Good things take time.

Ronda Stegmann
Executive Director

Lori Woratzeck
Chief Finance Officer

Missouri State Employees' Retirement System • A Component Unit of the State of Missouri
Comprehensive Annual Financial Report • Fiscal Year Ended June 30, 2018

Table of Contents

MISSION

MOSERS exists to advance
the financial security of its members.

VISION

We endeavor to:

Exceed customer expectations

Educate stakeholders

Ensure sound investment practices

Encourage responsible funding of the plan

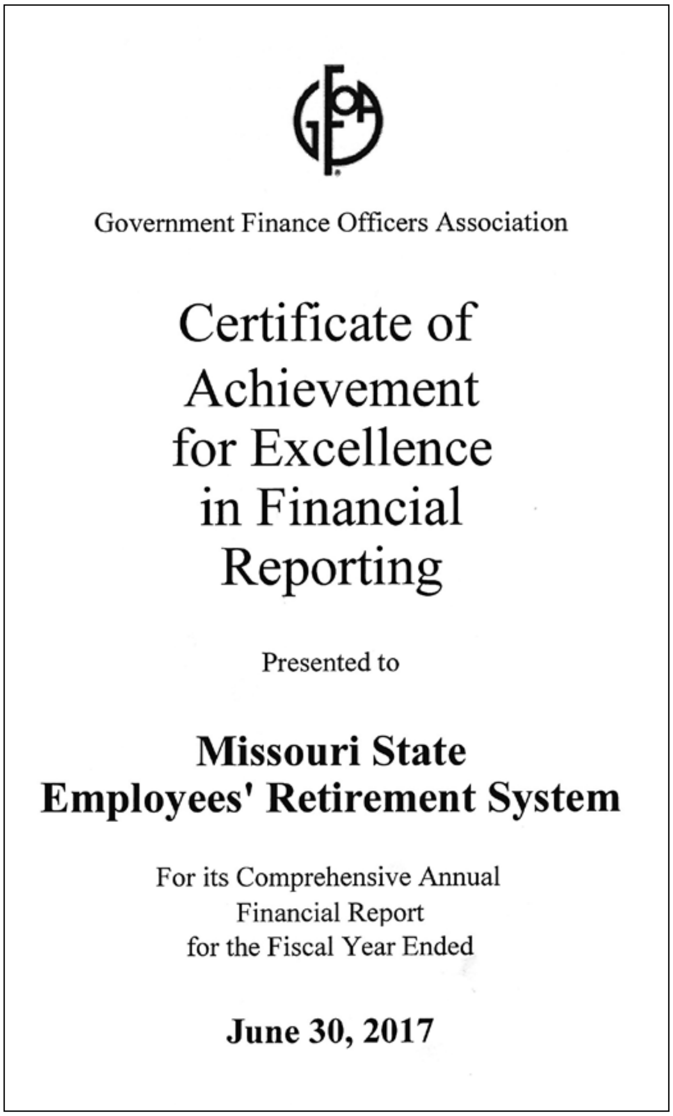
through a commitment to

Excellence. Always.

VALUES

Quality • Respect • Integrity
Openness • Accountability

Professional Awards



Government Finance Officers Association

Certificate of Achievement for Excellence in Financial Reporting

Presented to

Missouri State Employees' Retirement System

For its Comprehensive Annual Financial Report for the Fiscal Year Ended

June 30, 2017

Certificate of Achievement for Excellence in Financial Reporting

MOSERS' *Comprehensive Annual Financial Report* for the fiscal year ended June 30, 2017, was awarded the Certificate of Achievement for Excellence in Financial Reporting by the Government Finance Officers Association of the United States and Canada (GFOA). This was the 29th consecutive year that MOSERS has received this prestigious award. The Certificate of Achievement is the highest form of recognition for excellence in state and local government financial reporting. To be awarded a Certificate of Achievement, a government must publish an easily readable and efficiently organized comprehensive annual financial report (CAFR). The CAFR must satisfy generally accepted accounting principles, applicable legal requirements, and GFOA reporting standards.

Public Pension Coordinating Council

Public Pension Standards Award For Funding and Administration 2017

Presented to

Missouri State Employees' Retirement System

In recognition of meeting professional standards for plan funding and administration as set forth in the Public Pension Standards.

Presented by the Public Pension Coordinating Council, a confederation of

National Association of State Retirement Administrators (NASRA)
National Conference on Public Employee Retirement Systems (NCPERS)
National Council on Teacher Retirement (NCTR)

Alan H. Winkle
Program Administrator

Public Pension Standards Award

MOSERS received the Public Pension Standards Award from the Public Pension Coordinating Council (PPCC) in 2017, in recognition of meeting professional standards for plan design and administration as set forth in the Public Pension Standards. This award is presented by the PPCC, 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).

Letter of Transmittal

Missouri State Employees' Retirement System
Mailing Address: PO Box 209, Jefferson City, MO 65102-0209
Phone: (573) 632-6100 • (800) 827-1063 | Fax: (573) 632-6103
Relay MO: 711 (Voice) • (800) 735-2966 (TTY)
Website: *www.mosers.org* | Email: *mosers@mosers.org*
Visit us at 907 Wildwood Drive, Jefferson City, MO

October 19, 2018

The Board of Trustees
Missouri State Employees' Retirement System
907 Wildwood Drive
Jefferson City, MO 65109

To the Board of Trustees and Members of MOSERS:

I am pleased to submit the *Comprehensive Annual Financial Report* (CAFR) of the Missouri State Employees' Retirement System (MOSERS) for the fiscal year ended June 30, 2018. During FY18, the board and staff worked extensively and collaboratively on solutions to ensure the fiscal sustainability of MOSERS for current and future members. I would like to thank our trustees for their dedication and commitment. I am honored to have been chosen as your executive director this year and look forward to serving our members in the same tradition of excellence that is the hallmark of MOSERS.

This CAFR is designed to provide an overview of the financial condition of MOSERS while also satisfying the reporting requirements of state law as stipulated in Sections 104.480, 104.1006, and 105.661 of the Revised Statutes of Missouri (RSMo), as amended. In addition to the *Introductory Section*, MOSERS' CAFR also contains a *Financial Section*, *Investment Section*, *Actuarial Section* and *Statistical Section*. This report is available on our website at *www.mosers.org* or in paper format upon request.

Profile of MOSERS

MOSERS is a cost-sharing multiple-employer defined benefit pension plan that was established in 1957 by state law for the purpose of providing retirement benefits to most state employees. MOSERS is governed by an 11-member board of trustees. As of June 30, 2018, MOSERS serves 47,806 active employees and pays 48,207 benefit recipients.

In addition to retirement benefits, MOSERS administers term life and long-term disability insurance for most state employees. MOSERS provides these benefits through insured defined benefit plans with The Standard insurance company. We maintain membership information on those eligible and manage an internal service fund to track premiums collected from employers and payments made to the insurance company.

MOSERS oversees the State of Missouri Deferred Compensation Plan (MO Deferred Comp). We administer this plan through a contractual relationship with ICMA-RC as the third-party record keeper. The plan provides various investment options to participants who retain responsibility for the investment of their individual accounts. MOSERS accounts for administrative costs through an internal service fund. MO Deferred Comp issues separate audited financial statements reflecting member investment activity.

Additionally, MOSERS oversees the College and University Retirement Plan (CURP), a mandatory 401(a) defined contribution plan for education employees hired after June 30, 2002 by the regional colleges and universities that participate in MOSERS. The employer contribution rate has traditionally been set at 1% below the employer normal cost for the MSEP plan but, as part of changes included in Senate Bill 62 (passed in 2017), was set at a flat 6% for FY19 with a 2% employee contribution rate for employees hired after July 1, 2018. TIAA is responsible for third-party administration and for providing investment products to plan members.

Financial Statements

The financial statements in this report were prepared in accordance with accounting principles generally accepted in the United States. Management is responsible for the preparation of this report and the fairness and integrity of the information presented therein. Some amounts included in the financial statements and elsewhere may be based on estimates and judgments. Management is responsible for maintaining a system of adequate internal controls designed to provide reasonable, but not absolute, assurance that assets are properly safeguarded and that the financial statements are fairly stated. We believe that the internal controls currently in place support this purpose and that the financial statements and accompanying schedules are fairly presented in all material respects.

Williams-Keepers, LLC, our independent external auditors, conducted an audit of the basic financial statements in accordance with U.S. generally accepted auditing standards. This audit and the financial statements and related notes are presented on pages 17-55 of this report.

Management's Discussion and Analysis in the *Financial Section* serves as an introduction to and overview of the financial statements. Additional financial information can be found in the financial statements and schedules included in the *Financial Section* of this report.

MOSERS is considered a component unit of the state of Missouri for financial reporting purposes and, as such, the financial statements in this report are also included in the *State of Missouri Comprehensive Annual Financial Report*.

Investments

MOSERS' investment portfolio generated a time-weighted return of 7.4%, net of fees, for FY18. The total fund returned 2.6% more than would have been expected through passive investing in the benchmarks. Our investment portfolio is designed to mitigate risk and reduce fees. During FY18, our staff reduced investment management fees by $9 million. Additional detailed information regarding MOSERS' investments, including policies and strategies, can be found in the *Investment Section* on pages 75-96.

Actuarial Information

The board hires an external actuarial consultant to perform an actuarial valuation of its plans each year. The valuations use economic and demographic assumptions adopted by the board based upon experience studies conducted at least every five years. The most recent full experience study was adopted effective June 30, 2016.

During FY18, the board authorized an economic assumption and actuarial methods review to be performed by its external actuaries, Cavanaugh Macdonald Consulting, LLC. After considerable deliberation, the board adopted multiple changes based upon the results and recommendations of this study. The assumption change with the most substantial financial impact to the plans was the approval of the reduction of the assumed rate of return on investments from 7.5% to 7.25%, effective June 30, 2018. The board expressed the intention of further reducing the rate to 7.10%, effective June 30, 2019, and to 6.95%, effective June 30, 2020.

The board also adopted a more traditional five-year closed asset smoothing method with a seven-year transition period for previous losses. This was a change from the previous five-year open (rolling) smoothing method of determining the actuarial value of assets. Thirdly, the board approved resetting the amortization period for the unfunded actuarial accrued liability from 26 years to a layered 30-year closed period. Together, these changes will cause employer contributions to increase and our funded status to decrease in the short term, but they will work to ensure MOSERS' sustainability over the long term.

To allow for more predictable and stable contribution rates, MOSERS' funding is based upon the actuarial value of assets which smooths asset gains and losses over a five-year period. As of June 30, 2018, the MSEP was 64.9% pre-funded and the Judicial Plan was 27.3% pre-funded on an actuarial basis. The MSEP experienced a decrease from the June 30, 2017, funded status of 67.5%. The Judicial Plan reflected an increase from the June 30, 2017, funded status of 26.9%.

The required opinion letter from the board's retained actuary is contained on pages 97-98. Additional information regarding the financial condition of the pension trust funds can be found in the *Actuarial Section* of this report.

Legislative Changes

- **House Bill 2005** – The General Assembly authorized the appropriation of $413 million to MOSERS for FY19, which will fully fund the board certified employer contribution rate. This dollar amount was generated from the contribution rates calculated in the annual actuarial valuations performed by MOSERS' retained actuarial professionals and certified by the MOSERS Board of Trustees at its September 2017 meeting. On June 29, 2018, Governor Parson signed the FY19 budget bills passed by the General Assembly, including the MOSERS appropriation contained in HB 2005.

Administrative Initiatives

MOSERS staff completed several administrative initiatives during the year. Some of the more notable items are outlined below.

- **Implementation of Senate Bill 62** – Senate Bill 62, approved during the 2017 legislative session:
  - Gave the MOSERS board authority to establish a buyout program for eligible inactive-vested members
  - Changed the vesting requirement for the MSEP 2011 from 10 years to 5 years
  - Made changes to the College & University Retirement Plan (CURP)

  MOSERS implemented the buyout program in FY18 notifying approximately 17,000 members of their eligibility for the one-time payment. More than 4,300 members elected this option with total payments exceeding $60 million. The program ultimately reduced the plan's unfunded liability by more than $40 million, saving employers approximately $3 million in contributions annually over the next 30 years. Authorization for the board to offer this program expired May 31, 2018.

  By the end of FY18, 3,277 members of MSEP 2011 became vested and 27 members retired as a result of the vesting change in Senate Bill 62. In order to make this possible, staff re-coded 47 system programs and updated 22 different types of member documents.

  As noted above, Senate Bill 62 also increased the employer contribution rate for the CURP to a flat 6% beginning in FY19 and requires new employees first employed on or after July 1, 2018 to contribute 2% of pay to the CURP.
- **Project Phoenix** – MOSERS' dedicated project team continued work to replace our pension administration system. With the help of Linea Solutions, the MOSERS staff issued a request for proposal and selected Tegrit as its software partner and will begin implementing their Arrivos product in FY19. Data cleansing work continued during the year with the help of ICON Integration. Because of this effort, we currently have more than 12 million records conditioned for use in the new data structure.
- **Human Resources Information and Payroll System** – During FY18, MOSERS selected and implemented BambooHR, a new Human Resources Information and Payroll System. Employees use BambooHR to submit leave, update their demographics, locate coworker contact information, complete performance reviews, and review their pay and benefit information.
- **Board Investment Consultant** – Staff issued a request for proposal and the board selected Verus Advisory, Inc. to provide asset consulting services. Verus performed an asset liability study at the direction of the board and facilitated the adoption of a modified asset allocation policy.
- **Governance and Strategic Planning** – Staff issued a request for proposal and selected Mosaic Governance Advisors to assist the board and staff in the development of updated governance policies and to provide recommendations for an organization-wide strategic plan.

Awards

MOSERS received the Certificate of Achievement for Excellence in Financial Reporting by the Government Finance Officers Association of the United States and Canada (GFOA) for its comprehensive annual financial report for the fiscal year ended June 30, 2017. This was the 29th consecutive year that MOSERS has received this prestigious award. In order to be awarded a Certificate of Achievement, a government must publish an easily readable and efficiently organized comprehensive annual financial report. The report must satisfy generally accepted accounting principles and applicable legal requirements. A Certificate of Achievement is valid for a period of one year only. We believe that our current comprehensive annual financial report continues to meet the Certificate of Achievement Program's requirements and we are submitting it to the GFOA to determine its eligibility for another certificate.

MOSERS received the Public Pension Coordinating Council (PPCC), Public Pension Standards Award, in recognition of meeting the professional standards for plan design and administration as set forth in the Public Pension Standards. This award is presented by the PPCC, 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).

MOSERS also received two awards from the National Association of Government Communicators (NAGC) including a first place award for our Benefits U Human Resources Conference materials and an Award of Excellence for our Member Login Video Tutorial.

These prestigious awards recognize MOSERS for financial and professional standards of excellence and are gratifying to MOSERS' staff.

Conclusion

This report is a product of the combined efforts of MOSERS staff and advisors functioning under the board's leadership. It is intended to provide complete and reliable information that facilitates the management decision making process, serves as a means for determining compliance with legal requirements, and allows for the evaluation of responsible guardianship of system funds.

Copies of this report are provided to the Governor, State Auditor, and the Joint Committee on Public Employee Retirement of the General Assembly. Their support contributes to the success of MOSERS.

In reflecting on the year that was FY18 and all its activities here at MOSERS, we continue to be reminded that it is the long-term security of the benefits we administer that is most important. Those things that are of the highest quality and of the most value require a commitment of time, skill, hard work, sacrifice, and dedication to produce. Built well and properly maintained, they endure for generations. We know our members rely on their benefits now and far into the future. The decisions and initiatives completed by the board and our staff this year all work together to foster the long-term sustainability of the system. As we move into FY19, we, the staff of MOSERS, will continue to "roll up our sleeves" and work hard for our members, the board, and all our stakeholders. It is our honor to work for this great state and its citizens.

Respectfully submitted,

Ronda Stegmann
Executive Director

Letter from the Board Chairwoman

Missouri State Employees' Retirement System
Mailing Address: PO Box 209, Jefferson City, MO 65102-0209
Phone: (573) 632-6100 • (800) 827-1063 | Fax: (573) 632-6103
Relay MO: 711 (Voice) • (800) 735-2966 (TTY)
Website: *www.mosers.org* | Email: *mosers@mosers.org*
Visit us at 907 Wildwood Drive, Jefferson City, MO

October 19, 2018

Dear Members:

On behalf of the board of trustees, I am pleased to present the MOSERS *Comprehensive Annual Financial Report* for the fiscal year ended June 30, 2018. Much like the stately tree illustrated on this year's report cover, MOSERS has grown over the past 61 years in its commitment to provide greater financial security to you for your service to the state of Missouri and its citizens.

During FY18, the MOSERS Board of Trustees continued its ongoing commitment to security and stability by establishing three committees, comprised of three to five board members, to delve into MOSERS-specific topics. Committee members gained a stronger understanding of the important areas of:

- investments;
- strategic planning and governance; and
- procurement of the new pension administration system.

Committee members dedicated additional time and expertise, which resulted in robust analysis benefiting the board as a whole and our stakeholders.

During FY18, board and staff members implemented several initiatives including:

- developing a new asset allocation for the $8 billion MOSERS trust fund;
- embarking on re-writing the board's governance policies in FY19;
- engaging in a comprehensive environmental scan and analysis of our strengths, weaknesses, opportunities, and threats in preparation for a renewed strategic planning effort; and
- modifying the system's funding policy, after considerable deliberation, to lower MOSERS' investment return assumption. The new assumptions more accurately reflect capital market expectations. While this decision will result in higher annual employer contribution requirements in the short-term, we believe this prudent action will strengthen the financial position of the system and enhance the retirement security of our members over the long-term.

On behalf of the board and staff, I would like to recognize Mr. Joe Carmichael, Ms. Shannon Owens, Mr. Antwaun Smith, Representative Justin Alferman, and Representative Mike Bernskoetter for their hard work and dedication while serving as trustees. Four new trustees were named to the board during FY18 including Ms. Jenny Jacobs, Mr. Joe Keifer, Mr. Gary Metzger, and Representative Scott Fitzpatrick. Trustees devote many hours in fulfilling their fiduciary duties. Our newer trustees have already made substantial contributions of time and service to board discussion and decisions.

As we look forward to another fiscal year and the opportunities it will provide, I wish to thank the MOSERS staff for their dedication and professionalism. I also wish to express my appreciation to you, our members, for your commitment and service to this great state and its citizens. As a fellow state employee, I know many of the challenges you face and I am honored to serve as one of your representatives on the MOSERS board. If you ever have any questions, please contact us at MOSERS, P.O. Box 209, Jefferson City, MO 65102, call us at (800) 827-1063, or visit our website at *www.mosers.org*.

Sincerely,

Crystal D Wessing

Crystal Wessing, Chairwoman
Board of Trustees

Board of Trustees








Administrative Organization

Ronda Stegmann
Executive Director

- **Cindy Rehmeier,** *Manager – Defined Contribution Plans*
- **Nicki Russell,** *Chief Auditor*
- **Abby Spieler,** *Chief Counsel*
- **Lisa Verslues,** *Human Resources Coordinator*
- **Lori Woratzeck,** *Chief Finance Officer*

Mark J. Murphy
Deputy Executive Director • Operations
Chief Operations Officer

- **Andrea Binkley,** *Chief Benefits Officer*
- **Stacy Gillmore,** *Chief Technology Officer*
- **Lori Leeper,** *Board & Operations Projects Coordinator*
- **Carson Lepper,** *Project Manager*
- **Candy Smith,** *Communications Manager & Public Information Officer*

Seth Kelly
Deputy Executive Director • Investments
Chief Investment Officer

- **Shannon Davidson,** *Deputy Chief Investment Officer*
- **Patrick Morgan,** *Investment Legal & Compliance Counsel*
- **Scott Peppard,** *Manager – Illiquid Alpha Strategies*
- **Tyson Rehfeld,** *Manager – Global Rates & Credit*

About MOSERS

Purpose

MOSERS was established September 1, 1957, and is governed by laws of the state of Missouri.

MOSERS provides retirement, survivor, and disability benefits, as well as life insurance and deferred compensation plan management to its members.

MOSERS administers benefits for most state employees, including members of the Missouri General Assembly, elected state officials, and judges. MOSERS is responsible for administering benefits as set forth in state law and bears a fiduciary obligation to the state employees who are its members.

Administration

State law provides that responsibility for the administration of MOSERS is vested in an 11-member board of trustees. The board is comprised of the following:

- two members of the Senate appointed by the President Pro Tem of the Senate;
- two members of the House of Representatives appointed by the Speaker of the House;
- two members appointed by the Governor;
- the State Treasurer;
- the Commissioner of Administration; and
- three system members: two active members elected by the active and inactive-vested members, and one retiree elected by the retired members.

The day-to-day management of MOSERS is delegated to the executive director who is appointed by the board and serves at its pleasure. The executive director acts as advisor to the board on all matters pertaining to the system, contracts for professional services, and employs the remaining staff needed to manage the system.

Organization

The executive director, chief operations officer, and chief investment officer are responsible for planning, organizing, and administering the operations of the system under the broad policy guidance and direction of the board.

Executive

The executive staff provide administrative support by assisting the executive director, chief operations officer, and chief finance officer in the major legal, financial, operational, and oversight functions. Human resources, which includes oversight of general building maintenance, is also represented in this section.

MOSERS' office is divided into six administrative sections that perform specific functions for the system.

Benefits

Staff in the benefits section are responsible for all member data, benefit verifications and inceptions, as well as contact with members regarding the benefit programs administered by MOSERS (retirement, life insurance, and long-term disability insurance). This team also conducts educational seminars in 16-plus cities around the state each year and host webinars to inform members about their MOSERS benefits.

Communications

Communications staff are responsible for presenting information in clear and concise ways to facilitate effective, well-informed decision-making, planning, and action. They produce materials for members regarding the benefits administered by MOSERS including publications such as newsletters, handbooks, forms, brochures, and the annual report. Additionally, this team works in conjunction with information technology staff on electronic materials and tools such as the public, board, secure member, and internal websites. This section coordinates activities and processes for the organization that facilitate strategic thinking, planning, and implementation.

