44	0	$0	2	$72,540	2	$15,917	4	$88,457
45 to 49	0	$0	4	$137,844	0	$0	4	$137,844
50 to 54	10	$340,587	9	$318,432	1	$2,432	20	$661,451
55 to 59	101	$3,362,057	14	$467,568	10	$113,041	125	$3,942,666
60 to 64	383	$11,085,836	25	$679,292	18	$195,171	426	$11,960,299
65 to 69	1,204	$24,639,055	46	$807,155	36	$219,644	1,286	$25,665,855
70 to 74	1,202	$16,808,878	13	$171,482	40	$240,593	1,255	$17,220,953
75 to 79	531	$6,767,859	3	$12,176	18	$99,651	552	$6,879,685
80 to 84	146	$1,612,319	0	$0	12	$139,529	158	$1,751,848
85 to 89	35	$381,224	0	$0	1	$5,056	36	$386,280
90 to 94	5	$39,964	0	$0	0	$0	5	$39,964
95 & Over	0	$0	0	$0	0	$0	0	$0
Total	3,617	$65,037,779	116	$2,666,489	149	$1,085,681	3,882	$68,789,949

SCHEDULE F

TABLE 8

SCHEDULE OF RETIREE MEMBER DATA
AS OF OCTOBER 1, 2016

TEACHERS' RETIREMENT PLAN
FEDERAL PLUS DISTRICT

Attained Age	Service Retirement		Disability Retirement		Survivors and Beneficiaries		Total	
	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
Under 20	0	$0	0	$0	7	$45,612	7	$45,612
20 to 24	0	$0	0	$0	3	$19,920	3	$19,920
25 to 29	0	$0	0	$0	0	$0	0	$0
30 to 34	0	$0	0	$0	1	$12,792	1	$12,792
35 to 39	0	$0	0	$0	1	$3,744	1	$3,744
40 to 44	0	$0	2	$72,540	3	$29,412	5	$101,952
45 to 49	0	$0	4	$137,844	2	$13,584	6	$151,428
50 to 54	10	$452,223	9	$318,432	2	$14,268	21	$784,923
55 to 59	101	$4,947,714	20	$600,684	16	$330,552	137	$5,878,950
60 to 64	386	$18,818,985	27	$849,204	21	$442,752	434	$20,110,941
65 to 69	1,230	$57,435,943	67	$2,095,704	55	$1,021,872	1,352	$60,553,519
70 to 74	1,352	$62,616,239	46	$1,363,656	80	$1,465,620	1,478	$65,445,515
75 to 79	900	$41,890,920	40	$1,171,308	71	$1,457,052	1,011	$44,519,280
80 to 84	670	$31,003,068	33	$1,009,118	63	$1,332,540	766	$33,344,726
85 to 89	472	$20,813,844	32	$1,015,116	58	$1,403,268	562	$23,232,228
90 to 94	222	$9,355,824	23	$818,304	42	$992,184	287	$11,166,312
95 & Over	88	$4,045,284	12	$487,548	12	$299,436	112	$4,832,268
Total	5,431	$251,380,044	315	$9,939,458	437	$8,884,608	6,183	$270,204,110

SCHEDULE F

TABLE 9

SCHEDULE OF RETIREE MEMBER DATA
AS OF OCTOBER 1, 2016

POLICE OFFICERS' RETIREMENT PLAN
DISTRICT ONLY

Attained Age	Service Retirement		Disability Retirement		Survivors and Beneficiaries		Total	
	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
Under 20	0	$0	0	$0	43	$378,612	43	$378,612
20 to 24	0	$0	0	$0	8	$47,991	8	$47,991
25 to 29	0	$0	1	$22,620	0	$0	1	$22,620
30 to 34	0	$0	3	$73,728	1	$27,540	4	$101,268
35 to 39	0	$0	10	$360,120	1	$55,536	11	$415,656
40 to 44	0	$0	20	$678,096	7	$103,781	27	$781,877
45 to 49	2	$41,660	75	$2,706,996	30	$614,825	107	$3,363,481
50 to 54	460	$19,939,457	90	$3,181,387	40	$645,657	590	$23,766,501
55 to 59	438	$16,698,165	51	$1,175,813	49	$767,204	538	$18,641,182
60 to 64	375	$8,536,893	44	$737,627	65	$962,527	484	$10,237,047
65 to 69	247	$3,220,762	12	$122,022	65	$1,060,709	324	$4,403,493
70 to 74	65	$463,439	4	$44,353	34	$465,523	103	$973,315
75 to 79	6	$54,652	0	$0	12	$244,122	18	$298,774
80 to 84	0	$0	0	$0	3	$57,000	3	$57,000
85 to 89	0	$0	0	$0	3	$75,048	3	$75,048
90 to 94	0	$0	0	$0	1	$23,076	1	$23,076
95 & Over	0	$0	0	$0	0	$0	0	$0
Total	1,593	$48,955,028	310	$9,102,762	362	$5,529,151	2,265	$63,586,941

SCHEDULE F

TABLE 10

SCHEDULE OF RETIREE MEMBER DATA
AS OF OCTOBER 1, 2016

POLICE OFFICERS' RETIREMENT PLAN
FEDERAL PLUS DISTRICT

Attained Age	Service Retirement		Disability Retirement		Survivors and Beneficiaries		Total	
	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
Under 20	0	$0	0	$0	49	$591,960	49	$591,960
20 to 24	0	$0	0	$0	10	$109,164	10	$109,164
25 to 29	0	$0	1	$22,620	0	$0	1	$22,620
30 to 34	0	$0	3	$73,728	1	$27,540	4	$101,268
35 to 39	0	$0	10	$360,120	1	$55,536	11	$415,656
40 to 44	0	$0	20	$678,096	8	$134,880	28	$812,976
45 to 49	2	$54,732	80	$2,810,868	35	$1,075,476	117	$3,941,076
50 to 54	460	$30,439,992	99	$3,399,192	52	$1,374,288	611	$35,213,472
55 to 59	440	$30,398,136	77	$2,731,116	83	$2,333,796	600	$35,463,048
60 to 64	518	$33,000,048	117	$4,908,180	153	$4,264,876	788	$42,173,104
65 to 69	954	$52,669,552	160	$7,011,108	245	$6,972,608	1,359	$66,653,268
70 to 74	688	$37,699,824	155	$6,834,756	217	$6,456,120	1,060	$50,990,700
75 to 79	385	$21,327,396	104	$5,143,584	207	$6,490,848	696	$32,961,828
80 to 84	170	$9,822,312	71	$3,693,768	155	$4,950,588	396	$18,466,668
85 to 89	52	$3,749,784	69	$3,766,354	116	$3,690,372	237	$11,206,510
90 to 94	11	$929,100	25	$1,580,196	73	$2,164,128	109	$4,673,424
95 & Over	2	$169,620	8	$511,572	24	$791,196	34	$1,472,388
Total	3,682	$220,260,496	999	$43,525,258	1,429	$41,483,376	6,110	$305,269,130