Finance

The staff in this section are responsible for all financial records of the programs administered by MOSERS, including the preparation of financial and statistical reports and purchasing functions for MOSERS. This team interfaces with the investment custodian, internal investment managers, Office of Administration accounting, state of Missouri employers, life insurance companies, actuaries, banks, and the IRS. They are also responsible for all billing, payment processing, and balancing of member and employer contributions.

Information Technology

The information technology section provides computer and technical design support for MOSERS' administrative activities. This team is responsible for developing and maintaining the automated systems used to administer benefits. They are also responsible for the document imaging system, network, unified communication system, and personal computers. Information technology and communications staff are jointly responsible for MOSERS' websites.

Investments

The investments staff provides investment management and consulting services to the system. Primary functions include managing assets internally, selecting external managers for portions of the portfolio, researching and implementing portfolio allocation shifts and rebalancing, providing technical advice, serving as a liaison to the investment community, and informing and advising the board and executive director on financial, economic, and political developments which may affect the system. This team works closely with external investment consultants, legal counsel, and the executive director.

Project Management

The responsibilities of staff in this area include business continuity preparation and planning, business process mapping and analysis to identify efficiencies, and mitigate risk. This team is responsible for the selection and implementation efforts of a new pension administration solution to replace MIBS. This includes working closely with multiple external vendors focused on data preparation and systems design.

Outside Professional Services

Actuary
- Cavanaugh Macdonald Consulting, LLC

Auditor
- Williams-Keepers, LLC

Governmental Consultant
- Gamble & Schlemeier, Ltd.

Human Resources Consultant
- Korn Ferry

Information Technology Consultants
- Secureworks
- World Wide Technology

Legal Counsel
- Purrington Moody Weil, LLP
- Thompson Coburn, LLP

Pension System Administration Consultants
- ICON Integration and Design, Inc.
- Linea Solutions

Risk Management Consultant
- Charlesworth & Associates, LC

Third-Party Administrators
- ICMA-RC
  Deferred Compensation Plan
- The Standard
  Life Insurance and Long-Term Disability Insurance
- TIAA
  College and University Retirement Plan

Investment Management Consultants
- Blackstone Alternative Asset Management, LP
  Hedge Fund Asset Consultant
- Summit Strategies Group
  General Asset Consultant
- TimberLink Consulting, LLC
  Timberland Consultant
- Verus Advisory, Inc.
  Board Investment Consultant

Investment Risk Management
- MSCI BarraOne

Master Custodian
- Bank of New York Mellon

Securities Lending Advisor
- Deutsche Bank AG, New York Branch

Investment Advisors
- Actis Emerging Markets, LLP
- Alinda Capital Partners, LLC
- Alliance Bernstein Defined Contribution Investments
- AQR Capital Management, LLC
- Axiom Asia Private Capital
- Axxon Management, LP
- Bayview Asset Management, LLC
- BlackRock Financial Management, Inc.
- Blackstone Alternative Asset Management, LP
- Blackstone Real Estate Advisors
- Blakeney Management, Ltd.
- Bridgewater Associates, LP
- Campbell Global
- CarVal Investors, LLC
- Catalyst Capital Group, Inc.
- Catterton Partners
- Cornwall Capital Management, LP
- Development Partners International
- DRI Capital, Inc.
- EIG Global Energy Partners, LLC
- Elliott International Capital Advisors, Inc.
- Eton Park Capital Management, LP
- Farallon Capital Management, LLC
- Gaoling Fund, LP
- Glenview Capital Management, LLC
- Global Forest Partners, LP
- Harvest Fund Advisors, LLC
- HBK Investments, LP

Outside Professional Services continued on page 16

Outside Professional Services continued from page 15

- JLL Partners, LP
- King Street Capital Management, LP
- Linden Capital Partners, LLC
- Mast Capital Management, LLC
- Merit Energy Company
- MHR Institutional Partners, LLC
- Millennium Technology Value Partners, LP
- Moon Capital Management, LP
- NISA Investment Advisors, LLC
- Oaktree Capital Management, LP
- Pacific Alternative Asset Management Company, LLC
- Perry Partners, LLC
- Pharo Global Advisors, Ltd.
- Resource Management Service, LLC
- Silchester International Investors
- Silver Creek Capital Management, LLC
- Silver Lake Partners, LP
- Silver Point Capital, LP
- SIR Capital Management, LP
- Siris Capital Group, LLC
- State Street Global Advisors
- StepStone Group
- Stone Harbor Investment Partners, LP
- Visium Asset Management, LP
- Voya Financial
- Wellington Management Company, LLP

Investment management, custodial and consulting fees can be found in the Schedule of Investment Manager Fees on page 87. The Opportunistic Global Equities - Schedule of Brokerage Activity can be found on page 90. Additional information on investment managers can also be found in the Investment Section of this report.

Financial Section

Independent Auditors' Report

WILLIAMS KEEPERS LLC
CERTIFIED PUBLIC ACCOUNTANTS & CONSULTANTS

2005 West Broadway, Suite 100, Columbia, MO 65203
OFFICE (573) 442-6171 FAX (573) 777-7800
3220 West Edgewood, Suite E, Jefferson City, MO 65109
OFFICE (573) 635-6196 FAX (573) 644-7240
www.williamskeepers.com

The Board of Trustees
Missouri State Employees' Retirement System

We have audited the accompanying financial statements of the pension trust and internal service funds of the Missouri State Employees' Retirement System (MOSERS), a component unit of the State of Missouri, as of and for the year ended June 30, 2018, and the related notes to the financial statements, which collectively comprise the MOSERS' basic financial statements as listed in the table of contents.

Management's Responsibility for the Financial Statements

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

Auditors' Responsibility

Our responsibility is to express opinions on these financial statements based on our audit. We conducted our audit in accordance with U.S. generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

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

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

Opinions

In our opinion, the financial statements referred to above present fairly, in all material respects, the respective financial position of the pension trust and internal service funds of MOSERS as of June 30, 2018, and the respective changes in financial position and, where applicable, cash flows thereof for the year then ended in conformity with U.S. generally accepted accounting principles.

Other Matters

Required Supplementary Information

U.S. generally accepted accounting principles require that the *Management's Discussion and Analysis* on pages 19-24 and the *Schedule of Changes in Employers' Net Pension Liability*, *Schedule of Employer Contributions, Schedule of Annual Money-Weighted Rate of Return on Investments, Schedule of Proportionate Share of the Net OPEB Liability, Schedule of Employer Contributions for OPEB,* and the *Notes to the Schedules of Required Supplementary Information* on pages 56-66 be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board, who considers it to be an essential part of financial reporting for placing the basic financial statements in an appropriate operational, economic, or historical context.

We have applied certain limited procedures to the required supplementary information in accordance with U.S. generally accepted auditing standards, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Other Information

Our audit was conducted for the purpose of forming opinions on the financial statements that collectively comprise MOSERS' basic financial statements. The *Introductory*, *Investment*, *Actuarial,* and *Statistical Sections* and the additional information on pages 67-74 are presented for purposes of additional analysis and are not a required part of the financial statements.

The additional information presented on pages 67-74 is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the financial statements. Such information has been subjected to the auditing procedures applied in the audit of the basic financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the basic financial statements or to the basic financial statements themselves, and other additional procedures in accordance with U.S. generally accepted auditing standards. In our opinion, the additional information presented on pages 67-74 is fairly stated in all material respects in relation to the basic financial statements as a whole.

The *Introductory*, *Investment*, *Actuarial,* and *Statistical Sections* have not been subjected to the auditing procedures applied in the audit of the basic financial statements and, accordingly, we do not express an opinion or provide any assurance on them.

Williams-Keepers LLC

October 19, 2018

Management's Discussion and Analysis

This discussion and analysis of the Missouri State Employees' Retirement System (MOSERS) provides an overview of the retirement system's financial activities for the fiscal year ended June 30, 2018. It is intended to be used in conjunction with the *Transmittal Letter* beginning on page 6 and *Financial Statements* and *Notes to the Financial Statements*, on pages 25-55 of this report.

Using This Financial Report

This Comprehensive Annual Financial Report (CAFR) reflects the activities of MOSERS as reported in the *Statements of Fiduciary Net Position* and the *Statements of Changes in Fiduciary Net Position*, which begin on page 25. These statements are prepared in conformity with generally accepted accounting principles. The *Notes to the Financial Statements* are an integral part of the financial statements and include additional information not readily evident in the statements themselves. The *Required Supplementary Information* (RSI) and *Additional Financial Information* following the *Notes to the Financial Statements* provide historical information and additional details considered useful in evaluating the condition of the plan.

Investment data in the *Financial Section* is presented at fair value. See the *Actuarial Section* of this report for a detailed discussion of the actuarial value of assets and liabilities and the funded status of the plans.

The basic financial statements contained in this section of the CAFR consist of:

- The *Statements of Fiduciary Net Position* report the pension trust funds' assets, liabilities, and resulting net position, where total assets less current liabilities equal net position held in trust for future pension benefits available at the end of the fiscal year. It is a snapshot of the financial position of the pension trust funds at that specific point in time.
- The *Statements of Changes in Fiduciary Net Position* summarize the pension trust funds' financial transactions that have occurred during the fiscal year where additions less deductions equal net change in net position. It supports the change that has occurred to the prior year's net position on the *Statements of Fiduciary Net Position*.
- The *Statements of Net Position* of the internal service funds are similar to the *Statements of Fiduciary Net Position* in that it is also a snapshot of the financial position of the internal service funds where net position plus liabilities equals assets.
- The *Statements of Revenues, Expenses, and Changes in Net Position* of the internal service funds is similar to the *Statements of Changes in Fiduciary Net Position* in that it also reports a summary of the financial activity that occurred over the period of the fiscal year where revenues less expenses equals net revenue and supports the change to the prior year's net position.
- The *Statements of Cash Flows* of the internal service funds report the financial transactions of the fiscal year of the internal service funds on a cash basis. It is similar to the *Statements of Revenues, Expenses and Changes in Net Position*; however, the focus of this statement is on the change to cash balances with accrued income and expense items eliminated.
- The *Notes to the Financial Statements* are an integral part of the above financial statements and include additional information not readily evident in the statements themselves.
- *Management's Discussion and Analysis*, the *Required Supplementary Information*, and *Additional Financial Information* following the *Notes to the Financial Statements* provide detailed historical information considered useful in evaluating the condition of the plans administered by MOSERS.

Funding Analysis

The unfunded actuarial accrued liability (UAAL) for MSEP increased by $0.5 billion from $4.28 billion at June 30, 2017, to $4.78 billion at June 30, 2018, with a corresponding decrease in funded percentage from 67.5% to 64.9%. The UAAL for the Judicial Plan increased by $19.06 million from $412.59 million at June 30, 2017, to $431.65 million at June 30, 2018, with an increase in funded percentage from 26.9% to 27.3%. The primary reason for the increase in the UAAL in both plans was a reduction in the assumed rate of investment return from 7.50% to 7.25% and the recognition of prior year losses.

To determine the UAAL of the plans, MOSERS uses a smoothed value of assets which recognizes market gains and losses on the actuarial value of assets over a five-year closed period. For GASB 67 financial statement reporting purposes, the market value of assets is used to determine plan net position. The plan net position as a percentage of total pension liability decreased from 60.4% at June 30, 2017, to 59.0% at June 30, 2018, for MSEP and increased from 24.4% to 25.3% for the Judicial Plan.

Financial Reporting Highlights

- MOSERS' net position restricted for pensions increased by $108.5 million during FY18. On June 30, 2018, total plan assets (including net capital assets of $3.2 million) were $12.2 billion, exceeding total liabilities of $4.0 billion, resulting in a net position held in trust for pension benefits of $8.2 billion.
- Covered payroll, from which both employee and employer contributions are calculated, decreased $26.8 million for the Missouri State Employees' Plan (MSEP) and increased $1.4 million for the Judicial Plan, or (1.4%) and 2.4% respectively, over the last fiscal year.
- Total contributions for FY18 were $451.0 million, up from $401.4 million in FY17. Based upon the June 30, 2016 actuarial valuation, the FY18 actuarial required employer contribution rates were determined to be 19.45% for the MSEP and 62.09% for the Judicial Plan.
- Investment income, net of related fees, was $589.6 million. Investments of the pension trust funds generated a time-weighted rate of return of 7.4%, net of fees, for the year, up from the prior year's return of 3.5%. The money-weighted rate of return, net of investment expenses as defined by GASB Statement No. 67, was 7.57% for FY18.
- Investment activity expenses were $104.0 million in FY18, down from $140.3 million in FY17. The $36.3 million reduction was primarily due to a $9.2 million reduction in management fees and a $26.9 million reduction in incentive fees paid in FY18. The lower fees were driven by investment staff reducing exposure to higher fee managers and managers subject to incentive fee arrangements.
- Member benefit payments were $853.8 million in FY18, up $32.5 million from $821.3 million in FY17. Service transfers and refunds totaled $68.6 million in FY18, up $61.9 million from $6.7 million in FY17 due primarily to the buyout program offered during the year.
- Administrative expenses totaled $10.2 million in FY18, compared to $15.7 million in FY17. Administrative costs for FY17 were restated to include $6.8 million for OPEB expense due to the implementation of GASB Statement No. 75 during FY18 (see Note 12 on page 55). Other administrative costs increased $.8 million from FY17 to FY18 primarily due to increased consulting fees related to the implementation of a new pension administration system and $.5 million in OPEB expenses.
- A net OPEB liability of $7.1 million was reported in FY17, and $7.2 million in FY18, due to the implementation of GASB Statement No. 75, Accounting and Financial Reporting for Postemployment Benefits other than Pension in FY18. This liability represents MOSERS' proportionate share of the net OPEB liability for its employees to participate in the State Retiree Welfare Benefit Trust in retirement. Deferred outflows of $.3 million were reported in both FY17 and FY18 reflecting the premiums paid subsequent to the measurement date of the plan liability.
- The internal service fund's net position decreased by $0.2 million. This is due to an increase in administrative expenses to bring the State of Missouri Deferred Compensation Plan's education department in-house.

The schedules on pages 21-24 present *Summary Comparative Financial Statements* of the pension trust funds and internal service funds for FY18 and FY17. For each schedule, there is a brief summary of the significant changes noted in those schedules.

Requests for Information

This financial report is designed to provide a general overview of the system's finances for all those interested in the system. Questions concerning any of the information provided in this report or requests for additional information should be addressed to MOSERS at P.O. Box 209, Jefferson City, MO 65102 or by email at *mosers@mosers.org*.

Pension Trust Funds

Summary Comparative Statements of Fiduciary Net Position

	As of June 30, 2018	As of June 30, 2017*	Amount of Change	Percentage Change
Assets				
Cash and short-term investments	$ 3,532,158,169	$ 2,417,955,050	$ 1,114,203,119	46.08%
Receivables	152,195,889	43,498,874	108,697,015	249.88
Investments	8,535,881,439	9,018,590,792	(482,709,353)	(5.35)
Net capital assets	3,237,785	3,316,060	(78,275)	(2.36)
Other assets	44,847	105,911	(61,064)	(57.66)
Total assets	12,223,578,129	11,483,744,419	740,051,442	6.05
Deferred outflow of resources	301,182	277,732	23,450	8.44
Liabilities				
Administrative expense payables	2,320,559	2,434,501	(113,942)	(4.68)
Investment purchase payables	162,762,193	10,165,707	152,596,486	1501.09
Other liabilities	8,700,871	9,470,802	(769,931)	(8.13)
Obligations under repurchase agreements	3,853,968,794	3,373,773,555	480,195,239	14.23
MOSERS investment portfolio liability (MIP)	4,014,950	4,628,883	(613,933)	(13.26)
Net OPEB liability	7,272,038	7,118,443	153,595	2.16
Total liabilities	4,039,039,405	3,407,591,891	631,447,514	15.63
Deferred inflow of resources	71,907	0	71,907	100.00
Net positions restricted for pensions	$ 8,184,707,999	$ 8,076,152,528	$ 108,555,471	1.34

* *Some balances have been restated due to the adoption of GASB Statement No. 75, Other Post-Employment Benefits.*

The largest components of the net position of the pension trust funds are the cash, short-term investments, and investments (less obligations under repurchase agreements).

MOSERS' net position restricted for pension benefits increase by $0.1 billion from $8.08 billion in FY17 to $8.18 billion in FY18. The increase was due to the total investment return, net of fees, of 7.4% for FY18 exceeding the negative cash flow generated by benefit payments in excess of contribution revenue.

The net increase in investment receivables over investment liabilities was $44.13 million. This increase is due to the timing of investment transactions not completed by June 30.

Detailed information regarding MOSERS' investment portfolio is included in the *Investment Section* of this report.

Pension Trust Funds

Summary Comparative Statements of Changes in Fiduciary Net Position

	Year Ended June 30, 2018	Year Ended June 30, 2017*	Amount of Change	Percentage Change
Additions				
Contributions	$ 450,974,449	$ 401,359,185	$ 9,615,264	12.36%
Investment income – investing activities	589,611,104	276,722,915	312,888,189	113.07
Investment income – securities lending activities	0	21,896	(21,896)	(100.00)
Miscellaneous income	548,581	530,988	17,593	3.31
Total additions	1,041,134,134	678,634,984	362,499,150	53.42
Deductions				
Benefits	853,758,969	821,280,165	32,478,804	3.95
Service transfers and refunds	68,609,753	6,669,417	61,940,336	928.72
Administrative expenses	10,209,941	15,750,439	(5,540,498)	(35.18)
Total deductions	932,578,663	843,700,021	88,878,642	10.53
Net increase (decrease)	108,555,471	(165,065,037)	273,620,508	165.77
Net position beginning of year	8,076,152,528	8,241,217,565	(165,065,037)	(2.00)
Net positions restricted for pensions	$ 8,184,707,999	$ 8,076,152,528	$ 108,555,471	1.34

* *Some balances have been restated due to the adoption of GASB Statement No. 75, Other Post-Employment Benefits.*

The increase in contributions received is primarily attributable to an increase in contribution rates from FY17 to FY18.

The increase in investment income from FY17 to FY18 is attributable to market performance. The fund returned 7.4% in FY18 compared to 3.5% in FY17. The decrease in securities lending income is due to suspension of the securities lending program in FY18. The *Investment Section* of this report contains additional information regarding investments and securities lending activity.

The total benefit payments increased as a result of an increase in the number of benefit recipients plus cost-of-living adjustments provided to existing benefit recipients. Detailed schedules of these changes can be viewed on pages 110-121 of the *Actuarial Section* of this report.

Service transfers and refunds increased by $61.9 million. Of this increase, $61.7 million was primarily due to the buyout program offered in FY18.

Administrative expenses decreased $5.5 million. FY17 administrative expenses were restated to include $6.8 million for OPEB expenses due to the implementation of GASB Statement 75 (See Note 12 on page 55). The FY18 OPEB expenses were $.5 million, causing a net increase of $6.3 million. Other administrative expenses increased $.8 million from FY17 to FY18 primarily due to increased consulting fees related to the implementation of a new pension administration system.

Internal Service Funds
Summary Comparative Statements of Net Position

	As of June 30, 2018	As of June 30, 2017	Amount of Change	Percentage Change
Assets				
Premiums receivable	$ 945,148	$ 967,091	$ (21,943)	(2.27)%
Investments at fair value	4,294,253	4,291,721	2,532	0.06
Fixed assets net of accumulated depreciation	12,800	11,598	1,202	10.36
Leasehold improvements	0	970	(970)	(100.00)
Total assets	$ 5,252,201	$ 5,271,380	$ (19,179)	(0.36)
Liabilities				
Premiums payable	$ 2,493,654	$ 2,518,379	$ (24,725)	(0.98)
Deferred revenue	2,083,270	2,103,956	(20,686)	(0.98)
Other liabilities	397,165	153,924	243,241	158.03
Total liabilities	4,974,089	4,776,259	197,830	4.14
Unrestricted net position	278,112	495,121	(217,009)	(43.83)
Total liabilities and net position	$ 5,252,201	$ 5,271,380	$ (19,179)	(0.36)

The decrease in premiums receivable is attributable to normal fluctuations in the month-end balance of life and long-term disability insurance premiums receivable during the year, which are dependent on the number of members participating and amount of their coverage.

The increase in investments is attributable to reimbursement from the State of Missouri Deferred Compensation Plan's third-party record keeper to cover administrative expenses in FY18 and future years.

The increase in other liabilities is due to expenses allocated from the pension trust fund to the internal service fund but not yet paid for by the fund.

Long-term disability premiums are paid by the state on all active employees based upon a blended rate estimated by MOSERS. The Standard is paid the actual rate based upon active employees that are not yet eligible to retire. The deferred revenue balance represents amounts paid by the state in excess of that needed to pay the premiums. The reduction in deferred revenue during FY18 reflects a lower amount received than was needed to pay the premiums. This amount reduced the deferred revenue balance. This balance is estimated to continue to decrease in the future.

Internal Service Funds

Summary Comparative Statements of Revenues, Expenses, and Changes in Net Position

	Year Ended June 30, 2018	Year Ended June 30, 2017	Amount of Change	Percentage Change
Operating revenues				
Premium receipts	$ 31,119,232	$ 28,779,398	$ 2,339,834	8.13%
Deferred compensation receipts	800,000	700,000	100,000	14.29
Miscellaneous income	480,120	480,120	0	0.00
Total operating revenues	32,399,352	29,959,518	2,439,834	8.14
Operating expenses				
Premium disbursements	31,100,612	28,769,588	2,331,024	8.10
Premium refunds	14,211	9,810	4,401	44.86
Administrative expenses	1,587,344	950,121	637,223	67.07
Total operating expenses	32,702,167	29,729,519	2,972,648	10.00
Net operating (loss) income	(302,815)	229,999	(532,814)	(231.66)
Nonoperating revenues				
Investment income	85,806	36,497	49,309	135.10
Net revenues (under) over expenses	(217,009)	266,496	(483,505)	(181.43)
Net position beginning of year	495,121	228,625	266,496	116.56
Net position end of year	$ 278,112	$ 495,121	$ (217,009)	(43.83)

Premium receipts and premium disbursements increased due to a change in method for recording deferred revenue in the long-term disability program. Prior to FY17, amounts paid by the state in excess of amounts needed to pay The Standard were recorded as an expense and payable when received. These amounts were reclassified as deferred revenue in FY17.

Deferred compensation receipts and disbursements were $0.8 million for FY18. This is attributable to a $0.8 million reimbursement paid in FY18 to cover current and future administrative expenses to the internal service fund at MOSERS from the State of Missouri Deferred Compensation Plan's third-party record keeper, which collects deferred compensation contributions directly from employers. As of June 30, 2018, there were 64,556 participants (including active, inactive, and retired), which is an increase of 761 from FY17. The state of Missouri has not contributed an employer match since March 2010.

Administrative expenses increased due to an increase in expenses to bring the State of Missouri Deferred Compensation Plan's education department in-house.

Internal Service Funds

Summary Comparative Statements of Cash Flows

	Year Ended June 30, 2018	Year Ended June 30, 2017	Amount of Change	Percentage Change
Cash flows from operating activities	$ (81,359)	$ 330,265	$ (411,624)	(124.63)%
Cash flows from noncapital financing activities	(13)	(1,080)	1,067	98.80
Cash flows from investing activities	81,372	(329,185)	410,557	124.72
Net change in cash	0	0	0	
Cash balances beginning of year	0	0	0	
Cash balances end of year	$ 0	$ 0	$ 0	

The decrease in cash flows from operating activities is primarily attributable to the increase in deferred compensation payroll and fringe benefits associated with bringing the State of Missouri Deferred Compensation Plan's education department in-house.

The increase in cash flows from investing activities is attributable the increase in net sale of overnight repurchases to pay for administrative costs.

Basic Financial Statements

Pension Trust Funds
Statements of Fiduciary Net Position | As of June 30, 2018

	MSEP	Judicial Plan	Total
Assets			
Cash and short-term investments	$ 3,467,892,777	$ 64,265,392	$ 3,532,158,169
Receivables			
Contributions	15,390,037	1,592,973	16,983,010
Investment income	48,790,442	904,162	49,694,604
Investment sales	83,467,162	1,546,775	85,013,937
Other receivables	495,162	9,176	504,338
Total receivables	148,142,803	4,053,086	152,195,889
Investments at fair value			
U.S. treasury securities	4,196,311,319	77,764,109	4,274,075,428
Government bonds & gov't mortgage-backed securities	45,259,388	838,726	46,098,114
Corporate bonds	233,695,919	4,330,745	238,026,664
U.S. dollar-denominated international corporate bonds	41,267,878	764,757	42,032,635
Limited partnerships	2,893,466,144	53,620,382	2,947,086,526
Common stock	131,027,142	2,428,135	133,455,277
International equities	838,439,860	15,537,581	853,977,441
Foreign currency	1,101,675	20,416	1,122,091
Real estate investment trust	7,131	132	7,263
Total investments	8,380,576,456	155,304,983	8,535,881,439
Capital assets			
Land	262,423	4,863	267,286
Building and building improvements	4,165,980	77,202	4,243,182
Furniture, fixtures and equipment	1,376,009	25,500	1,401,509
Software	722,919	13,397	736,316
Total capital assets	6,527,331	120,962	6,648,293
Accumulated depreciation	(3,348,456)	(62,052)	(3,410,508)
Net capital assets	3,178,875	58,910	3,237,785
Prepaid expenses and other	44,031	816	44,847
Total assets	11,999,834,942	223,683,187	12,223,518,129
Deferred outflow of resources	295,702	5,480	301,182
Liabilities			
Administrative and benefit expense payables	2,278,338	42,221	2,320,559
Investment purchases payable	159,800,837	2,961,356	162,762,193
Investment incentive fees payable	7,868,598	145,817	8,014,415
Employee vacation and overtime liability	673,966	12,490	686,456
Obligations under repurchase agreements	3,783,848,261	70,120,533	3,853,968,794
MOSERS investment portfolio liability (MIP)	3,941,901	73,049	4,014,950
Net OPEB liability	7,139,728	132,310	7,272,038
Total liabilities	3,965,551,629	73,487,776	4,039,039,405
Deferred inflow of resources	70,591	1,316	71,907
Net position restricted for pensions	$ 8,034,508,424	$ 150,199,575	$ 8,184,707,999

See accompanying *Notes to the Financial Statements.*

Pension Trust Funds

Statements of Changes in Fiduciary Net Position | For the Year Ended June 30, 2018

	MSEP	Judicial Plan	Total
Additions			
Contributions			
Employer contributions	$ 379,557,962	$ 36,892,203	$ 416,450,165
Member contributions	28,303,993	902,320	29,206,313
Member purchases of service credit	2,020,720	0	2,020,720
Service transfer contributions	3,297,251	0	3,297,251
Total contributions	413,179,926	37,794,523	450,974,449
Investment income			
From investing activities:			
Net appreciation in fair value of investments	620,043,390	11,490,358	631,533,748
Interest	60,196,973	1,115,543	61,312,516
Dividends	560,480	10,387	570,867
Other income	157,126	2,912	160,038
Total investing activity income	680,957,969	12,619,200	693,577,169
Investing activity expenses:			
Management and incentive fees	(96,649,483)	(1,791,064)	(98,440,547)
Custody fees	(355,598)	(6,590)	(362,188)
Consultant fees	(649,296)	(12,032)	(661,328)
Performance measurement fees	(451,078)	(8,359)	(459,437)
Internal investment activity expenses	(3,969,013)	(73,552)	(4,042,565)
Total investing activity expenses	(102,074,468)	(1,891,597)	(103,966,065)
Total net investment income	578,883,501	10,727,603	589,611,104
Miscellaneous income	538,600	9,981	548,581
Total additions	992,602,027	48,532,107	1,041,134,134
Deductions			
Benefits	733,750,284	35,651,489	769,401,773
BackDROP & lump sum benefits	84,357,196	0	84,357,196
Inactive-vested buyout payments	61,041,258	0	61,041,258
Service transfer payments	2,060,037	0	2,060,037
Contribution refunds	5,502,698	5,760	5,508,458
Administrative expenses	10,024,178	185,763	10,209,941
Total deductions	896,735,651	35,843,012	932,578,663
Net increase in net position	95,866,376	12,689,095	108,555,471
Net position restricted for pensions			
Beginning of year	7,938,642,048	137,510,480	8,076,152,528
End of year	$ 8,034,508,424	$ 150,199,575	$ 8,184,707,999

See accompanying *Notes to the Financial Statements.*

Internal Service Funds

Statement of Net Position | As of June 30, 2018

	Total
Assets	
Premiums receivable	$ 945,148
Investments at fair value	4,294,253
Capital assets	23,370
Accumulated depreciation — fixed assets	(10,570)
Leasehold improvements	3,880
Accumulated depreciation — leasehold	(3,880)
Total assets	$ 5,252,201
Liabilities and net position	
Liabilities	
Premiums payable	$ 2,493,654
Deferred revenue	2,083,270
Other liabilities	397,165
Total liabilities	4,974,089
Unrestricted net position	278,112
Total liabilities and net position	$ 5,252,201

See accompanying *Notes to the Financial Statements*.

Internal Service Funds

Statement of Revenues, Expenses, and Changes in Net Position | For the Year Ended June 30, 2018

	Total
Operating revenues	
Premium receipts	$ 31,119,232
Deferred compensation receipts	800,000
Miscellaneous income	480,120
Total operating revenues	32,399,352
Operating expenses	
Premium disbursements	31,100,612
Premium refunds	14,211
Administrative expenses	1,587,344
Total operating expenses	32,702,167
Net operating (loss)	(302,815)
Nonoperating revenues	
Investment income	85,806
Net revenues (under) expenses	(217,009)
Net position beginning of year	495,121
Net position end of year	$ 278,112

See accompanying *Notes to the Financial Statements*.

Internal Service Funds

Statement of Cash Flows | For the Year Ended June 30, 2018

	Total
Cash flows from operating activities	
Cash received from employers and members	$ 32,421,295
Payments to outside carriers	(30,902,768)
Refunds of premiums to members	(14,211)
Cash payments to employees for services	(1,302,596)
Cash payments to other suppliers of goods and services	(283,079)
Net cash (used) by operating activities	(81,359)
Cash flows from noncapital financing activities	
Implicit funding of checks outstanding net of deposits	1,032
Implicit repayment of prior years checks outstanding net of deposits	(1,045)
Net cash (used) by noncapital financing activities	(13)
Cash flows from investing activities	
Purchase of investment securities	(1,275,186,148)
Proceeds from sale and maturities of investment securities	1,275,183,616
Cash received from investment income	85,806
Purchase of capital assets	(1,902)
Net cash provided by investing activities	81,372
Net cash	0
Cash balances beginning of year	0
Cash balances end of year	$ 0
Reconciliation of net operating (loss) to net cash provided (used) by operating activities	
Net operating (loss)	$ (302,815)
Adjustments to reconcile net operating (loss) to net cash provided (used) by operating activities	
Depreciation expense	1,670
Change in assets and liabilities:	
Increase in operational accounts receivable	21,943
Increase in operational liabilities	197,843
Total adjustments	221,456
Net cash (used) by operating activities	$ (81,359)

See accompanying *Notes to the Financial Statements.*

Notes to the Financial Statements | Year Ended June 30, 2018

(1) Plan Descriptions and Contribution Information

Missouri State Employees' Plan (MSEP)

The MSEP is a cost-sharing multiple-employer, defined-benefit public employee retirement plan with two benefit structures known as the MSEP (closed plan) and MSEP 2000 (which includes the MSEP 2011 tier), which are administered by the Missouri State Employees' Retirement System (MOSERS) in accordance with Sections 104.010 and 104.312 to 104.1215 of the Revised Statutes of Missouri (RSMo). As established under Section 104.320, RSMo, MOSERS is a body corporate and an instrumentality of the state. In the system are vested the powers and duties specified in Sections 104.010 and 104.312 to 104.1215, RSMo and such other powers as may be necessary or proper to enable it, its officers, employees, and agents to carry out fully and effectively all the purposes of Sections 104.010 and 104.312 to 104.1215, RSMo.

Responsibility for the operation and administration of the system is vested in the 11-member MOSERS Board of Trustees as defined by state law. Due to the nature of MOSERS' reliance on funding from the state of Missouri and the overall control of the plan document by the legislative and executive branches of state government, the MSEP is considered a component unit of the state of Missouri financial reporting entity and is included in the state's financial reports as a pension trust fund.

The board intends to follow a financing pattern which computes and requires contribution amounts which, expressed as a percent of active member payroll, will remain approximately level from year to year and from one generation of citizens to the next generation. For the year ended June 30, 2018, the employer contribution rate was 19.45% of covered payroll.

Complete recognition of the year-to-year swings in the fair value of system assets would produce contribution rate changes that would run counter to the "approximately level" goal. A common actuarial practice, referred to as asset smoothing, is used to address that issue. The board adopted a new asset smoothing method effective with the June 30, 2018 valuation. Under the new method, the difference between the actual and assumed investment return on the market value of assets is recognized evenly over a five-year period. No corridor is used with the new method. In addition, the total unrecognized investment experience as of June 30, 2017, will be recognized evenly over a seven-year period beginning June 30, 2018.

At any point in time, the ratio of actuarial to fair value of assets will be more or less than the fair value but, if the smoothing method is prudent and properly constructed, those values will converge over time. As of June 30, 2018 and 2017, the ratio of actuarial to fair value of assets was 110% and 112%, respectively, for the MSEP.

The 2018 actuarial valuation used the nominal investment return assumption of 7.25% and wage inflation and price inflation of 2.5% each to value plan liabilities. See the *Actuarial Section* for all actuarial assumptions used.

As of the June 30, 2018 valuation, membership in the MSEP consisted of the following:

Retirees and beneficiaries currently receiving benefits		48,207
Active		
Vested	30,384	
Nonvested	17,422	47,806
Inactive		
Vested (not yet receiving benefits)*	16,386	
Nonvested (with contributions balances)	15,619	32,005
Total membership		**128,018**

* *Includes 178 members on leave of absence and 732 on long-term disability.*

Generally, all full-time state employees, employed before July 2000 who became vested and were not covered under another state-sponsored retirement plan, are eligible for membership in the MSEP (closed plan). Full-time state employees who were employed after July 1, 2000, but before January 1, 2011, are members in the MSEP 2000. Those first employed in a benefit-eligible position on or after January 1, 2011, are members of the MSEP 2011 tier of the MSEP 2000. MOSERS participates as an employer in the MSEP and MSEP 2000.

Unless otherwise delineated, data for MSEP is inclusive of members in the MSEP 2000 and MSEP 2011, which all provide defined-benefit pension, survivor, life insurance, and long-term disability benefits.

Contributions for the MSEP are determined through annual actuarial valuations. Employer contributions for FY18 were 19.45% of covered payroll. Administration of the MSEP is financed through contributions from the state of Missouri and its component employers, employee contributions (from MSEP 2011 tier members only), and investment earnings.

For a summary of benefits for general employees, legislators, and elected officials under the MSEP, MSEP 2000, and MSEP 2011 tier, refer to the *Summary of Plan Provisions* in the *Actuarial Section* of this report.

MSEP (closed plan)
General state employees are fully vested for benefits upon accruing 5 years of credited service. Under the MSEP, general employees may retire with full benefits upon the earliest of attaining:

- Age 65 with 5 years of service;
- Age 60 with 15 years of service; or
- Age 48 with age and service equaling 80 or more –"Rule of 80."

General employees may retire early at age 55 with at least 10 years of service with reduced benefits. The base benefit in the general employee plan is equal to 1.6% multiplied by the final average pay multiplied by years of credited service.

Members hired prior to August 28, 1997, receive cost-of-living adjustments (COLAs) annually based on 80% of the percentage increase in the average consumer price index (CPI) from one year to the next, with a minimum rate of 4% and maximum rate of 5% until the cumulative amount of COLAs equals 65% of the original benefit. Thereafter, the 4% minimum rate is eliminated. Members hired on or after August 28, 1997, and members who have met their COLA cap receive COLAs annually based on 80% of the percentage increase in the average CPI from one year to the next, up to a maximum rate of 5%.

Qualified, inactive-vested members may make a one-time election to receive the present value of their future benefit in a lump-sum payment rather than a monthly benefit at retirement age. To qualify, they must have left state employment on or after October 1, 1984, and prior to September 1, 2002, have less than 10 years of service, not be within five years of retirement eligibility, meet age requirements, and have a benefit present value of less than $10,000.

There are no employee (member) contributions to the MSEP.

MSEP 2000
General state employees are fully vested for benefits upon accruing 5 years of credited service. Under the MSEP 2000, general employees may retire with full benefits upon the earliest of attaining:

- Age 62 with 5 years of service; or
- Age 48 with age and service equaling 80 or more –"Rule of 80."

General employees may retire early at age 57 with at least 5 years of service with reduced benefits. The base benefit in the general employee plan is equal to 1.7% multiplied by final average pay multiplied by years of credited service.

Those retiring under "Rule of 80" receive an additional temporary benefit equivalent to 0.8% multiplied by final average pay multiplied by years of credited service which is payable until age 62.

COLAs are provided annually based on 80% of the percentage increase in the average CPI from one year to the next, up to a maximum rate of 5%.

There are no employee (member) contributions to the MSEP 2000.

MSEP 2011 Tier
On July 19, 2010, legislation was signed into law adding a new tier (MSEP 2011) to the MSEP 2000 defined-benefit pension plan. This tier includes all members first employed in a benefit-eligible position on or after January 1, 2011.

Legislation signed into law on July 14, 2017, changed the original vesting requirement of 10 years to 5 years for actively employed members of the MSEP 2011, effective January 1, 2018.

Under the MSEP 2011, general employees may retire with full benefits upon the earliest of attaining:

- Age 67 with 5 years of service; or
- Age 55 with age and service equaling 90 or more – "Rule of 90."

General employees may retire early at age 62 with at least 5 years of service with reduced benefits. The base benefit in the general employee plan is equal to 1.7% multiplied by final average pay multiplied by years of credited service.

Those retiring under "Rule of 90" receive an additional temporary benefit equivalent to 0.8% multiplied by final average pay multiplied by years of credited service, which is payable until age 62.

COLAs are provided annually based on 80% of the percentage increase in the average CPI from one year to the next, up to a maximum rate of 5%.

Employees (members) are required to contribute 4% of pay to the MSEP 2011.

Judicial Plan

The Judicial Plan is a single-employer, public employee retirement plan administered in accordance with Sections 476.445 to 476.690, RSMo. Responsibility for the operation and administration of the Judicial Plan is vested in the MOSERS Board of Trustees. Due to the nature of MOSERS' reliance on funding from the state of Missouri and the overall control of the plan document by the legislative and executive branches of state government, the Judicial Plan is considered a component unit of the state of Missouri financial reporting entity and is included in the state's financial reports as a pension trust fund.

The 2018 actuarial valuation of the Judicial Plan used the nominal investment return assumption of 7.25% and wage inflation and price inflation of 2.5% each. See the *Actuarial Section* for all actuarial assumptions used.

Judges and commissioners of the supreme court or the court of appeals, judges of any circuit court, probate court, magistrate court, court of common pleas, court of criminal corrections, justices of the peace, commissioners or deputy commissioners of the circuit court appointed after February 29, 1972, commissioners of the juvenile division of the circuit court appointed pursuant to Section 211.023, RSMo, commissioners of the drug court or commissioners of any family court are eligible for membership in the Judicial Plan. The Judicial Plan provides defined-benefit pension, survivor, life insurance, and disability benefits. Members are immediately vested.

Funding of the Judicial Plan on an actuarial basis began on July 1, 1998. Contributions are determined through annual actuarial valuations. Employer contributions for FY18 were 62.09% of covered pay. The state of Missouri makes the employer contribution to the Judicial Plan. Administration of the Judicial Plan is financed through contributions to this plan from the state of Missouri and investment earnings.

As of the June 30, 2018 valuation, membership in the Judicial Plan consisted of the following:

Retirees and beneficiaries currently receiving benefits		569
Active		
Vested	415	
Nonvested	0	415
Inactive		
Vested (not yet receiving benefits)		26
Total membership		**1,010**

Judicial Plan (closed plan)

Members of the Judicial Plan may retire with full benefits upon the earliest of attaining:

- Age 62 with 12 years of service;
- Age 60 with 15 years of service; or
- Age 55 with 20 years of service.

Employees may retire early at age 62 with less than 12 years of service or age 60 with less than 15 years of service with a reduced benefit that is based upon years of service relative to 12 or 15 years.

In the Judicial Plan, the base benefit for members with 12 or more years of service is equivalent to 50% of compensation on the highest court served.

Members first employed prior to August 28, 1997, receive COLAs annually based on 80% of the percentage increase in the average CPI from one year to the next, with a minimum rate of 4% and a maximum rate of 5% until the cumulative amount of COLAs equals 65% of the original benefit. Thereafter, the 4% minimum rate is eliminated. Members first employed on or after August 28, 1997, and members who have met their COLA cap receive COLAs annually based on 80% of the percentage increase in the average CPI from one year to the next, up to a maximum rate of 5%.

Qualified, inactive-vested members may make a one-time election to receive the present value of their future benefit in a lump-sum payment rather than a monthly benefit at retirement age. To qualify, they must have left state employment on or after August 28, 1997, and prior to September 1, 2002, have less than 10 years of service, not be within five years of retirement eligibility, and have a benefit present value of less than $10,000.

Judicial Plan 2011 Tier

On July 19, 2010, an additional tier of the defined-benefit Judicial Plan was signed into law. This tier (Judicial Plan 2011) includes all new judicial members first serving as a judge on or after January 1, 2011.

Under the Judicial Plan 2011, members may retire with full benefits upon the earliest of attaining:

- Age 67 with 12 years of service; or
- Age 62 with 20 years of service; or

Judicial Plan 2011 members may retire early at age 67 with less than 12 years of service with reduced benefits, or age 62 with less than 20 years of service with a reduced benefit based on years of service.

For a more detailed summary of benefits for members of the Judicial Plan, refer to the *Summary of Plan Provisions* in the *Actuarial Section* of this report.

Missouri State Insured Defined-Benefit Insurance Plan

The Missouri State Insured Defined-Benefit Insurance Plan is accounted for as an internal service fund of the state of Missouri and is administered through The Standard, which is a third-party administrator with oversight by MOSERS. It provides basic life insurance in an amount equal to one times annual salary while actively employed (with a $15,000 minimum) to eligible members of the MSEP, MSEP 2000 (except employees of the Missouri Department of Conservation and certain state colleges and universities), MSEP 2011, Judicial Plan, Judicial Plan 2011, and certain members of the Public School Retirement System.

The plan also provides duty-related death benefits, optional life insurance for active employees and retirees who are eligible for basic coverage, and a long-term disability insurance plan for eligible members. For a more detailed description of insurance benefits, refer to page 133-134 in the *Actuarial Section* of this report.

Due to the nature of MOSERS' reliance on funding from the state of Missouri and its component employers, and the overall control of the plan document by the legislative and executive branches of state government, the Missouri State Insured Defined-Benefit Insurance Plan is considered a component unit of the state of Missouri financial reporting entity and is included in the state's financial reports as an internal service fund. Administration of the Missouri State Insured Defined-Benefit Insurance Plan is financed through contributions from the state of Missouri and its component employers.

State of Missouri Deferred Compensation Plan (MO Deferred Comp)

MO Deferred Comp is a retirement savings plan for state of Missouri employees, including faculty and staff at 10 state universities. Money invested in the plan provides income in retirement to supplement the member's defined-benefit pension and Social Security benefits. Funds are automatically deducted from the employee's pay and placed in their account. The participant decides how the money will be invested. Employees may also roll over eligible pre-tax distributions from other qualified retirement plans.

The State of Missouri Deferred Compensation Plan is accounted for as an internal service fund. MOSERS uses ICMA-RC as an external provider for record keeping. Total plan assets were $2,167,901,956 as of June 30, 2018.

Record keeping of individual accounts and management of investment options are paid from charges to the participants and investment option asset-based fee reimbursement arrangements. Participants in the plan manage individual accounts by choosing investment options from the available fund lineup. MOSERS' role is to oversee the plan, choose external providers and investment options, and develop communications to plan participants. In FY18, a total of $2,841,881 was collected from a combination of $1,879,676 in investment option asset-based fee reimbursements and $962,205 in participant fees.

Effective July 1, 2012, new permanent full-time and part-time employees are automatically enrolled at 1% of pay into the State of Missouri Deferred Compensation Plan. As of June 30, 2018, 16,117 currently active employees have been automatically enrolled in the plan since inception. There are 14,610 employees who continue to contribute to the plan, making the opt-out rate 9.4%.

Audited financial statements for the State of Missouri Deferred Compensation Plan can be viewed online at *www.modeferredcomp.org*.

(2) Summary of Significant Accounting Policies and Plan Asset Matters

Basis of Accounting
The financial statements of the MSEP, the Judicial Plan, the Missouri State Insured Defined-Benefit Insurance Plan, and the State of Missouri Deferred Compensation Plan were prepared using the accrual basis of accounting. The accompanying financial statements are prepared in accordance with accounting principles generally accepted in the U.S. that apply to governmental accounting.

Contributions are recognized as revenues when due, pursuant to statutory requirements. Benefits and refunds are recognized when due and payable and expenses are recorded when the corresponding liabilities are incurred regardless of when contributions are received or payment is made. The direct method of reporting cash flows is used.

Estimates
The preparation of financial statements in conformity with accounting principles generally accepted in the U.S. requires management to make estimates and assumptions that affect the accompanying financial statements and disclosures. Actual results could differ from those estimates.

Method Used to Value Investments
Section 104.440, RSMo allows the board of trustees to invest the trust fund assets in accordance with the prudent person rule. Investments of the pension trust funds and the internal service funds are reported on the basis of fair value. MOSERS unitizes investments for the purpose of allowing participants in the State of Missouri Deferred Compensation Plan the option to invest in the MOSERS investment portfolio (MIP). For financial reporting purposes, investments throughout this CAFR are reported in whole and include 0.05%, or $4,014,950, of the units invested in the MIP by Deferred Compensation participants. The schedule on page 48 provides a summary of the fair value of the investments as reported on the *Statements of Fiduciary Net Position* of the pension trust funds and *Statements of Net Position* of the internal service funds.

Disclosures regarding fair value measurements, the level of fair value hierarchy, and valuation techniques can be found in note *(3) Cash and Investments* on pages 38-39.

Fair values for the equity real estate investments are based on appraisals. Fair values of the limited partnership investments are based on valuations of the underlying companies of the limited partnerships as reported by the general partner. Certain limited partnerships reflect values and related performance on a quarter lag basis due to the nature of those investments and the time it takes to value them. Fair value of the commingled funds is determined based on the underlying asset values. The remaining assets are primarily valued by the system's master custodian, BNY Mellon, using the last trade price information supplied by various pricing data vendors.

Other Post-Employment Benefits
During the fiscal year ended June 30, 2018, MOSERS implemented GASB Statement No. 75, Accounting and Financial Reporting for Postemployment Benefits Other than Pensions. For purposes of measuring the net OPEB liability, deferred outflows of resources and deferred inflows of resources related to OPEB, and OPEB expense, information about the fiduciary net position and additions to/deductions from fiduciary net position have been determined on the same basis as they are reported. For this purpose, employer contributions are recognized as revenue when due and payable. Benefits are recognized when due and payable in accordance with the terms of the Plan (see Note 7 on page 51).

Capital Assets
The MOSERS building and other capital assets are stated at cost less accumulated depreciation.

(3) Cash and Investments

Cash

Custodial credit risk for cash deposits and investments is the risk that, in the event of a bank failure, the system and plan deposits may not be returned. The board adopted the following policy on June 18, 2009:

The executive director shall require that banks managing demand deposit accounts for any retirement plan associated with MOSERS (MOSERS' defined-benefit plan and the deferred compensation plan/state incentive compensation plan) to hold, at minimum, collateral security in either MOSERS' name or the State of Missouri Deferred Compensation Plan and in an amount equal to, or more than, the amount on deposit that exceeds the Federal Deposit Insurance Corporation (FDIC) insured amount. The types of collateral security shall be included on a list maintained by the State Treasurer's office in accordance with Section 30.270 RSMo, but in no case may a bank pledge collateral that does not specifically allow MOSERS to release the collateral or pledge collateral that represents securities of the pledging banks.

Cash balances represent both demand deposit accounts held at the bank and investment cash on deposit with the investment custodian. To maximize investment income, the float caused by outstanding checks is invested in an internally managed short-term investment account, thus causing a possible negative book balance. Negative book balances are reflected in the cash and short-term investments on the *Statements of Fiduciary Net Position* of the pension trust funds and the liabilities section of the *Statements of Net Position* of the internal service funds.

The table below is a schedule of the aggregate book and bank balances of all cash accounts.

Aggregate Book and Bank Balances

	Cash Balances	
	Book	Bank/Investment Custodian
Pension trust funds – investment custodian	$ 289,866	$ 289,866
Pension trust funds – demand deposits	(11,570,995)	553,875
Internal service fund – insurance and deferred compensation plan demand deposits	(1,031)	514

Under the repurchase agreement, the bank does not have the right to substitute other appropriate securities. The bank pledged the following securities to MOSERS on June 30, 2018, as collateral for overnight repurchase agreements:

Collateral for Overnight Repurchase Agreements

	Maturity	Pledged	Fair Value
Federal Home Loan Bank	09/14/2018	$ 10,825,000	$ 10,822,510
Federal Home Loan Bank	05/15/2019	9,700,000	9,936,486
Grundy County, MO	12/01/2020	180,000	176,722
Callaway County, MO School District	03/01/2021	100,000	98,320
Dekalb County, MO School District	04/15/2022	100,000	99,744
Small Business Association Pool	05/25/2031	7,891,632	7,905,504
Small Business Association Pool	06/25/2032	1,000,000	1,063,359
Small Business Association Pool	08/25/2035	4,000,000	4,227,188
Small Business Association Pool	11/25/2036	4,143,632	4,454,566
Small Business Association Pool	01/25/2037	5,000,000	5,223,633
Small Business Association Pool	02/25/2037	5,000,000	5,364,844
Small Business Association Pool	11/25/2037	1,180,000	1,260,065
Small Business Association Pool	02/25/2038	1,000,000	1,085,547
Small Business Association Pool	04/25/2038	2,000,000	2,170,547
Small Business Association Pool	04/25/2039	5,000,000	5,398,438

Investment Policy

In 2015, MOSERS completed a transition to a portfolio that shifted from a return-driven process to a risk-driven process using an allocation approach that focuses on fundamental economic factors such as growth and inflation as well as other factors with expected return values such as credit, carry, and illiquidity. In July 2016, the board voted to adjust the policy portfolio slightly but still maintain the risk-driven approach to asset allocation.

MOSERS' policy, with respect to the allocation of invested assets, is established and may be amended by the board of trustees' majority vote. The board's guiding principles with respect to the investment of MOSERS' assets are to preserve the long-term corpus of the fund, maximize total return within prudent risk parameters, and act in the exclusive interest of the members of the system. The board has developed a risk-weighted policy allocation that is designed to achieve the long-term required return objectives of the system, given certain risk constraints. The current asset allocation reflects a diversified portfolio, which will perform well in a variety of economic conditions and will help reduce the portfolio's overall volatility.

The board has authorized staff to create and maintain an internally managed beta-balanced portfolio that utilizes a modest amount of leverage in order to balance the risk allocations equally across the five asset classes contained in that portfolio. The leverage is limited to .83 times beta-balanced capital. The total exposure is limited to 183% of the beta-balanced capital. The first table below illustrates the fair value, market exposure, and policy exposure of the internally managed beta-balanced portfolio by asset class as of June 30, 2018.

The long-term expected rate of return on pension plan investments was determined using a building-block method in which best-estimate rates of expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and by adding expected inflation. Best estimates of geometric real rates of return for each major asset class included in MOSERS' target asset allocation as of June 30, 2018, are summarized in the last table below.

Schedule of Internally Managed Leverage

Internal Beta-Balanced Portfolio	Fair Value of Internally Managed Beta-Balanced Capital	Percent of Investments at Fair Value	Market Exposure	Percent of Investments at Market Exposure	Policy Exposure Beta-Balanced
Opportunistic global equities	$ 2,901,667,761	38.7%	$ 3,040,786,070	40.5%	38%
Nominal bonds	1,020,791,097	13.6	2,943,258,313	39.2	44
Commodities	446,412,239	6.0	1,327,951,329	17.7	20
Inflation-linked bonds	1,023,504,890	13.6	2,672,104,671	35.6	39
Alternative beta	2,110,615,527	28.1	2,110,615,527	28.1	31
Total internal beta-balanced portfolio	$ 7,502,991,514	100.0%	$12,094,715,910	161.1%	172%

Target Asset Allocation

	Policy Allocation	Long-Term Expected Real Rate of Return*	Weighted Average Long-Term Expected Real Rate of Return
Opportunistic global equities	38.0%	5.5%	2.1%
Nominal bonds	44.0	1.0	0.5
Commodities	20.0	4.5	0.9
Inflation-linked bonds	39.0	0.8	0.3
Alternative beta	31.0	4.5	1.4
	172.0%		5.2%

* *Represents best estimates of geometric rates of return for each major asset class included.*

Concentration of Credit Risk

Concentration of credit risk is the risk of loss attributed to the magnitude of an investment in a single-issuer. Issuer concentration limits are established in individual portfolio guidelines that generally do not allow a single issuer to be greater than 5% of the portfolio's fair value. As of fiscal year end, there is no single issuer exposure, exclusive of investments issued or explicitly guaranteed by the U.S. government, within MOSERS' portfolio that comprises 5% or more of the overall portfolio or MOSERS' fiduciary net position. Therefore, there is no concentration of credit risk to report.

Money-Weighted Rate of Return

The annual money-weighted rate of return on pension plan investments, net of pension plan investment expense, was 7.57% for the year ended June 30, 2018. The money-weighted rate of return expresses investment performance, net of investment expense, adjusted for changing amounts actually invested.

Fair Value Measurement

MOSERS categorizes its fair value measurements within the fair value hierarchy established by generally accepted accounting principles. The hierarchy is based on the valuation inputs used to measure the fair value of the asset and give the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (level 1 measurements) and the lowest priority to unobservable inputs (level 3 measurements).

- **Level 1** – Unadjusted quoted prices for identical instruments in active markets.
- **Level 2** – Quoted prices for similar instruments in active markets; quoted prices for identical or similar instruments in markets that are not active; and model-derived valuations in which all significant inputs are observable.
- **Level 3** – Valuations derived from valuation techniques in which significant inputs are unobservable.

Investments that are measured at fair value using the net asset value per share (or its equivalent) as a practical expedient are not classified in the fair value hierarchy.

The categorization of investments within the hierarchy is based upon the pricing transparency of the instrument and should not be perceived as the particular investment's risk.

In instances where inputs used to measure fair value fall into different levels in the fair value hierarchy, fair value measurements in their entirety are categorized based on the lowest level input that is significant to the valuation. MOSERS' assessment of the significance of particular inputs to these fair value measurements requires judgment and considers factors specific to each asset or liability. The tables on pages 38-39 show the fair value leveling of the investments.

Debt, equities, and investment derivatives classified in level 1 of the fair value hierarchy are valued using prices quoted in active markets for those securities.

Debt securities and liabilities classified in level 2 have non-proprietary information that was readily available to market participants from multiple independent sources, which are known to be actively involved in the market. Pricing inputs may include market quotations, yields, maturities, call features and ratings. Derivative securities classified in level 2 are securities whose values are derived daily from associated traded securities.

Private equity securities classified in level 2 are valued at the price observed in subsequent market activity.

Investments and Derivative Instruments Measured at Fair Value

		Fair Value Measurement Using		
June 30, 2018	Total	Quoted Prices in Active Markets for Identifical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Investments by fair value level				
Assets				
Equity securities				
U.S. common and preferred stock	$ 39,909,892	$ 39,903,842	$ 0	$ 6,050
Foreign stocks	862,917	862,917	0	0
Total equity securities	40,772,809	40,766,759	0	6,050
Debt securities				
U.S. short-term funds	665,709,000	665,709,000	0	0
Repurchase agreements	1,100,000,000	0	1,100,000,000	0
U.S. agency obligations	866,944,904	0	866,944,904	0
Foreign debt securities	88,485,656	0	88,485,656	0
U.S. corporate bonds	237,671,757	0	237,671,757	0
U.S. government	5,173,727,347	5,173,727,347	0	0
Total debt securities	8,132,538,664	5,839,436,347	2,293,102,317	0
Total investment assets	8,173,311,473	5,880,203,106	2,293,102,317	6,050
Liabilities				
Reverse repurchase agreements	(3,853,968,794)	0	(3,853,968,794)	0
Total net investment assets by fair value level	4,319,342,679	5,880,203,106	(1,560,866,477)	6,050
Investment derivative instruments				
Futures contracts	20,086,959	20,086,959	0	0
Foreign exchange forward contracts	(363,060)	(363,060)	0	0
Swap market value	(35,520,967)	0	(35,520,967)	0
Total investment derivative instruments	(15,797,068)	19,723,899	(35,520,967)	0
Investments measured at net asset value (NAV)				
Commingled international equity funds	948,436,029			
Hedge funds	2,063,529,776			
Private equity funds	597,947,369			
Private real estate funds	91,533,628			
Private timber funds	192,306,895			
Total investments measured at NAV	3,893,753,697			
Other investments				
Cash and receivables/payables	(25,590,054)			
Total fund value	$ 8,171,709,255			
Reconciliation to *Statement of Fiduciary Net Position*				
Total portfolio value	$ 8,171,709,255			
Reverse repurchase agreements	3,853,968,794			
Short-term investment fund (STIF)	(3,529,778,213)			
Uninvested cash	(289,866)			
Interest and dividends receivable	(49,694,604)			
Other payables	2,915,084			
Accounts receivable securities sold	(85,013,937)			
Accounts payable securities purchased	162,762,193			
Fees payable	9,302,733			
Investments per *Statement of Fiduciary Net Position*	$ 8,535,881,439			

Investments Measured at the Net Asset Value

	June 30, 2018	Unfunded Commitments	Redemption Frequency (If Currently Eligible)	Redemption Notice Period (Days)
Commingled international equity funds [1]	$ 948,436,029		Daily, Monthly	1-30
Active hedge funds				
Long/short equity [2]	268,915,714		Quarterly, Semi-Annually, Annually	30-60
Merger arbitrage [3]	121,279,322		Monthly	45
Equity market neutral [4]	99,758,765		Quarterly	90
Event driven [5]	231,123,000		Quarterly	60-65
Macro [6]	172,395,917		Monthly, Quarterly	30
Risk premia [7]	327,665,811		Bi-Weekly, Monthly	15-30
Risk parity [8]	597,439,990		Monthly	5-15
Fund-of-funds [9]	205,209,053		Monthly	95
Pending liquidated hedge funds [10]	39,742,204			
Private equity funds [11]	597,947,369	$ 259,230,574		
Private real estate funds [11]	91,533,628	10,567,666		
Private timber funds [11]	192,306,895			
Total investments measured at net asset value (NAV)	$ 3,893,753,697	$ 269,798,240		

1 **Commingled international equity funds** – Three international equity funds are considered to be commingled in nature. Each are valued at the NAV held at the end of the period based upon the fair value of the underlying investments.

2 **Long/short equity hedge funds** – Consisting of three funds, this strategy invests both long and short in U.S. and global equity securities, with a goal of adding growth and minimizing market exposure. These investments are valued at NAV. Due to contractual lock-up restrictions, these investments remain restricted for 4 to 12 months.

3 **Merger arbitrage hedge fund** – Consisting of one fund, this strategy invests in the common stock of companies that are involved in publicly announced mergers and seeks to generate attractive returns while dampening volatility. This investment is valued at NAV, is redeemable monthly, and is not subject to lock-up restrictions.

4 **Equity market neutral hedge fund** – Consisting of one fund, this strategy invests both long and short in U.S. and global equity securities, with the goal of having little to no net market exposure. This investment is valued at NAV, is redeemable quarterly, and is not subject to lock-up restrictions.

5 **Event driven hedge fund** – Consisting of one fund, this strategy seeks to gain an advantage from pricing inefficiencies that may occur at the onset or in the aftermath of a corporate action or related event. These investments are valued at NAV. Due to contractual lock-up restrictions, approximately 19% of the value of these investments is eligible for redemption quarterly. The remaining 81% of the value of these investments remains restricted for 4 to 20 months.

6 **Macro hedge funds** – Consisting of two funds, this strategy seeks to take advantage of macroeconomic dislocations between countries by trading a number of different markets and financial instruments. These investments are valued at NAV, are redeemable monthly and quarterly, and are not subject to lock-up restrictions.

7 **Risk premia hedge fund** – Consisting of one fund, this strategy seek to capture hedge fund betas through the use of systematic, bottom-up security selection across major hedge fund strategies. Style premia such as value, momentum, and carry help build the long/short portfolios. This investment is valued at NAV, is redeemable at least monthly, and is not subject to lock-up restrictions.

8 **Risk parity funds** – Consisting of two funds, these strategies attempt to build a more efficient portfolio through an equal risk methodology. They take long only positions across equity indices, developed nominal bonds, TIPS, commodities, and credit. Diversification benefits decrease both the expected return and volatility thus requiring leverage to maintain a similar return to a more conventional portfolio. These investments are valued at NAV, are redeemable monthly, and are not subject to lock-up restrictions.

9 **Fund-of-fund** – Consisting of one fund, this fund seeks to provide diversification by holding a number of funds within a single fund structure. This investment is valued at NAV, is redeemable monthly, and is not subject to lock-up restrictions.

10 **Pending liquidated hedge funds** – This item consists of 11 funds which have been fully redeemed as of June 30, 2018, for which MOSERS is awaiting final distribution of the proceeds, which will be received upon sale of the underlying investments or upon completion of the audit of the firm's annual financial statements.

11 **Private equity, real estate, and timber funds** – MOSERS' private equity portfolio consists of 46 funds with exposure to buyout funds, distressed funds, infrastructure, energy, royalty funds, and special situations. The real estate portfolio, comprised of five funds, invests mainly in U.S. commercial real estate. The timber portfolio, which consists of three funds, invests in global timberland. The fair values of the majority of these funds has been determined using net assets valued one quarter in arrears plus current quarter cash flows. These funds are not eligible for redemption. Distributions are received when underlying investments within the funds are liquidated, which, on average, can occur over the span of 5 to 10 years.

Credit Risk

Credit risk is the risk that an issuer or other counterparty to an investment will not fulfill its obligations to MOSERS. As of June 30, 2018, MOSERS' fixed income assets that are not U.S. Government guaranteed represented 36% of fixed income securities. In preparing this report, credit risk associated with all fixed income holdings, including collateral for repurchase agreements has been included. The tables below summarize MOSERS' fixed income security exposure levels and credit qualities.

As a matter of practice, there are no overarching limitations for credit risk exposures within the overall fixed income portfolio. Each individual portfolio within fixed income is managed in accordance with operational guidelines that are specific as to permissible credit quality ranges, exposure levels within individual quality tiers, and average credit quality.

Credit risk for derivative instruments held by the system results from counterparty risk assumed by MOSERS. This is essentially the risk that the counterparty to a MOSERS transaction will be unable to meet its obligation. Information regarding MOSERS' credit risk related to derivatives is found under the derivatives disclosures on page 44 of these notes.

Policies related to credit risk pertaining to MOSERS' securities lending program are found under the securities lending disclosures found on page 45 of these notes.

Average Credit Quality and Exposure Levels of Nongovernment Guaranteed Securities

Fixed Income Security Type	Fair Value June 30, 2018	Percent of all Fixed Income Assets	Weighted Average Credit Quality	Ratings Dispersion Requiring Further Disclosure
Collateralized mortgage obligations	$ 19,410,605	0.2%	AA	See below
U.S. government agencies	847,566,000	10.4	AA	See below
Asset backed securities	643,827	0.0	A	See below
Non-U.S. sovereign	48,549,132	0.6	BBB	See below
Corporate bonds	280,306,441	3.4	BBB	See below
Bank deposits	605,908,055	7.4	FDIC insured	None
Repurchase agreements	1,100,127,306	13.5	Not rated	None
Pooled investments	60,846,980	0.7	AAA	None
Total nongov't. guaranteed securities	$ 2,963,358,346	36.2%		
Total fixed income securities	$ 8,159,723,683			

Ratings Dispersion Detail - Fair Value

Credit Rating Level	Collateralized Mortgage Obligations	Non-U.S. Sovereign	Corporate Bonds	Asset-Backed Securities	U.S. Government Agencies
AAA	$ 0	$ 0	$ 474,640	$ 0	$ 0
AA	19,410,605	0	8,088,232	612,025	847,566,000
A	0	7,520,430	102,667,197	0	0
BBB	0	24,809,748	165,655,806	0	0
BB	0	15,730,724	3,420,566	0	0
B	0	488,230	0	0	0
Not Rated	0	0	0	31,802	0
	$ 19,410,605	$ 48,549,132	$ 280,306,441	$ 643,827	$ 847,566,000

Interest Rate Risk

Interest rate risk is the risk that changes in interest rates will adversely affect the fair value of an investment. This risk is managed by using the effective duration or option adjusted methodology. It is widely used in the management of fixed income assets by quantifying the risk of interest rate changes. This methodology takes into account optionality on bonds and scales the risk of price changes on bonds depending upon the degree of change in rates and the slope of the yield curve. Within the investment policy, operational guidelines specify the degree of interest rate risk taken within the system's fixed income portfolios, with the exception of some portfolios in which credit risk is the predominant factor and is also controlled by specific guidelines. MOSERS believes that the reporting of effective duration found in the tables below quantifies to the fullest extent possible the interest rate risk of the system's fixed income securities.

MOSERS invests in mortgage-backed securities, which are reported at fair value in the *Statements of Fiduciary Net Position* of the pension trust funds. Such securities have embedded within them the risk of being called, whereby the issuer has the option to keep the debt outstanding in rising interest rate environments or repay the debt in declining interest rate environments, a factor that advantages the issuer. MOSERS invests in these securities to diversify the portfolio with high quality and liquid investments which capture a significant yield premium that is intended to compensate for the call risk. This risk is incorporated within the effective duration calculation used in the interest rate risk analysis.

Effective Duration of Fixed Income Assets by Security Type

Fixed Income Security Type	Fair Value June 30, 2018	Percent of all Fixed Income Assets	Weighted Average Effective Duration (Years)	Interest Rate Risk Requiring Further Disclosure
U.S. treasuries	$ 5,196,365,337	63.7%	8.7	See below
U.S. government agencies	847,566,000	10.4	0.2	None
Asset-backed securities	643,827	0.0	6.7	None
Collateralized mortgage obligations	19,410,605	0.2	0.0	None
Non-U.S. sovereign	48,549,132	0.6	5.3	None
Corporate bonds	280,306,441	3.4	4.0	None
Bank deposits	605,908,055	7.4	0.0	None
Repurchase agreements	1,100,127,306	13.5	0.0	None
Pooled investments	60,846,980	0.8	0.0	None
	$ 8,159,723,683	100.0%	5.7	

Effective Duration Analysis of U.S. Treasuries

Maturity	Fair Value June 30, 2018	Average Effective Duration of the Security Type (Years)	Contribution to Effective Duration (Years)
Less than 1 year to maturity	$ 919,700,045	0.0	0.0
1- to 10-year maturities	2,483,540,432	5.2	2.5
Long coupon treasuries	1,793,124,860	17.9	6.2
	$ 5,196,365,337		8.7

Repurchase Agreements

Tri-party repurchase agreements (repos) are a secured loan by a financial institution with the collateral held at a custodian bank. In a tri-party repo transaction, MOSERS transfers cash to a financial institution and the financial institution transfers securities to the custodian bank. Simultaneously, the financial institution promises to repay the loan in the future plus interest in exchange for the return of the securities.

Reverse repurchase agreements (reverse repos) are used to convert securities into cash. In a reverse repo transaction, MOSERS transfers securities that are owned in the portfolio to a financial institution and the financial institution transfers cash to MOSERS. Simultaneously, MOSERS promises to repay the loan in the future plus interest in exchange for the return of the securities.

Typical collateral for repos and reverse repos include treasury securities, agency securities, mortgage-backed securities, investment grade corporate bonds, commercial paper, and common stock. Repos and reverse repos are typically done for an overnight term; however, they can be done for a longer term. MOSERS enters into repo transactions to earn interest on short-term funds and enters into reverse repos to finance the purchase of additional securities.

The yield earned by MOSERS on the repo transactions ranged from 0.98% to 2.06% and had maturities of one to 5 days.

The yield earned by the counterparties on the reverse repo transactions ranged from 1.30% to 2.39% and had maturities of one month to one year. The maturities of the investments made with reverse repo proceeds generally have maturities of one to 30 years.

In repo transactions, MOSERS may have credit risk if the counterparty fails to repay the loan and the value of the securities held as collateral fall below the loan balance. To minimize this risk, MOSERS requires the financial institution to send collateral with a market value greater than the value of the loan and revalues the collateral on a daily basis. As of fiscal year end, MOSERS held $43.9 million of counterparty collateral in excess to the repo balance.

In a reverse repo transaction, MOSERS may be subject to credit risk if the counterparty fails to return the securities and the value of the securities held as collateral rise above the loan balance. To minimize this risk, MOSERS sends the minimum amount of collateral required by the financial institution and requires the financial institution to revalue the collateral and return excess collateral on a daily basis. As of fiscal year end, counterparties held $25.5 million of MOSERS' collateral in excess to the reverse repo balance.

The tables below summarize MOSERS' exposure for repo and reverse repo transactions.

Tri-Party Repurchase Agreements by Collateral Type

Collateral Type	Fair Value of Collateral June 30, 2018	Fair Value Including Accrued Interest of Repos June 30, 2018	Excess (Deficit) Collateral	Percent Over Collateralized
U.S. treasuries/U.S. gov't. agencies	$ 765,000,112	$ 750,000,000	$ 15,000,112	
Common stock	379,055,637	350,000,000	29,055,637	
Accrued interest	0	127,306	(127,306)	
	$ 1,144,055,749	$ 1,100,127,306	$ 43,928,443	4.0%

Reverse Repurchase Agreements by Collateral Type

Collateral Type	Fair Value of Collateral June 30, 2018	Fair Value Including Accrued Interest of Reverse Repos June 30, 2018	Excess (Deficit) Collateral	Percent Over Collateralized
U.S. treasuries	$ 3,904,629,952	$ 3,853,968,794	$ 50,661,158	
Receivables	(1,687,555)	0	(1,687,555)	
Accrued interest	0	23,518,239	(23,518,239)	
	$ 3,902,942,397	$ 3,877,487,033	$ 25,455,364	0.7%

Foreign Currency Risk

Foreign currency risk is the risk that changes in exchange rates will adversely impact the fair value of an investment. MOSERS' currency risk exposures, or exchange rate risk, primarily reside within MOSERS' international equity investment holdings. MOSERS' implementation policy allows external managers to decide what action to take regarding their respective portfolio's foreign currency exposures using currency forward contracts. MOSERS' exposure to foreign currency risk in U.S. dollars, as of June 30, 2018, is highlighted in the table below.

Currency Exposures by Asset Class

Currency	Cash & Cash Equivalents	Equities	Fixed Income	Alternatives	Total
Argentine Peso	$ 4	$ 0	$ 0	$ 0	$ 4
Australian Dollar	(229,607)	581,216	(495,464)	0	(143,855)
Brazilian Real	4,382	5,347,613	5,519,322	0	10,871,317
Canadian Dollar	2,653,376	10,372,198	(1,002,479)	0	12,023,095
Chilean Peso	6,043	836,770	177,264	0	1,020,077
Chinese Yuan Renminbi	30	7	0	0	37
Colombian Peso	6,984	296,101	3,968,046	0	4,271,131
Czech Koruna	2,731	167,611	865,803	0	1,036,145
Danish Krone	0	1,918,539	0	0	1,918,539
Egyptian Pound	169	100,611	0	0	100,780
Euro	438,792	136,074,045	2,315,250	667,515	139,495,602
Hong Kong Dollar	(63,219)	95,511,462	0	0	95,448,243
Hungarian Forint	1,511	254,521	0	0	256,032
Indian Rupee	21,135	7,883,221	0	0	7,904,356
Indonesian Rupiah	39,856	1,757,620	5,485,876	0	7,283,352
Israeli Shekel	0	16	0	0	16
Japanese Yen	(96,404)	250,133,346	0	0	250,036,942
Kazakhstan Tenge	0	0	144,852	0	144,852
Malaysian Ringgit	6,213	2,126,111	0	0	2,132,324
Mexican Peso	4,541	4,291,896	6,628,348	0	10,924,785
New Taiwan Dollar	(363,060)	0	0	0	(363,060)
Pakistani Rupee	2,176	43,428	0	0	45,604
Peruvian Nuevo Sol	1	0	377,036	0	377,037
Philippine Peso	1,789	865,222	0	0	867,011
Polish Zloty	2,321	1,029,315	5,092,174	0	6,123,810
Qatari Riyal	757	728,176	0	0	728,933
Romanian New Leu	0	0	721,989	0	721,989
Russian Ruble	0	1,187,417	5,872,032	0	7,059,449
Singapore Dollar	0	23,555,154	0	0	23,555,154
South African Rand	67,015	5,571,077	5,508,842	0	11,146,934
South Korean Won	(644,052)	27,251,625	641,563	0	27,249,136
Swedish Krona	0	8,249,716	0	0	8,249,716
Swiss Franc	0	91,712,993	0	0	91,712,993
Thai Baht	17,512	18,980,116	1,122,499	0	20,120,127
Turkish Lira	2,182	9,885,601	4,179,006	0	14,066,789
United Arab Emirates Dirham	1,215	506,854	0	0	508,069
United Kingdom Pound Sterling	(811,298)	128,803,525	119,300	0	128,111,527
Uruguayan Peso	0	0	417,445	0	417,445
	$ 1,073,095	$ 836,023,123	$ 47,658,704	$ 667,515	$ 885,422,437

Derivatives

Derivative instruments are financial contracts whose values depend on the values of one or more underlying assets, reference rates, or financial indexes. They include futures contracts, swap contracts, options contracts, and forward foreign currency exchange. The following tables summarize the various contracts in the portfolio as of June 30, 2018.

Futures Contracts

Futures Contract	Notional Value	Exposure
Currency futures	$ (271,365,108)	$ 3,909,919
Fixed income futures	489,401,076	22,072,980
Equity index futures	370,506,089	(5,912,705)
Commodity futures	91,509,546	16,765
Total	$ 680,051,603	$ 20,086,959

Foreign Currency Forward Contracts

Currency	Net Notional Long (Short)	Exposure
Argentine Peso	$ 3,780,135	$ (741,486)
Brazilian Real	(348,453)	9,823
Chiliean Peso	2,141,412	(53,131)
Colombian Peso	(1,581,300)	40,163
Czech Koruna	2,665,871	(11,783)
Indonesian Rupiah	(1,462,330)	45,271
Mexican Peso	(542,006)	(20,366)
Peruvian Sol	(770,496)	(181)
Polish Zloty	1,085,446	(22,709)
Romanian Leu	440,631	(4,784)
Thai Baht	(787,150)	24,874
Turkish Lira	(395,217)	209
South African Rand	1,028,783	7,980
U.S. Dollar	(5,981,446)	0
Foreign currency forward contract asset (liability)	$ (726,120)	$ (726,120)

Swap Contracts

Counterparty Credit Rating	Notional Value	Exposure
Total return swaps - equity		
A+	$ 673,173,065	$ (2,945,132)
Total	$ 673,173,065	$ (2,945,132)
Total return swaps - fixed income		
A+	$ 527,773,693	$ 2,869,105
Total	$ 527,773,693	$ 2,869,105
Total return swaps - commodities		
A+	$ 883,546,443	$ 0
A	445,573,393	0
Total	$ 1,329,119,836	$ 0

While the board has no formal policy specific to derivatives, the MOSERS investment implementation program, through its external managers, holds investments in futures contracts, swap contracts, and forward foreign currency exchange. MOSERS enters into these certain derivative instruments as investments primarily to enhance the performance and reduce the volatility of its portfolio. It enters swaps and futures contracts to gain or hedge exposure to certain markets and to manage interest rate risk and enters into forward foreign currency exchange contracts primarily to hedge foreign currency exposure.

The notional values associated with these derivative instruments are generally not recorded in the financial statements; however, the amounts for the exposure on these instruments are recorded in the *Statements of Fiduciary Net Position* and the total changes in fair value for the year are included as net appreciation in fair value of investments in the *Statements of Changes in Fiduciary Net Position*. For the year ended June 30, 2018, the change in fair value in the swap contracts resulted in a gain of $115.9 million of investment income. The change in fair value in the futures contracts resulted in a gain of $92.8 million of investment income. The change in fair value in the foreign exchange contracts resulted in a loss of $0.6 million of investment income. MOSERS does not anticipate additional significant market risk from the derivative arrangements.

MOSERS could be exposed to risk if the counterparties to the contracts are unable to meet the terms of the contracts. MOSERS' investment managers seek to control this risk through counterparty credit evaluations and approvals, counterparty credit limits, and exposure monitoring procedures. MOSERS anticipates that the counterparties will be able to satisfy their obligations under the contracts. Investments in limited partnerships and commingled funds may include derivatives that are not shown in the derivative totals.

Limited Partnerships

Many of MOSERS' alternative investments are organized in the form of limited partnerships. In these partnerships, the manager is a general partner and the limited partners are the investors. Investments in limited partnerships are accounted for using the equity method of accounting and their earnings or losses for the period are included in investment income using the equity method.

As of June 30, 2018, MOSERS had contracts with over 76 limited partnerships across various types of alternative investments which collectively represent 36% of the total fund. A *Schedule of Limited Partnerships* follows on pages 46-47.

Securities Lending Program

The board of trustees' investment policy permits the pension trust funds to participate in a securities lending program. Fixed income, international equity and domestic equity securities of the pension trust funds are loaned to participating brokers who provide collateral in the form of cash, U.S. Treasury or government agency securities, or letters of credit issued by approved banks. Collateral must be provided in the amount of 102% of market value for domestic loans and 105% of market value for international loans. MOSERS does not have the authority to pledge or sell collateral securities, without borrower default.

As of June 30, 2018, Deutsche Bank AG, New York Branch, served as the agent for the fixed income, domestic equity and international equity securities lending programs. In this capacity, MOSERS reduces credit risk by allowing Deutsche Bank to lend these securities to a diverse group of dealers on behalf of MOSERS. Indemnification against dealer default is provided by Deutsche Bank AG, a "BBB rated" bank. With each of MOSERS' securities lending programs, a majority of loans are open loans and can be terminated on demand by either MOSERS or the borrower. Net income from the three lending programs is split on a 90/10 basis between MOSERS and Deutsche Bank respectively.

Daily monitoring of securities that are on loan ensures proper collateralization levels and mitigates counterparty risk. Cash collateral from all three programs is commingled and invested in a separately managed short-term investment account for MOSERS. This cash collateral account is managed by Deutsche Bank. On June 30, 2018, there were no securities on loan or cash collateral held in the account. For all of the securities lending operational services, the custodian is paid an annual fee, which is netted against MOSERS' earnings in the securities lending programs managed by Deutsche Bank. The custodian fee is not being charged while there are no loans outstanding.

Schedule of Limited Partnerships

Partnership Name	Style	Investments at Fair Value as of June 30, 2018
Actis Emerging Markets III	Opportunistic global equities – emerging markets	$ 8,546,000
Actis Emerging Markets IV	Opportunistic global equities – emerging markets	32,267,422
Alinda Infrastructure Fund I, LP	Opportunistic global equities – infrastructure	144,981
AQR DELTA Sapphire Fund, LP	Alternative beta – multi-strategy	327,665,811
AQR Global Risk Premium Fund IV, LP	External beta-balanced – risk parity	297,528,042
Axiom Asia Private Capital Fund II, LP	Opportunistic global equities – emerging markets	29,358,637
Axiom Asia Private Capital Fund III, LP	Opportunistic global equities – emerging markets	60,340,893
Axxon Brazil Private Equity Fund II B, LP	Opportunistic global equities – emerging markets	29,342,341
Bayview Opportunity Domestic IIIb, LP	Opportunistic global equities – opportunistic mortgages	7,184,636
Bayview Opportunity Domestic, LP	Opportunistic global equities – opportunistic mortgages	275,175
Blackstone Real Estate Partners IV	Opportunistic global equities – active real estate	9,574,748
Blackstone Real Estate Partners V	Opportunistic global equities – active real estate	16,477,295
Blackstone Real Estate Partners VI	Opportunistic global equities – active real estate	9,229,445
Blackstone Real Estate Partners VII	Opportunistic global equities – active real estate	56,193,342
Blackstone Topaz Fund, LP	Alternative Beta multi-strategy – fund of funds	205,209,053
Blakeney Onyx, LP	Opportunistic global equities – emerging markets	1,762,816
Bridgewater Associates – All Weather, LLC	External beta-balanced – risk parity	299,911,948
Bridgewater Associates – Diamond Ridge Fund, LLC	Alternative beta – global macro	115,220,885
CarVal Investors CVI Global Value Fund A, LP – private debt	Opportunistic global equities – distressed real estate debt	6,950,000
CarVal Investors CVI Global Value Fund A, LP – real estate	Opportunistic global equities – distressed real estate debt	6,950,000
Catalyst Fund III, LP	Opportunistic global equities – Canadian distressed debt	45,521,845
Catalyst Fund IV, LP	Opportunistic global equities – Canadian distressed debt	16,291,316
Catalyst Fund V, LP	Opportunistic global equities – Canadian distressed debt	23,680,244
Catterton Partners V, LP	Opportunistic global equities – corporate buyout	384,546
Cornwall Domestic, LP	Alternative beta – multi-strategy	17,262,998
DRI Capital – LSRC	Opportunistic global equities – intellectual property	12,988,292
EIG Energy Co-investment I	Opportunistic global equities – energy – mezzanine	5,122,022
EIG Energy Fund XIV, LP	Opportunistic global equities – energy – mezzanine	5,709,321
EIG Energy Fund XV, LP	Opportunistic global equities – energy – mezzanine	29,162,222
EIG Energy Fund XVI, LP	Opportunistic global equities – energy – mezzanine	29,434,070
Elliott International, Ltd.	Alternative beta – multi-strategy	231,123,000
Eton Park Fund, LP	Alternative beta – multi-strategy	99,183
Farallon Capital Institutional Partners, LP	Alternative beta – multi-strategy	1,880,474
Gaoling Fund, LP	Opportunistic global equities – long/short – equity	160,352,387
Garnet Sky Investors Company, Ltd.	Opportunistic global equities – timberland	107,009,858
Gateway Energy & Resource Holdings, LLC	Opportunistic global equities – energy – diversified	12,511,704
GCM Sidecar, LP	Opportunistic global equities – long/short – equity	66,620,964
Glenview Capital Opportunity Fund, LP	Opportunistic global equities – long/short – equity	41,942,363

Schedule of Limited Partnerships continued from page 46

Partnership Name	**Style**	**Investments at Fair Value as of June 30, 2018**
Global Forest Partners GTI7 Institutional Investors Company, Ltd.	Opportunistic global equities – timberland	13,746,939
HBK Merger Strategies Offshore Fund, Ltd.	Alternative beta – merger arbitrage	121,279,322
JLL Partners Fund V, LP	Opportunistic global equities – corporate buyout	2,988,310
JLL Partners Fund VI, LP	Opportunistic global equities – corporate buyout	19,860,764
King Street Capital, LP	Alternative beta – credit driven	2,234,416
King Street Capital, Ltd.	Alternative beta – credit driven	196,697
Linden Capital Partners Co-investment, LP	Opportunistic global equities – corporate buyout	45,000
Linden Capital Partners II, LP	Opportunistic global equities – corporate buyout	28,762,406
Mast Credit Opportunities I, LP	Alternative beta – credit driven	14,607,205
Merit Energy Partners F–II, LP	Alternative beta – energy – oil & gas	4,910,313
MHR Institutional Partners IIA, LP	Alternative beta – distressed debt	28,519,410
MHR Institutional Partners III, LP	Alternative beta – distressed debt	33,689,556
MHR Institutional Partners IV, LP	Alternative beta – distressed debt	17,746,117
Millennium Technology Value Partners Co-investment	Opportunistic global equities – direct secondaries	3,976,541
Millennium Technology Value Partners II, LP	Opportunistic global equities – direct secondaries	19,544,830
Moon Capital Global Equity Offshore Fund, Ltd.	Opportunistic global equities – long/short – equity	721,089
Oaktree European Credit Opportunities Fund, LP	Opportunistic global equities – European loans	667,515
OCM Opportunities Fund VIIb, LP	Alternative beta – distressed debt	6,243,174
OCM Opportunities Fund VIIIb, LP	Alternative beta – distressed debt	13,892,684
OCM Power Opportunities Fund III, LP	Opportunistic global equities – corporate buyout	6,934,984
OCM Real Estate Opportunities Fund III, LP	Opportunistic global equities – active real estate	58,798
Perry Partners, LP	Alternative beta – multi–strategy	27,434
Pharo Macro Fund, Ltd.	Alternative beta – global macro	57,167,960
Resource Management Service – Wildwood Timberlands, LLC	Opportunistic global equities – timberland	71,550,098
Silver Creek Special Opportunities Fund I, LP	Opportunistic global equities – fund-of-funds (special situations)	8,179,376
Silver Creek Special Opportunities Fund II, LP	Opportunistic global equities – fund-of-funds (special situations)	11,827,879
Silver Lake Partners II, LP	Opportunistic global equities – corporate buyout	2,283,614
SIRIS II Co–investment I	Opportunistic global equities – corporate buyout	6,035,512
SIRIS II Co–investment II	Opportunistic global equities – corporate buyout	7,380,000
Standard Investment Research Hedged Equity Fund, LP	Alternative beta – equity market neutral	99,758,765
StepStone Capital Buyout Fund I, LP	Opportunistic global equities – corporate buyout – fund-of-funds	5,569
StepStone Capital Buyout Fund II, LP	Opportunistic global equities – corporate buyout – fund-of-funds	11,022,716
StepStone Opportunities Fund II, LP	Opportunistic global equities – corporate buyout – fund-of-funds	1,265,431
TPG – Axon Partners (Offshore), Ltd.	Opportunistic global equities – long/short – equity	1,096,083
Visium Balanced Fund, LP	Opportunistic global equities – long/short – equity	1,344,567
Wellington Management Spindrift Investors (Bermuda)	Opportunistic global equities – long/short – equity	272,058
Other Miscellaneous	Miscellaneous	13,115
		$2,947,086,526

Summary of Fair Value of Investments as of June 30, 2018

	Pension Trust Funds		Internal Service Funds	
	Investments at Cost Value	**Investments at Fair Value**	**Investments at Cost Value**	**Investments at Fair Value**
U.S. treasury securities	$ 4,502,110,250	$ 4,274,075,428		
Government bonds & gov't. mortgage-backed securities	55,898,457	46,098,114		
Corporate bonds	$242,756,018	$238,026,664		
U.S. dollar-denominated international corporate bonds	43,214,610	42,032,635		
Limited partnerships	1,733,922,922	2,947,086,526		
Common stock	112,706,642	133,455,277		
International equities	139,465,930	853,977,441		
Foreign currency	19,771	1,122,091		
Real estate investment trust	3,617	7,263		
Repurchase agreements	13,282,975	13,282,975	$ 4,294,253	$ 4,294,253
Short-term investment funds	3,529,778,213	3,529,778,213		
Total investments	$10,373,159,405	$ 12,078,942,627	$ 4,294,253	$ 4,294,253

Reconciliation to investments on *Statement of Fiduciary Net Position*	
Total investments	$ 12,078,942,627
Less short-term investments:	
Repurchase agreements	(13,282,975)
Short-term investment funds	(3,529,778,213)
Investments on *Statement of Fiduciary Net Position*	$ 8,535,881,439

Detailed reports are available upon request.

(4) Capital Assets

Office building, furniture, fixtures, and equipment costing $1,000 or more when acquired are recorded at cost at the time of acquisition and are reported net of accumulated depreciation. Improvements, which increase the useful life of the property, are also capitalized. Maintenance and repairs are charged to expense as incurred. Depreciation is computed using the straight-line method over the estimated useful life of the related assets according to the following guidelines:

- 5 years for furniture, fixtures, and equipment
- 40 years for building
- 5 years for software and licensing

Below are schedules of the capital asset account balances for the pension trust funds and the internal service funds – State of Missouri Deferred Compensation Plan for the year ended June 30, 2018.

Pension Trust Funds
Capital Asset Account

	Land	Building and Building Improvements	Furniture Fixtures and Equipment	Software and Licensing	Total Capital Assets
Capital assets					
Balances June 30, 2017	$ 267,286	$ 4,243,182	$ 1,294,939	$ 736,316	$ 6,541,723
Additions	0	0	138,193	0	138,193
Deletions	0	0	(31,623)	0	(31,623)
Balances June 30, 2018	267,286	4,243,182	1,401,509	736,316	6,648,293
Accumulated depreciation					
Balances June 30, 2017	0	1,847,748	1,062,267	315,648	3,225,663
Depreciation expense	0	142,407	44,289	28,779	215,475
Deletions	0	0	(30,630)	0	(30,630)
Balances June 30, 2018	0	1,990,155	1,075,926	344,427	3,410,508
Net capital assets June 30, 2018	$ 267,286	$ 2,253,027	$ 325,583	$ 391,889	$ 3,237,785

Internal Service Funds
Capital Asset Account

	Leasehold Improvements	Furniture Fixtures and Equipment	Software and Licensing	Total Capital Assets
Capital assets				
Balances June 30, 2017	$ 3,880	$ 16,518	$ 4,950	$ 25,348
Additions	0	1,902	0	1,902
Balances June 30, 2018	3,880	18,420	4,950	27,250
Accumulated depreciation				
Balances June 30, 2017	2,910	5,840	4,030	12,780
Depreciation expense	970	239	461	1,670
Balances June 30, 2018	3,880	6,079	4,491	14,450
Net capital assets June 30, 2018	$ 0	$ 12,341	$ 459	$ 12,800

(5) Employers' Net Pension Liability

The components of the net pension liability, as of June 30, 2018, are in the *Schedule of Employers' Net Pension Liability* below.

Schedule of Employers' Net Pension Liability

	MSEP	Judicial Plan
Total pension liability	$ 13,612,763,961	$ 593,788,592
MOSERS fiduciary net position	8,034,508,424	150,199,575
Employers' net pension liability	$ 5,578,255,537	$ 443,589,017
Plan net position as a percentage of the total pension liability	59.02%	25.30%
Covered payroll	$ 1,951,454,817	$ 59,417,302
Employers' net pension liability as a percentage of employee covered payroll	285.85%	746.57%

Actuarial valuation of an ongoing plan involves estimates of the reported amounts and assumptions about the probability of occurrence of events far into the future. Examples include assumptions about future employment mortality and future salary increases. Amounts determined regarding the net pension liability are subject to continual revision as actual results are compared with past expectations and new estimates are made about the future. The *Schedule of Changes in Employers' Net Pension Liability* presents multi-year trend information about whether the plan fiduciary net positions are increasing or decreasing over time relative to the total pension liability. These schedules are presented in the *Required Supplementary Information* on pages 56-59. The total pension liability, as of June 30, 2018, is $13,612,763,961 for MSEP and $593,788,592 for the Judicial Plan based on an actuarial valuation performed as of June 30, 2018, and a measurement date of June 30, 2018, using generally accepted actuarial procedures.

Changes to Amortization Period, Asset Smoothing Method, and Economic Assumptions
In July 2018, the board made several changes to actuarial methods and assumptions based upon an *Economic Assumption Report* presented by its outside actuarial consultant. Based upon this study, the board voted to reduce the investment return assumption to 7.25% with a 2.5% inflation assumption, effective June 30, 2018; then to 7.10% with a 2.35% inflation assumption, effective June 30, 2019; and then to 6.95% with a 2.25% inflation assumption, effective June 30, 2020, and thereafter. The asset smoothing method was moved to a 5-year closed method with a 7-year transition to recognize previous losses. The amortization period was reset to a layered 30-year closed period from a 30-year closed period with 26 years remaining. The *Summary of Actuarial Assumptions* below applies to all periods included in the measurement of the total pension liability.

Summary of Actuarial Assumptions for the MSEP & the Judicial Plan

Valuation date	June 30, 2018
Actuarial cost method	Entry age normal
Amortization method	Level percentage, closed
Remaining amortization period	30 years
Asset valuation method	Closed 5-year
Investment rate of return	7.25% (effective June 30, 2018)
Projected salary increases	3.0 – 8.5% (MSEP) 2.75 – 4.95% (Judicial Plan)
Rate of payroll growth	2.50%
COLAs	4.00%/2.00%*
Price inflation	2.50%

Mortality rates are based on the RP-2014 Healthy Annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 120% for the MSEP and 98% for the Judicial Plan. The preretirement mortality table used was the RP-2014 Employee mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 95% for males and 90% for females for the MSEP.

An experience study covering the five-year period ended June 30, 2015, was performed in 2016.

* *On a compound basis, 4.00% for the first 12 years, 3.06% for the 13th year, and 2.00% per year thereafter. When no minimum COLA is in effect, the annual COLA is assumed to be 2.00% (80% of the 2.50% price inflation), on a compounded basis.*

The discount rate used to measure the total pension liability was 7.25%. The projection of cash flows used to determine the discount rate assumed that contributions from participating employers will be made using the actuarially determined rates. Based on those assumptions, MOSERS' fiduciary net position was projected to be available to make all the projected future benefit payments of the current plan members. As a result, the long-term expected rate of return on pension plan investments of 7.25% was applied to all periods of projected benefit payments to determine the total pension liability.

The table below presents the net pension liability of the plans, as of June 30, 2018, calculated using the discount rate of 7.25%, as well as what the net pension liability would be if it were calculated using a discount rate that is 1% lower (6.25%) or 1% higher (8.25%) than the current rate.

Sensitivity of Net Pension Liability to Changes in the Discount Rate

Employers' Net Pension Liability	1% Decrease (6.25%)	Current Discount Rate (7.25%)	1% Increase (8.25%)
MSEP	$7,125,771,094	$5,578,255,537	$4,276,970,991
Judicial Plan	$ 504,645,591	$ 443,589,017	$ 391,378,208

The funding status of the plans and *Employer Schedule of Funding Progress* can be found in the *Actuarial Section* on page 106.

(6) Contributions

The MSEP and the Judicial Plan are pension plans covering substantially all state of Missouri employees and judges. The state of Missouri and its component employers make required contributions to the plans. The required contributions are expressed as a level percentage of covered payroll and are actuarially determined using an individual entry-age normal actuarial cost method. MSEP 2011 and Judicial Plan 2011 members are required to contribute 4% of their pay. Costs of administering the plans are financed from the contributions to the pension trust funds and investment earnings.

(7) Other Post-Employment Benefit (OPEB) Plans

In addition to the defined-benefit pension provided through MOSERS, the state of Missouri also funds, either partially or in its entirety, OPEB plans for eligible members as follows:

Retiree Life Insurance
Members who retire on or after October 1, 1985, are eligible for $5,000 of state-sponsored basic life insurance coverage if they retire directly from active employment. As of June 30, 2018, 26,777 retirees were participating in the program. This insured defined-benefit coverage is financed on a percentage of payroll (.115%) and is purchased as a group policy through The Standard insurance company. The cost for the year ended June 30, 2018, was $1,880,705.73. Premiums are contributed entirely by the state and its component employers as provided by Section 104.515, RSMo.

Retirees of the Department of Labor and Industrial Relations (DOLIR), who retired prior to January 1, 1996, are eligible for state-sponsored insured defined-benefit insurance coverage in the same amount of coverage they were receiving through the DOLIR. As of June 30, 2018, 180 retirees were participating in the program. The coverage for this closed group is purchased as a group policy at a current cost of $2.07 per thousand dollars of coverage, per month, per eligible participant ($21,399 for the year ended June 30, 2018). Premiums are paid entirely by the DOLIR as provided by Section 288.225, RSMo. Retirees of the DOLIR who retired on or after January 1, 1996, are eligible for $5,000 of state-sponsored life insurance coverage if they retire directly from active employment. They are included in the group described in the preceding paragraph.

Long-Term Disability Insurance (LTD)
MOSERS provides LTD coverage for eligible members and generally includes those active members of MOSERS' retirement plans who do not have other disability coverage and are not yet eligible to receive normal (unreduced) retirement benefits.

There were 32,836 members covered under the program, as of June 30, 2018. This insured defined-benefit coverage is financed on a percentage of covered payroll (0.55%). Purchased as group policy, LTD is administered by The Standard insurance company. The cost for the year ended June 30, 2018, was $8,129,863.44. Premiums are contributed by the state and its component employers as provided for by Section 104.515, RSMo.

Post-Employment Retiree Health Care

MOSERS participates as an employer in a cost-sharing, multiple-employer, defined benefit, other post-employment benefits plan, the State Retiree Welfare Benefit Trust (SRWBT), operated by Missouri Consolidated Health Care Plan (MCHCP). Employees may participate at retirement if eligible to receive a monthly retirement benefit from MOSERS. The terms and conditions governing post-employment benefits are vested with the MCHCP Board of Trustees within the authority granted under Chapter 103 of the Revised Statutes of Missouri (2000) as amended ("RSMo") 103.003 through 103.178. The SRWBT does not issue a separate stand-alone financial report. Financial activity of the SRWBT is included in the *MCHCP Comprehensive Annual Financial Report* as a fiduciary fund and is intended to present only the financial position of the activities attributable to the SRWBT. Additionally, MCHCP is considered a component unit of the state of Missouri reporting entity and is included in the state's financial report.

The plan's financial statements are available on MCHCP's website at *www.mchcp.org*.

Benefits

The SRWBT was established and organized on June 27, 2008, pursuant to the Revised Statutes of Missouri (2000) as amended ("RSMo") 103.003 through 103.178 to provide health and welfare benefits for the exclusive benefit of current and future retired employees of the state and their dependents who meet eligibility requirements, except for those retired members covered by other OPEB plans of the state. MCHCP's three medical plans offer the same basic coverage such as preventative care, freedom to choose care from a nationwide network of primary care providers, specialists, pharmacies and hospitals, usually at a lower negotiated group discount and the same covered benefits for both medical and pharmacy. Benefits are the same in all three plans; other aspects differ such as premium, deductible and out of pocket costs. Retiree benefits are the same as for active employees.

Contributions

Contributions are established, and may be amended by the MCHCP Board of Trustees, with the authority granted under Chapter 103 of the Revised Statutes of Missouri (2000) as amended ("RSMo") 103.003 through 103.178. For the fiscal year ended June 30, 2017, employers were required to contribute 4.26% for the period July 1, 2016, through December 31, 2016, and 4.02% for the period January 1, 2017, through June 30, 2017, of gross active employee payroll toward their required contributions. Employees do not contribute to this plan. No payables to the plan were outstanding at year end.

OPEB Liabilities, OPEB Expense, and Deferred Outflows of Resources and Deferred Inflows of Resources

At June 30, 2018, MOSERS reported a liability of $7,272,038 for its proportionate share of the net OPEB liability. The net OPEB liability was measured as of June 30, 2017, and the total OPEB liability used to calculate the net OPEB liability was determined by an actuarial valuation as of that date. MOSERS proportion of the net OPEB liability was based on a projection of its long-term share of contributions to the OPEB plan relative to the projected contributions of all participating entities, actuarially determined. At June 30, 2017, MOSERS proportion was .4121%.

For the year ended June 30, 2018, MOSERS recognized OPEB expense of $503,233. As of June 30, 2018, MOSERS reported deferred outflows of resources and deferred inflows of resources related to OPEB from the following sources:

Deferred Outflows/Inflows of Resources Related to Post-Employment Retiree Health Care

	Deferred Outflows of Resources	Deferred Inflows of Resources
Difference between expected and actual experience		$13,196
Net difference between projected and actual earnings on plan investments		709
Changes in proportion and differences between district contributions and proportionate share of contributions		58,002
MOSERS contributions subsequent to the measurement date	$301,182	
	$301,182	$71,907

In the year ended June 30, 2019, $301,182 will be reported as deferred outflows of resources related to OPEB resulting from MOSERS contributions subsequent to the measurement date and will be recognized as a reduction of the net OPEB liability in the year ended June 30, 2019. Other amounts reported as deferred inflows of resources related to OPEB will be recognized in OPEB expense as follows:

Deferred Outflows/Inflows of Resources Related to Post-Employment Retiree Health Care to be Recognized in Future Years

Year Ending June 30	
2019	$ (9,219)
2020	(9,219)
2021	(9,219)
2022	(9,219)
2023	(8,302)
Thereafter	(26,729)
Total	$ (71,907)

Actuarial Assumptions

The collective total OPEB liability for the June 30, 2017, measurement date was determined by an actuarial valuation as of January 1, 2017, with updated procedures used to roll forward the total OPEB liability to June 30, 2017. This actuarial valuation used the following actuarial assumptions:

Summary of Actuarial Assumptions for Post-Employment Retiree Health Care

Valuation Year	July 1, 2016 – June 30, 2017
Actuarial cost method	Entry age normal, level percentage of payroll
Asset valuation method	Market value
Discount rate (blended)	5.71%
Projected payroll growth rate	4.0%
Inflation rate	3.0%
Health care cost trend rate (medical & prescription drugs combined)	
Nonmedicare	6.5% for fiscal year 2017 (rate decreases by 0.25% per year to an ultimate rate of 5.0% in fiscal 2023 and later)
Medicare	7.5% for fiscal year 2017 (rate decreases by 0.25% per year to an ultimate rate of 5.0% in fiscal year 2027 and later)

Mortality: RP-2016 for Employees/Annuitants without collar adjustments using Scale MP-2016.

The last experience study was conducted for the period July 1, 2008, through June 30, 2012. The last independent actuarial review of the reasonableness and accuracy of actuarial assumptions, actuarial cost methods, and valuations was conducted as of June 30, 2016.

A discount rate of 5.71% was used to measure the total OPEB liabilities. The projection of cash flows used to determine the discount rate assumed that contributions from plan members will be made at the current contribution rates and the contributions will be made at statutorily required rates, actuarially determined. This discount rate was determined as a blend of the best estimate of the expected return on plan assets and the 20-year high quality municipal bond rate as of the measurement date. For years where expected benefit payments can be covered by projected trust assets, expected returns are used. For years where payments are not expected to be covered by trust assets, the municipal Bond Buyer 20-Bond General Obligation Index rate is utilized.

Sensitivity of MOSERS' proportionate share of the Net OPEB Liability to Changes in the Discount Rate

The following table presents MOSERS' net OPEB liability, calculated using a discount rate of 5.71%, as well as what the net OPEB liability would be if it were calculated using a discount rate that is one percent lower or one percent higher:

Sensitivity of the Net OPEB Liability to Changes in Discount Rate (in thousands)

	1% Decrease in Discount Rate (4.71%)	Current Discount Rate (5.71%)	1% Increase in Discount Rate (6.71%)
Net OPEB liability	8,588	7,272	6,230

Sensitivity of MOSERS' proportionate share of the Net OPEB Liability to Changes in the Health Care Cost Trend Rates

The following table presents MOSERS' net OPEB liability, calculated using the current trend rate, as well as what the net OPEB liability would be if it were calculated using a trend rate that is one percent lower or one percent higher:

Sensitivity of the Net OPEB Liability to Changes in Health Care Cost Trend Rates (in thousands)

	1% Decrease in Trend Rates	Current Trend Rates	1% Increase in Trend Rates
Net OPEB liability	6,198	7,272	8,632

Long-Term Expected Rate of Return

The target allocation and expected real rate of return for each major asset class are listed below:

Long-Term Expected Rate of Return

Asset Class	Target Allocation	Expected Real Rate of Return
Large cap stocks	20.0%	5.7%
Mid cap stocks	10.0%	6.0%
Small cap stocks	10.0%	6.0%
High-yield bonds	10.0%	2.6%
BarCap aggregate bonds	20.0%	1.0%
Long government/credit	25.0%	1.4%
Cash equivalents	5.0%	0.3%

(8) Plan Termination

MOSERS and its related plans are administered in accordance with Missouri statutes. Plans can only be terminated by an amendment to these statutes by the Missouri legislature.

On April 26, 2005, Senate Bill 202 was enacted, which terminated the Administrative Law Judges and Legal Advisors' Plan (ALJLAP) for new hires only. Under this legislation, individuals who assume a position after April 26, 2005, who would have otherwise been covered by the ALJLAP, will instead participate in the MSEP or the MSEP 2000, depending on when they initially became state employees. For fiscal years 2005 and after, all liabilities and assets of the ALJLAP were transferred and combined with the MSEP. Membership totals for the ALJLAP are included in the MSEP in all relevant sections of this report.

(9) Commitments

As of June 30, 2018, MOSERS has $269,798,240 in unfunded commitments in the private asset class.

During FY19, MOSERS entered into a contract with a software and consulting firm to provide and implement a pension administration system at a cost of approximately $9.4 million. As of June 30, 2018, no amounts had been paid.

(10) Contingencies

There were no contingencies which would have a material impact on the financial statements as of June 30,2018.

(11) Risk Management

MOSERS is exposed to various risks of loss related to natural disasters, errors, and omissions, loss of assets, torts, etc. MOSERS has chosen to cover such losses through the purchase of commercial insurance to help mitigate some of the exposure to those risks. There have been no material insurance claims filed or paid during the past three years.

(12) Change in Accounting Principle

During the fiscal year ended June 30, 2018, MOSERS implemented GASB Statement No. 75, Accounting and Financial Reporting for Postemployment Benefits Other than Pensions. This statement established standards for measuring and recognizing liabilities, deferred outflows and inflows of resources, and expenses related to Other Post Employment Benefits.

As a result of the implementation, net position restricted for pensions as of June 30, 2017, was restated as follows:

Restatement of FY17 Net Positions

	MSEP	Judicial	Total
Net position restricted for pensions, as previously reported	$7,945,358,298	$137,634,941	$8,082,993,239
Prior period adjustment			
OPEB liability (as of June 30, 2017)	(6,988,929)	(129,514)	(7,118,443)
Deferred outflow of resources	272,679	5,053	277,732
Net position restricted for pensions, as restated	$7,938,642,048	$137,510,480	$8,076,152,528

Pension Trust Funds
Schedule of Changes in Employers' Net Pension Liability | For Years Ended June 30, 2014–2018*

MSEP

	2014	2015
Total pension liability		
Service cost	$ 158,116,026	$ 150,412,577
Interest on the total pension liability	869,878,195	896,451,618
Benefit changes	0	0
Difference between expected and actual experience	12,376,237	(27,983,267)
Assumption changes	0	(57,568,553)
Benefit payments and member refunds	(680,436,107)	(728,265,800)
Net change in total pension liability	359,934,351	233,046,575
Total pension liability - beginning	11,134,637,484	11,494,571,835
Total pension liability - ending (a)	$ 11,494,571,835	$ 11,727,618,410
Plan fiduciary net position		
Employer contributions	$ 326,370,336	$ 329,752,832
Employee contributions	14,025,328	18,099,455
Pension plan net investment income (loss)	1,193,952,121	(237,070,529)
Benefit payments and member refunds	(680,436,107)	(728,265,800)
Pension plan administrative expense	(7,336,922)	(8,077,692)
Other	296,369,500	5,434,820
Net change in plan fiduciary net position	1,142,944,256	(620,126,914)
Plan fiduciary net position - beginning	7,993,837,570	9,136,781,826
Plan fiduciary net position - ending (b)	9,136,781,826	8,516,654,912
Net pension liability - ending (a)-(b)	$ 2,357,790,009	$ 3,210,963,498
Plan fiduciary net position as a percentage of total pension liability	79.49%	72.62%
Covered payroll	$ 1,902,719,928	$ 1,918,527,768
Net pension liability as a percentage of covered employee payroll	123.92%	167.37%

* *Schedule is intended to show last 10 fiscal years and will be displayed as it becomes available.*

** *Some balances have been reclassified since the completion of the GASB 67 valuation. This is due to the adoption of GASB Statement No. 75 (Other Post-Employment Benefits).*

Schedule of Changes in Employers' Net Pension Liability continued from page 56

2016	2017	2018**
$ 149,021,755	$ 152,766,134	$ 157,351,979
913,877,923	945,654,398	956,201,619
0	(1,696,059)	0
61,150,083	(104,203,260)	(118,252,032)
656,805,085	202,554,786	351,899,973
(757,310,503)	(793,964,857)	(886,711,473)
1,023,544,343	401,111,142	460,490,066
11,727,618,410	12,751,162,753	13,152,273,895
$ 12,751,162,753	$ 13,152,273,895	$ 13,612,763,961
$ 329,957,369	$ 335,217,422	$ 379,557,962
21,684,920	25,439,343	28,303,993
1,740,269	272,595,668	576,188,826
(757,310,503)	(793,964,857)	(886,711,473)
(8,489,375)	(8,759,341)	(9,799,256)
4,923,622	5,668,849	1,610,073
(407,493,698)	(163,802,916)	89,150,125
8,516,654,912	8,109,161,214	7,945,358,299
8,109,161,214	7,945,358,298	8,034,508,424
$ 4,642,001,539	$ 5,206,915,597	$ 5,578,255,537
63.60%	60.41%	59.02%
$ 1,921,528,936	$ 1,975,353,105	$ 1,951,454,817
241.58%	263.59%	285.85%

Pension Trust Funds

Schedule of Changes in Employers' Net Pension Liability | For Years Ended June 30, 2014–2018*

Judicial Plan

	2014	2015
Total pension liability		
Service cost	$ 8,990,293	$ 10,613,686
Interest on the total pension liability	34,013,615	36,161,612
Benefit changes	0	0
Difference between expected and actual experience	13,360,614	5,103,664
Assumption changes	0	0
Benefit payments and member refunds	(29,406,625)	(31,245,906)
Net change in total pension liability	26,957,897	20,633,056
Total pension liability - beginning	435,378,358	462,336,255
Total pension liability - ending (a)	$ 462,336,255	$ 482,969,311
Plan fiduciary net position		
Employer contributions	$ 29,264,877	$ 32,696,686
Employee contributions	294,810	488,193
Pension plan net investment income (loss)	17,199,701	(3,610,352)
Benefit payments	(29,406,625)	(31,245,906)
Pension plan administrative expense	(105,693)	(123,015)
Other	4,195,049	0
Net change in plan fiduciary net position	$ 21,442,119	$ (1,794,394)
Plan fiduciary net position - beginning	111,203,538	132,645,657
Plan fiduciary net position - ending (b)	132,645,657	130,851,263
Net pension liability - ending (a)-(b)	$ 329,690,598	$ 352,118,048
Plan fiduciary net position as a percentage of total pension liability	28.69%	27.09%
Covered payroll	$ 49,587,936	$ 55,656,457
Net pension liability as a percentage of covered employee payroll	664.86%	632.66%

* *Schedule is intended to show last 10 fiscal years and will be displayed as it becomes available.*

** *Some balances have been reclassified since the completion of the GASB 67 valuation. This is due to the adoption of GASB Statement No. 75 (Other Post-Employment Benefits).*

Schedule of Changes in Employers' Net Pension Liability continued from page 58

2016	2017	2018**
$ 10,932,097	$ 12,945,567	$ 12,997,198
37,755,240	40,617,091	41,018,371
0	0	0
(5,036,696)	(10,687,091)	(1,319,696)
53,991,379	7,905,466	12,332,042
(32,989,714)	(33,984,725)	(35,657,248)
64,652,306	16,796,308	29,370,667
482,969,311	547,621,617	564,417,925
$ 547,621,617	$ 564,417,925	$ 593,788,592
$ 33,642,498	$ 34,246,826	$ 36,892,203
661,206	786,745	902,320
28,081	4,680,131	10,677,666
(32,989,714)	(33,984,725)	(35,657,248)
(136,983)	(150,387)	(181,595)
0	0	(68,711)
$ 1,205,088	$ 5,578,590	$ 12,564,635
130,851,263	132,056,351	137,634,940
132,056,351	137,634,941	150,199,575
$ 415,565,266	$ 426,782,984	$ 443,589,017
24.11%	24.39%	25.30%
$ 57,421,016	$ 58,591,661	$ 59,417,302
723.72%	728.40%	746.57%

Pension Trust Funds
Schedule of Employer Contributions | Last Ten Fiscal Years

MSEP

Year Ended June 30	Actuarially Determined Contribution	Contributions in Relation to the Actuarially Determined Contribution**	Contribution Deficiency (Excess)	Covered Payroll	Contributions as a Percentage of Covered Payroll*
2009	$252,105,008	$252,105,008	$ 0	$2,002,402,087	12.6%
2010	251,226,187	251,226,187	0	1,945,095,321	12.9
2011	263,418,048	263,418,048	0	1,875,569,816	14.0
2012	263,373,924	263,373,924	0	1,864,069,493	14.1
2013	274,655,284	274,655,284	0	1,880,212,950	14.6
2014	326,370,336	326,370,336	0	1,902,719,928	17.2
2015	329,752,832	329,752,832	0	1,918,527,768	17.2
2016	310,124,928	329,957,369	(19,832,414)	1,921,528,936	17.2
2017	322,772,697	335,217,422	(12,444,725)	1,975,353,105	19.0
2018	379,557,962	379,557,962	0	1,951,454,817	19.5

Judicial Plan

Year Ended June 30	Actuarially Determined Contribution	Contributions in Relation to the Actuarially Determined Contribution*	Contribution Deficiency (Excess)	Covered Payroll	Contributions as a Percentage of Covered Payroll**
2009	$27,725,882	$27,725,882	$ 0	$45,505,512	60.9%
2010	27,029,198	27,029,198	0	46,112,730	58.6
2011	27,702,682	27,702,682	0	45,888,020	60.4
2012	26,324,526	26,324,526	0	45,835,501	57.4
2013	28,330,649	28,330,649	0	48,697,726	58.2
2014	29,264,877	29,264,877	0	49,587,936	59.0
2015	32,696,686	32,696,686	0	55,656,457	58.7
2016	31,604,527	33,642,498	(2,037,971)	57,421,016	58.6
2017	32,670,710	34,246,826	(1,576,116)	58,591,661	58.5
2018	36,892,203	36,892,203	0	59,417,302	62.1

* *Since the percent of payroll contribution rate was applied to pension payroll during the fiscal year, the actuarially determined contribution is equal to the actual contribution.*

** *Actuarial contribution rate shown is the actual employer contribution made divided by payroll in force on May 31 reported for valuation. This rate as computed may vary from the board's certified employer contribution rate due to the fluctuations in membership and pay during the year.*

Pension Trust Funds

Schedule of Annual Money-Weighted Rate of Return on Investments*

Year Ended June 30	Annual Money-Weighted Rate of Return — Net of Investment Expense
2014	19.25%
2015	(2.60)
2016	0.08
2017	3.51
2018	7.57

* *Schedule is intended to show last 10 fiscal years and will be displayed as it becomes available.*

Pension Trust Funds

Notes to the Schedules of Required Supplementary Information | Last Ten Years

Actuarial Methods and Assumptions for Valuations Performed as of June 30, 2018

The entry-age actuarial cost method of valuation is used in determining liabilities and normal cost. Regular actuarial valuations provide valuable information about the composite change in the unfunded actuarial accrued liabilities (whether or not the liabilities are increasing or decreasing, and by how much). Since the future cannot be predicted with precision, actual experience is expected to differ from assumed experience. Differences occurring in the past between assumed experience and actual experience (actuarial gains and losses) become part of actuarial accrued liabilities. Unfunded actuarial accrued liabilities are amortized to produce payments (principal and interest), which are expressed as a percent of payroll. A layered, closed 30-year amortization period was used for the June 30, 2018 valuations to determine the FY20 contribution rates. The actuarial value is calculated by recognizing the difference between the actual and expected return on the market value of assets each year over a closed five-year period. In addition, the total unrecognized investment experience as of June 30, 2017, will be recognized evenly over a seven-year period beginning June 30, 2018.

The investment return rate assumption was reduced from 7.50%, as of June 30, 2017, to 7.25% per year, as of June 30, 2018, compounded annually (net of investment expenses). The price inflation assumption used was 2.5% per year. Projected salary assumptions were 3.00% to 8.50% for the MSEP and 2.75% to 4.95% for the Judicial Plan. The assumption used for annual post-retirement benefit increases (COLAs) is 4.0% (on a compound basis) when a minimum COLA is in effect. When no minimum COLA is in effect, the annual COLA is assumed to be 2.00% (80% of the 2.50% price inflation), on a compounded basis.

2009 The actuarial valuations, as of June 30, 2009, reflected the following changes to the computed contribution rates for fiscal year ended June 30, 2011.

	Amount	Percent of Payroll
MSEP		
State of Missouri general pay freeze	$ (4,405,285)	(0.22)%
Experience and nonrecurring items	55,466,538	2.77
Change in valuation asset corridor from +/- 20% to +/- 30%	(29,835,791)	(1.49)
Judicial Plan		
State of Missouri general pay freeze	350,392	0.77
Experience and nonrecurring items	496,010	1.09
Change in valuation asset corridor from +/- 20% to +/- 30%	(141,067)	(0.31)

2010 The actuarial valuations, as of June 30, 2010, reflected the following changes to the computed contribution rates for fiscal year ended June 30, 2012.

	Amount	Percent of Payroll
MSEP		
State of Missouri general pay freeze	$ (2,528,624)	(0.13)%
Addition of new tier of benefits effective January 1, 2011	(17,311,348)	(0.89)
Experience and nonrecurring items	25,480,749	1.31
Change in timing of contributions	(2,528,624)	(0.13)
Judicial Plan		
State of Missouri general pay freeze	(308,955)	(0.67)
Addition of new tier of benefits effective January 1, 2011	(493,406)	(1.07)
Experience and nonrecurring items	438,071	0.95
Change in timing of contributions	(894,587)	(1.94)

2011

The actuarial valuations, as of June 30, 2011, reflected the following changes to the computed contribution rates for fiscal year ended June 30, 2013.

	Amount	Percent of Payroll
MSEP		
State of Missouri general pay freeze	$(6,376,937)	(0.34)%
Experience and nonrecurring items	17,630,356	0.94
Change in normal cost due to increasing population in MSEP 2011	(2,250,684)	(0.12)
Judicial Plan		
State of Missouri general pay freeze	(293,683)	(0.64)
Experience and nonrecurring items	289,095	0.63
Change in normal cost due to increasing population in Judicial Plan 2011	(169,786)	(0.37)

2012

The actuarial valuations, as of June 30, 2012, reflected the following changes to the computed contribution rates for fiscal year ended June 30, 2014.

	Amount	Percent of Payroll
MSEP		
Change in assumptions or methods	$21,623,206	1.16%
Experience and nonrecurring items	25,537,752	1.37
Judicial Plan		
Change in assumptions or methods	948,795	2.07
Experience and nonrecurring items	320,849	0.70

2013

The actuarial valuations, as of June 30, 2013, reflected the following changes to the computed contribution rates for fiscal year ended June 30, 2015.

	Amount	Percent of Payroll
MSEP		
Change in benefit assumptions or methods	$18,990,151	1.01%
Experience and nonrecurring items	(376,043)	(0.02)
Judicial Plan		
Change in benefit assumptions or methods	(603,852)	(1.24)

2014

The actuarial valuations, as of June 30, 2014, reflected the following changes to the computed contribution rates for fiscal year ended June 30, 2016.

	Amount	Percent of Payroll
MSEP		
Recognition of asset gains	$16,173,119	0.85%
Experience and nonrecurring items	(1,141,632)	(0.06)
Change in normal cost due to increasing population in MSEP 2011 and experience	4,376,256	0.23
Judicial Plan		
Change in normal cost due to increasing population in Judicial Plan 2011 and experience	(510,756)	(1.03)
Anticipated change in salary levels	(1,180,193)	(2.38)

2015

The actuarial valuations, as of June 30, 2015, reflected the following changes to the computed actuarially determined contribution (ADC) rates for fiscal year ended June 30, 2017. Actual contribution rate differs from computed ADC due to minimum funding policy adopted by the board in September 2014, requiring contributions to be no less than 16.97% of covered payroll for MSEP and 58.45% for Judicial Plan until the funding ratio is at least 80% for each plan.

	Amount	Percent of Payroll
MSEP		
Recognition of asset losses	$ 7,674,111	0.40%
Experience and nonrecurring items	4,412,614	0.23
Change in normal cost due to increasing population in MSEP 2011 and experience	(4,604,467)	(0.24)
Liability (gain) loss	(1,918,528)	(0.10)
Change in benefit assumptions or methods	3,069,644	0.16
Minimum funding policy contribution	(1,151,117)	(0.06)
Judicial Plan		
Recognition of asset losses	116,879	0.21
Experience and nonrecurring items	417,423	0.75
Change in normal cost due to increasing population in Judicial Plan 2011 and experience	(372,898)	(0.67)
Liability (gain) loss	361,767	0.65
Minimum funding policy contribution	(122,444)	(0.22)

2016

The actuarial valuations, as of June 30, 2016, reflected the following changes to the computed actuarially determined contribution (ADC) rates for fiscal year ended June 30, 2018.

	Amount	Percent of Payroll
MSEP		
Recognition of asset losses	$ 21,136,818	1.10%
Change in normal cost due to increasing population in MSEP 2011 and experience	(3,843,058)	(0.20)
Liability (gain) loss	3,843,058	0.20
Projected payroll higher than expected	(192,153)	(0.01)
Change in benefit assumptions or methods	39,583,496	2.06
Minimum funding policy contribution	(768,612)	(0.04)
Judicial Plan		
Recognition of asset losses	9,415,492	0.49
Experience and nonrecurring items	(13,258,550)	(0.69)
Change in benefit assumptions or methods	130,856,121	6.81
Change in normal cost due to increasing population in Judicial 2011 and experience	(1,345,070)	(0.07)
Minimum funding policy contribution	(4,035,211)	(0.21)

2017

The actuarial valuations, as of June 30, 2017, reflected the following changes to the computed actuarially determined contribution (ADC) rates for fiscal year ending June 30, 2019.

	Amount	Percent of Payroll
MSEP		
Recognition of asset losses	$ 14,758,970	0.76%
Recognition of liability gains	(1,359,379)	(0.07)
Change in benefit assumptions or methods	13,982,182	0.72
Projected payroll lower than expected	970,985	0.05
Minimum funding policy contribution	(776,788)	(0.04)
Normal cost	(2,524,561)	(0.13)
Change in effective employee contribution rate	1,359,379	0.07
Transition/actuarial software	(12,622,804)	(0.65)
Experience and nonrecurring items	970,985	0.04
Judicial Plan		
Recognition of asset losses	226,789	0.39
Recognition of liability gains	(122,117)	(0.21)
Change in benefit assumptions or methods	453,577	0.78
Projected payroll lower than expected	343,091	0.59
Minimum funding policy contribution	(104,672)	(0.18)
Normal cost	(360,536)	(0.62)
Change in effective employee contribution rate	58,151	0.10
Transition/actuarial software	186,083	0.32
Other experience	261,679	0.45

2018

The actuarial valuations, as of June 30, 2018, reflected the following changes to the computed actuarially determined contribution (ADC) rates for fiscal year ending June 30, 2020.

	Amount	Percent of Payroll
MSEP		
Recognition of asset losses	$13,022,972	0.68%
Recognition of liability gains	(5,362,400)	(0.28)
Change in benefit assumptions or methods	16,087,201	0.84
Projected payroll lower than expected	12,256,915	0.64
Normal cost	(574,543)	(0.03)
Change in effective employee contribution rate	(3,064,229)	(0.16)
Voluntary buyout program	(2,681,200)	(0.14)
Experience and nonrecurring items	191,514	0.01
Judicial Plan		
Recognition of asset losses	196,521	0.33
Recognition of liability gains	(81,411)	(0.14)
Change in benefit assumptions or methods	58,151	0.10
Projected payroll lower than expected	151,192	0.26
Normal cost	(186,083)	(0.32)
Change in effective employee contribution rate	(110,487)	(0.19)
Other experience	29,075	0.05

Schedule of Proportionate Share of the Net OPEB Liability | For the Year Ended June 30, 2018*

State Retiree Welfare Benefit Trust

	2018
MOSERS' proportion of the net OPEB liability	0.4121%
MOSERS' proportionate share of the net OPEB liability	$ 7,272,038
MOSERS' covered-employee payroll	$ 6,669,717
MOSERS' proportionate share of the net OPEB liability as a percentage of its covered-employee payroll	109%
Plan fiduciary net position as a percentage of the total OPEB liability	6.64%

* *The amounts presented in this schedule were determined as of the previous fiscal year end. Intended to show information for 10 years, data for additional years will be displayed as it becomes available.*

Schedule of Employer Contributions for OPEB | For the Year Ended June 30, 2018*

State Retiree Welfare Benefit Trust

	2018
Contractually required contribution	$ 277,732
Contributions in relation to the contractually required contribution	$ 277,732
Contribution deficiency (excess)	$ 0
MOSERS' covered-employee payroll	$ 6,669,717
Contributions as a percentage of covered-employee payroll	4.16%

* *The amounts presented in this schedule were determined as of the previous fiscal year end. Intended to show information for 10 years, data for additional years will be displayed as it becomes available.*

Pension Trust Funds

Schedules of Investment Expenses | For the Year Ended June 30, 2018

Investing Activity	MSEP	Judicial Plan	Total
Investment management and administrative fees			
Actis Emerging Markets III & IV – private equity	$ 1,015,187	$ 18,813	$ 1,034,000
African Development Partners I & II, LLC – private equity	2,351,847	43,583	2,395,430
Alinda Infrastructure Fund I, LP – private equity	93,163	1,726	94,889
AQR DELTA Sapphire Fund, LP – hedge funds	3,897,930	72,235	3,970,165
AQR Global Risk Premium Fund, LP – beta-balanced	2,402,358	44,519	2,446,877
AQR Style Premia Fund, LP – hedge funds	1,738,447	32,216	1,770,663
Astenbeck Capital – beta-balanced	256,720	4,757	261,477
Axiom Asia Private Capital Fund II & III, LP – private equity	1,878,560	34,813	1,913,373
Axxon Brazil Private Equity Fund II – private equity	254,816	4,722	259,538
Bayview Opportunity Domestic, LP – high yield	147,737	2,738	150,475
Bayview Opportunity Domestic III, LP – real estate	1,133,332	21,002	1,154,334
BlackRock Financial Management Bank Loans – high yield	(1,428)	(26)	(1,454)
Blackstone Real Estate Partners IV, V, VI, & VII – real estate	4,997,963	92,620	5,090,583
Blackstone Topaz Fund, LP – hedge funds	2,642,349	48,967	2,691,316
Blakeney Onyx, LP – emerging markets	604,628	11,205	615,833
Bridgewater Associates Diamond Ridge Fund, LLC – hedge funds	3,877,255	71,851	3,949,106
Bridgewater All Weather, LLC – beta-balanced	1,961,386	36,347	1,997,733
Campbell Timber Fund II A, LP – timber	1,215	23	1,238
CarVal Investors CVI Global Value Fund A, LP – real estate	26,877	498	27,375
CarVal Investors CVI Global Value Fund A, LP – private debt	26,877	498	27,375
Catalyst Fund III, IV & V, LP – private debt	(1,712,285)	(31,731)	(1,744,016)
Catterton Partners V, VI, & VII, LP – private equity	46,609	864	47,473
Cornwall Domestic, LP – hedge funds	897,458	16,631	914,089
Davidson Kempner Institutional Partners, LP – hedge funds	371,995	6,894	378,889
DRI Capital LSRC – private equity	360,931	6,689	367,620
EIG Energy Fund XIV, XV, & XVI, LP – private equity	2,358,582	43,708	2,402,290
Elliott International, Ltd. – hedge funds	9,574,227	177,425	9,751,652
Farallon Capital Institutional Partners, LP – hedge funds	(127,274)	(2,359)	(129,633)
Gaoling Fund, LP – hedge funds	12,763,100	236,520	12,999,620
Garnet Sky Investors Company, Ltd. – timber	8,678,102	160,819	8,838,921
Gateway Energy & Resource Holdings, LLC – real estate	370,519	6,866	377,385
GCM Equity Partners & Glenview Capital Opportunity Fund, LP – hedge funds	696,675	12,910	709,585
Global Forest Partners GTI7 Institutional Investors Company, Ltd. – timber	119,038	2,206	121,244
Harvest Fund Advisors – real estate	559,714	10,372	570,086
HBK Merger Strategies Offshore Fund, Ltd. – hedge funds	2,459,877	45,585	2,505,462
JLL Partners V & VI, LP – private equity	3,094,752	57,351	3,152,103
King Street Capital, LP – hedge funds	238,834	4,426	243,260
Linden Capital Partners II & Linden Co – Investment I – private equity	469,003	8,691	477,694
Mast Credit Opportunities I, LP – hedge funds	477,740	8,853	486,593
Merit Energy Partners F–II, LP – real estate	90,860	1,684	92,544
MHR Institutional Partners IIA, III & IV LP – private debt	1,791,028	33,190	1,824,218

Schedules of Investment Expenses continued on page 68

Schedules of Investment Expenses continued from page 67

Investing Activity	MSEP	Judicial Plan	Total
Millennium Technology Partners II, LP – private equity	1,411,731	26,162	1,437,893
NISA Investment Advisors, LLC – beta-balanced	5,033,176	93,272	5,126,448
OCM Real Estate Opportunities Fund III, LP – real estate	9,680	179	9,859
OCM Opportunities Fund IVb, VII & VIIIb, LP – private debt	324,317	6,010	330,327
OCM/GFI Power Opportunities Fund II & III, LP – private equity	1,281,039	23,740	1,304,779
Perry Capital – hedge funds	277	5	282
Pharo Macro Fund, Ltd. – hedge funds	5,142,762	95,303	5,238,065
Resource Management Service Wildwood Timberlands, LLC – timber	663,016	12,287	675,303
Silchester International Investors – int'l developed equity	4,766,590	88,332	4,854,922
Silver Creek Special Opportunities Fund I & II – private equity	60,540	1,122	61,662
Silver Lake Partners II, LP – private equity	16,972	315	17,287
SIR Hedged Equity Fund, Ltd. – hedge funds	3,327,527	61,664	3,389,191
State Street Global Advisors – emerging markets	146,777	2,720	149,497
StepStone Capital Buyout Fund I & II, LP – private equity	1,004,297	18,611	1,022,908
StepStone Opportunities Fund II, LP – private equity	152,425	2,825	155,250
Stone Harbor Investment Partners, LP – emerging markets	198,428	3,677	202,105
Viking Global Equities III, Ltd. – hedge funds	223,225	4,139	227,364
Total investment management fees	96,649,483	1,791,064	98,440,547
Other investment fees			
Investment consultant fees			
Summit Strategies, Inc.	595,297	11,031	606,328
TimberLink Consulting	53,999	1,001	55,000
Investment custodial fees			
BNY Mellon	355,598	6,590	362,188
Performance and risk measurement fees			
BNY Mellon	175,805	3,258	179,063
MSCI, Inc.	275,273	5,101	280,374
Internal investment activity expenses	3,969,013	73,552	4,042,565
Total investing activity expenses	$ 102,074,468	$ 1,891,597	$ 103,966,065

Pension Trust Funds

Schedules of Internal Investment Activity Expenses | For the Year Ended June 30, 2018

	MSEP	Judicial Plan	Total
Personnel services			
Salaries	$ 2,334,228	$ 43,257	$ 2,377,485
Fringe benefits	867,883	16,083	883,966
Total personnel services	3,202,111	59,340	3,261,451
Professional services			
Attorney services	264,181	4,896	269,077
Consulting services	1,166	22	1,188
Total professional services	265,347	4,918	270,265
Communications			
Telephone	11,365	211	11,576
Total communications	11,365	211	11,576
Facilities			
Utilities	2,611	48	2,659
Lease expense	66,698	1,236	67,934
Depreciation	31,300	580	31,880
Facility maintenance	7,582	140	7,722
Vehicle maintenance and operation	210	4	214
Total facilities	108,401	2,008	110,409
Software and equipment			
Computer supplies and software	372	7	379
Depreciation	2,128	39	2,167
Loss on sale of equipment	488	9	497
Total software and equipment	2,988	55	3,043
Education, meetings and travel			
Tuition reimbursement	7,015	130	7,145
Professional development including travel	16,961	314	17,275
Due diligence travel	1,370	25	1,395
Total travel and meetings	25,346	469	25,815
General			
Research and information services	327,888	6,076	333,964
Membership dues	14,987	278	15,265
Office supplies	927	17	944
Periodicals and publications	9,653	180	9,833
Total general	353,455	6,551	360,006
Total internal investment activity expenses	$ 3,969,013	$ 73,552	$ 4,042,565

Pension Trust Funds

Schedules of Administrative Expenses | For the Year Ended June 30, 2018

	MSEP	Judicial Plan	Total
Personnel services			
Salaries	$ 4,524,603	$ 83,848	$ 4,608,451
Fringe benefits	2,104,730	39,004	2,143,734
Total personnel services	6,629,333	122,852	6,752,185
Professional services			
Actuarial services	252,360	4,677	257,037
Attorney services	322,434	5,975	328,409
Auditing services	74,838	1,387	76,225
Banking services	39,277	728	40,005
Consulting services	896,472	16,613	913,085
Total professional services	1,585,381	29,380	1,614,761
Communications			
Video production	1,449	27	1,476
Telephone	61,590	1,141	62,731
Printing	35,814	664	36,478
Postage and mailing	183,058	3,392	186,450
Total communications	281,911	5,224	287,135
Facilities			
Depreciation	108,516	2,011	110,527
Utilities	55,790	1,034	56,824
Facility maintenance	132,782	2,461	135,243
Vehicle maintenance and operation	4,533	84	4,617
Total facilities	301,621	5,590	307,211
Software and equipment			
Computer supplies and software	26,393	489	26,882
Depreciation	69,611	1,290	70,901
Maintenance agreements	347,057	6,431	353,488
Equipment rental	156,574	2,902	159,476
Gain on sale of equipment	(1,861)	(34)	(1,895)
Total software and equipment	597,774	11,078	608,852
Education, meetings and travel			
Board travel and meetings	38,445	712	39,157
Professional development including travel	85,566	1,586	87,152
MOSERS sponsored seminars	97,934	1,815	99,749
Due diligence travel	369	7	376
Tuition reimbursement	7,728	143	7,871
Total education, meetings and travel	230,042	4,263	234,305
General			
Advertising	3,132	57	3,189
Research and information services	52,855	979	53,834
Insurance	167,334	3,101	170,435
Membership dues	13,793	256	14,049
Business continuity	64,226	1,190	65,416
Office supplies	455	8	463
Periodicals and publications	96,321	1,785	98,106
Total general	398,116	7,376	405,492
Total administrative expenses	$10,024,178	$ 185,763	$10,209,941

Schedules of Professional Service Fees | For the Year Ended June 30, 2018

	Pension Trust Funds			Internal Service Funds		
Professional Services	MSEP	Judicial Plan	Total	Life and LTD	Deferred Compensation	Total
Operation administrative expenses						
Actuarial services						
Cavanaugh Macdonald Consulting, LLC	$ 252,360	$ 4,677	$ 257,037	$ 0	$ 0	$ 0
Attorney services						
Thompson Coburn, LLP	322,434	5,975	328,409	0	4,809	4,809
Auditing services						
Williams-Keepers, LLC	74,616	1,384	76,000	5,252	38,300	43,552
Banking services						
Central Bank	39,277	728	40,005	552	0	552
Consulting services						
Albert Slawsky – investment consulting	50,946	944	51,890	0	0	0
Charlesworth & Associates – risk management	7,411	137	7,548	0	0	0
Gamble & Schlemeier, Ltd. – governmental affairs	25,451	472	25,923	0	0	0
ICON Integration and Design, Inc. – pension administration system	381,474	7,069	388,543	0	0	0
Korn Ferry – personnel recruiting	94,253	1,747	96,000	0	0	0
Linea Solutions – pension administration system	149,216	2,765	151,981	0	0	0
Mosaic Governance Advisors, LLC – strategic planning	58,737	1,088	59,825	0	0	0
Secureworks – information technology	11,452	212	11,664	0	0	0
Sikich, LLP – strategic communications	20,497	380	20,877	0	0	0
Verus Advisory, Inc. – investment consulting	32,972	611	33,583	0	0	0
World Wide Technology – information technology	58,744	1,089	59,833	0	0	0
Miscellaneous services less than $2,500 each	5,541	102	5,643	240	0	240
Operations administrative expenses	1,585,381	29,380	1,614,761	6,044	43,109	49,153
Investment administrative expenses						
Legal services						
Purrington Moody Weil, LLP	4,985	92	5,077	0	0	0
Thompson Coburn, LLP	257,860	4,779	262,639	0	0	0
Miscellaneous services less than $1,500 each	2,502	47	2,549	0	0	0
Investment administrative expenses	265,347	4,918	270,265	0	0	0
Total professional fees	$1,850,728	$34,298	$1,885,026	$6,044	$43,109	$49,153

Information on investment management and consulting fees can be found in the *Schedule of Investment Expenses* on pages 67-68.

Internal Service Funds

Combined Statements of Net Position | As of June 30, 2018

	Life & LTD	Deferred Compensation	Total
Assets			
Premiums receivable	$ 945,148	$ 0	$ 945,148
Investments at fair value	3,973,375	320,878	4,294,253
Capital assets	0	23,370	23,370
Accumulated depreciation — fixed assets	0	(10,570)	(10,570)
Leasehold improvements	0	3,880	3,880
Accumulated depreciation — leasehold	0	(3,880)	(3,880)
Total assets	$ 4,918,523	$ 333,678	$ 5,252,201
Liabilities and net position			
Liabilities			
Premiums payable	$ 2,493,654	$ 0	$ 2,493,654
Deferred revenue	2,083,270	0	2,083,270
Other liabilities	387,708	9,457	397,165
Total liabilities	4,964,632	9,457	4,974,089
Unrestricted net (deficit) position	(46,109)	324,221	278,112
Total liabilities and net position	$ 4,918,523	$ 333,678	$ 5,252,201

Internal Service Funds

Combined Statements of Revenues, Expenses, and Changes in Net Position | For Year Ended June 30, 2018

	Life & LTD	Deferred Compensation	Total
Operating revenues			
Premium receipts	$ 31,119,232	$ 0	$ 31,119,232
Deferred compensation receipts	0	800,000	800,000
Miscellaneous income	480,120	0	480,120
Total operating revenues	31,599,352	800,000	32,399,352
Operating expenses			
Premium disbursements	31,100,612	0	31,100,612
Premium refunds	14,211	0	14,211
Administrative expenses	526,023	1,061,321	1,587,344
Total operating expenses	31,640,846	1,061,321	32,702,167
Net operating (loss)	(41,494)	(261,321)	(302,815)
Nonoperating revenues			
Investment income	79,389	6,417	85,806
Net revenues over (under) expenses	37,895	(254,904)	(217,009)
Net position (deficit) July 1, 2017	(84,004)	579,125	495,121
Net position (deficit) June 30, 2018	$ (46,109)	$ 324,221	$ 278,112

Internal Service Funds

Combined Statements of Cash Flows | For the Year Ended June 30, 2018

	Life & LTD	Deferred Compensation	Total
Cash flows from operating activities			
Cash received from employers and members	$ 31,621,295	$ 800,000	$ 32,421,295
Payments to outside carriers	(30,902,768)	0	(30,902,768)
Refunds of premiums to members	(14,211)	0	(14,211)
Cash payments to employees for services	(409,164)	(893,432)	(1,302,596)
Cash payments to other suppliers of goods and services	(121,570)	(161,509)	(283,079)
Net cash provided (used) by operating activities	173,582	(254,941)	(81,359)
Cash flows from noncapital financing activities			
Implicit funding of checks outstanding net of deposits	1,869	(837)	1,032
Implicit repayment of prior years checks outstanding net of deposits	(2,114)	1,069	(1,045)
Net cash (used) provided by noncapital financing activities	(245)	232	(13)
Cash flows from investing activities			
Purchase of investment securities	(1,179,900,849)	(95,285,299)	(1,275,186,148)
Proceeds from sale and maturities of investment securities	1,179,648,123	95,535,493	1,275,183,616
Cash received from investment income	79,389	6,417	85,806
Purchase of capital assets	0	(1,902)	(1,902)
Net cash (used) provided by investing activities	(173,337)	254,709	81,372
Net increase (decrease) in cash	0	0	0
Cash balances June 30, 2017	0	0	0
Cash balances June 30, 2018	$ 0	$ 0	$ 0
Reconciliation of net operating (loss) to net cash provided (used) by operating activities			
Net operating (loss)	$ (41,494)	$ (261,321)	$ (302,815)
Adjustments to reconcile net operating (loss) to net cash provided (used) by operating activities			
Depreciation expense	0	1,670	1,670
Change in assets and liabilities:			
Increase in operational accounts receivable	21,943	0	21,943
Increase in operational liabilities	193,133	4,710	197,843
Total adjustments	215,076	6,380	221,456
Net cash provided (used) by operating activities	$ 173,582	$ (254,941)	$ (81,359)

Internal Service Funds

Schedules of Administrative Expenses | For the Year Ended June 30, 2018

	Life and LTD	Deferred Compensation	Total
Personnel services			
Salaries	$ 289,593	$ 614,257	$ 903,850
Employee fringe benefits	119,571	279,174	398,745
Total personnel services	409,164	893,431	1,302,595
Professional services			
Attorney services	0	4,809	4,809
Auditing services	5,252	38,300	43,552
Banking services	792	0	792
Total professional services	6,044	43,109	49,153
Communications			
Postage and mailing	10,187	241	10,428
Telephone	4,322	9,065	13,387
Printing	2,513	877	3,390
Video production expense	102	1,312	1,414
Total communications	17,124	11,495	28,619
Facilities			
Building use charge	14	8,702	8,716
Utilities	3,915	0	3,915
Maintenance	9,427	0	9,427
Total facilities	13,356	8,702	22,058
Software and equipment			
Computer supplies and equipment	1,542	7,372	8,914
Depreciation	0	1,670	1,670
Equipment maintenance	24,341	8,131	32,472
Equipment rental	10,988	0	10,988
Total software and equipment	36,871	17,173	54,044
Education, meetings and travel			
Board travel and meetings	2,698	0	2,698
Professional development including travel	6,535	9,875	16,410
MOSERS sponsored seminars	6,873	50,308	57,181
Due diligence travel	26	3,379	3,405
Total education, meetings and travel	16,132	63,562	79,694
General			
Advertising	220	5,931	6,151
Research and information services	3,503	15,023	18,526
Insurance	11,743	0	11,743
Membership dues	968	2,125	3,093
Business continuity	6,759	0	6,759
Office supplies	4,107	770	4,877
Periodicals and publications	32	0	32
Total general	27,332	23,849	51,181
Total administrative expenses	$ 526,023	$ 1,061,321	$ 1,587,344

Investment Section

Chief Investment Officer's Report

Missouri State Employees' Retirement System
Mailing Address: PO Box 209, Jefferson City, MO 65102-0209
Phone: (573) 632-6100 • (800) 827-1063 | Fax: (573) 632-6103
MO Relay: 7-1-1 (Voice) • (800) 735-2966 (TTY)
Website: *www.mosers.org* | Email: *mosers@mosers.org*
Visit us at 907 Wildwood Drive, Jefferson City, MO

WE ARE HERE FOR YOUR BENEFIT.

October 19, 2018

Dear Members,

The MOSERS portfolio generated a time-weighted rate of return, based on market value, of 7.4% for fiscal year 2018. This was 2.6% better than the policy expectation of 4.8%. For the past two years, we have focused on achieving excess returns and reducing fees. Fiscal year 2018 continued the pattern of achievement around those goals.

We exceeded our expectations for the asset allocation by 2.6%. The overwhelming majority of the extra return came from our external alternative beta managers. However, staff's market positioning was additive to the result.

We also lowered management fees by $9 million in fiscal year 2018. This represents an approximate 15% year-over-year reduction in management fees. In addition, there was a $37 million year-over-year reduction in total fees paid because of a drop in incentive fees earned by external managers. Fiscal year 2018 fees reflected the work from prior years on reducing the number of illiquid alternative managers in the portfolio.

So, fiscal year 2018 was a good year. We earned more money than the asset allocation suggested possible at lower fees than the year before. In total, those efforts created about $260 million more than would have been expected by the asset allocation alone.

The negative for the year was simple – equity markets continued to perform well, which means diversification did not work in our favor this year. This year, more equities meant more return. However, the key to successful long-term portfolios is to diversify. Diversification simply is putting eggs into several baskets. While this year's results would have been better if we had put all of our eggs in the equity basket, that won't be the outcome in every year. We continue to remain confident that diversification will win in the long term.

As we plan for the future, our focus is on:

- Building a portfolio that better serves the needs of all of our stakeholders
- Continuing to reduce investment management fees
- Continuing to lead the industry in fee transparency

The investments staff continues working to set a higher standard for due diligence. We are implementing a due diligence process that equally incorporates the four distinct risk areas of manager/investment risk, quantitative risk, operational risk, and legal risk. The work product being created in the MOSERS investments department is second to none. This protects our fiduciary interests, because we can demonstrate that our processes are thorough and prudent.

I would like to thank the MOSERS Board of Trustees and Executive Director, Ronda Stegmann, for their continued support in all the above endeavors. As always, we are here for the benefit of our members and, in all ways, our efforts will continue to focus on strengthening MOSERS' already strong financial foundation.

Sincerely,

Seth Kelly
Chief Investment Officer

Investment Policy Summary

Guiding Principles

Critical to the financial security of present and future benefit recipients is the effectiveness and efficiency of the system's asset management program. The MOSERS Board of Trustees, charged with the responsibility for investing the assets of the system in a manner consistent with fiduciary standards set forth in the prudent person rule, has adopted the following fundamental principles to guide all investment-related decisions:

- Preserve the long-term corpus of the fund.
- Maximize total return within prudent risk parameters.
- Act in the exclusive interest of the system's members.

The investment policy summary serves as a reference point for management of system assets and outlines MOSERS' investment philosophy and practices. Investments within this report are presented on the basis of fair value using a variety of sources such as appraisals, valuations of underlying companies and assets for limited partnerships, and commingled funds, and through fair values obtained from the investment custodian.

Investment Objective

In keeping with the three guiding principles, the board has adopted the following broad investment objectives:

- Develop a real return objective (RRO) that will keep contribution rates reasonably level over long periods of time, absent changes in actuarial assumptions.
- Establish an asset allocation policy that is expected to meet the RRO over long periods of time, while minimizing the impact of the fund's volatility on the contribution rate.
- Monitor costs associated with the efficient implementation of the asset allocation through the use of internal and external resources.

Investment Beliefs

MOSERS' internal investment staff and external general asset consultant have arrived at investment beliefs, which are the foundation for implementation of the investment portfolio to achieve the board's objectives. These beliefs guide every decision made within MOSERS' portfolio and are the fundamental concepts underlying the MOSERS investment program. These beliefs are:

- **Portfolio construction should focus first on the allocation and balancing of risk; it is the allocation of risk that drives portfolio returns.** While investment returns receive a lot of public attention, understanding and balancing risk across asset classes improves the consistency of returns for a given level of risk and thus provides more stability in the contribution rate for the employer. Returns are the end product, where risks are the ingredients.
- **Diversification is critical because the future is unknown.** Reliable diversification requires a fundamental understanding of the economic drivers of risk and return. MOSERS' policy portfolio has been built upon the premise that very little is known about what the future holds. Therefore, it is rational to construct a portfolio that is believed to combat various economic conditions.
- **Every investment should be examined in the context of its potential return from beta (market return) and alpha (value added return); while separation is not always possible, every effort should be made to distinguish the two distinct return components.** Beta is the return which is expected to be earned by investing passively within a specific asset class or compensated risk premium. Exposures to beta can be purchased cheaply, and over long periods of time, the beta return should be positive and coincide with the risk associated with a given asset class. In contrast, alpha is the return generated through a manager's ability to select particular investments that perform better than the asset class as a whole. Alpha is a zero-sum game.
- **Regardless of the source of the return, it is important to construct the portfolio based on a conscious decision to include a certain amount of beta exposure in the portfolio and a certain amount of alpha exposure.** By consciously selecting this balance within the portfolio, staff is better able to manage the risks of the portfolio while ensuring the RRO is achieved.

- **Flexibility to opportunistically alter the portfolio away from risk-balanced when markets are driven to extremes as a result of short-term economic cycles is an important portfolio management tool.** As a result of the cyclical nature of the economy, asset classes or investment strategies may be more or less attractive relative to others in given time frames, thus marginal flexibility in the allocation policy provides the system with the opportunity to capitalize on this within prudent risk constraints. Under circumstances where the valuations of a particular asset class are compelling, it may make sense to modify the portfolio's allocation at the margins in order to capitalize on attractively valued opportunities without exposing the fund to additional risk.

Roles and Responsibilities

Board of Trustees

The board of trustees bears the ultimate fiduciary responsibility for the investment of system assets. Members of the board must adhere to state law and prudent standards of diligence with respect to their duties as investment fiduciaries. Accordingly, they are required to discharge their duties in the interest of plan participants. They must also "act with the same care, skill, prudence, and diligence under prevailing circumstances that a prudent person, acting in a similar capacity and familiar with those matters, would use in the conduct of a similar enterprise with similar aims."[1] Specifically related to investments, the board is charged with the duties of establishing and maintaining broad policies and objectives for the investment program along with the recommendations of staff and the external asset consultants.

Chief Investment Officer (CIO) and Internal Staff

The CIO reports directly to the board with respect to the investment program, but in all other respects reports to the executive director. The CIO has primary responsibility for the overall direction of the investment program. The CIO works with the external asset consultants and the board investment consultant in advising the board on policies related to the investment program. The CIO has primary responsibility to make hiring and termination decisions related to money managers with the approval of the external general asset consultant. The CIO is also responsible for making strategic allocation decisions with the approval of the external general asset consultant. Other responsibilities include monitoring the investment of system assets, overseeing external money managers and the internally managed portfolios, and keeping the board apprised of situations which merit their attention. The internal investment staff is accountable to the CIO.

Investment Management Consultants

Summit Strategies Group serves at the pleasure of the board as the system's general asset consultant. Their primary duty is to provide an independent perspective and oversight of the system's investment program. The general asset consultant must approve all manager hiring and termination decisions, as well as strategic allocation decisions made by the CIO. The general asset consultant also provides advice and input to the CIO and internal investment staff on investment-related issues and money manager searches.

Blackstone Alternative Asset Management, LP, the system's hedge fund asset consultant, serves at the pleasure of the board to provide an independent perspective and oversight of the system's hedge fund investment program. The hedge fund asset consultant must approve all hedge fund manager hiring and termination decisions and, additionally, provides advice and input to the CIO and internal investment staff on hedge fund program issues and manager searches.

Verus Advisory, Inc. serves at the pleasure of the board as the system's board investment consultant to provide investment advisory and oversight services to the board. Specifically, the board investment consultant assists the board in developing investment policy, recommends asset allocation policy, and assists in oversight of the investment program.

Chief Auditor

The chief auditor reports administratively to the executive director and functionally to the board. The chief auditor is independent of the system's investment operations and, among other duties, is responsible for providing objective audit and review services for the investment operations. It is the chief auditor's objective to promote adequate and effective internal controls at a reasonable cost.

Master Custodian

Bank of New York Mellon serves as the master custodian of the system's assets except in cases where investments are held in partnerships, commingled accounts, or unique asset classes where it is impossible for them to do so. The master custodian is responsible for maintaining the official book of records, providing performance reports, and serving as an additional layer of risk control in the safekeeping of system assets.

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[1] Section 105.688, RSMo - Investment Fiduciaries, Duties.

Asset Allocation

Determining the system's asset allocation is regarded as one of the most important decisions in the investment management process. The board, with advice from staff and external consultants, has developed a risk-weighted policy allocation that is designed to achieve the long-term required return objectives of the system, given certain risk constraints. The current allocation reflects the need for a diversified portfolio, which will perform well in a variety of economic conditions and will help reduce the portfolio's overall volatility. In determining the optimum mix of assets, the board considers five factors:

- The expected risk of each asset class.
- The expected rate of return for each asset class.
- The correlation between the rates of return of the asset classes.
- The investment objectives and risk constraints of the fund.
- The impact of the portfolio's volatility on the contribution rate.

While the board maintains a set policy allocation mix, they have taken steps to provide flexibility by granting authority to the CIO, with the approval of the general asset consultants, to make strategic allocation decisions to capitalize on attractively valued opportunities within prudent risk constraints. This flexibility has allowed the system to take advantage of changing market conditions. The table below shows the policy asset allocation and ranges formally adopted by the board in July 2016.

Asset Allocation

Beta-Balanced Portfolio	Risk Allocation Policy	Risk Allocation Ranges[1]	Benchmark Index[2]	Benchmark Weight
Opportunistic global equity	36%	25% - 47%	MSCI ACWI[3] + .75%	38%
Nominal bonds	24%	17% - 31%	Barclays Long Treasury	44%
Commodities	19%	13% - 25%	S&P GSCI/BCOM[4]	20%
Inflation-linked bonds	8%	5% - 10%	Barclays 1-10 TIPS	39%
Alternative beta	13%	9% - 17%	AQR DELTA[5]	31%

1 The board has granted the CIO the authority to alter the equal risk-weighted allocation policy. This authority exists within risk ranges as depicted in the table above. These risk ranges, like the policy allocation, are driven by the long-term volatility and correlation expectations for the five betas that make up the beta-balanced portfolio. The CIO will make these strategic allocation decisions away from the policy benchmark subject to consultation and agreement from the general asset consultant.

2 Benchmarks are net of MOSERS' actual leveraging costs on borrowed assets with the exception of the alternative beta benchmark which is net of management fees.

3 Morgan Stanley Capital International All Country World Index (net dividends). Legacy real estate and timber assets are benchmarked to the Dow Jones U.S. REIT Index and NCREIF Timber, respectively.

4 S&P Goldman Sachs Commodity Index/Bloomberg Commodity Index. The board approved a three-year transition from S&P GSCI to BCOM beginning August 1, 2016.

5 A diversified risk-balanced portfolio of liquid hedge fund risk premia managed by AQR Capital net of management fees.

Rebalancing

It is the responsibility of staff to ensure that the asset allocation adheres to the system's rebalancing policy. MOSERS utilizes a combination of cash market and exchange traded futures transactions to maintain the total fund's allocation at the broad policy level. Month-end reviews are conducted to bring the portfolio back within allowable ranges of the broad policy targets.

Risk Controls

MOSERS' investment program faces numerous risks; however, the primary risk to MOSERS is that the assets will not support the liabilities over long periods of time. In order to control this risk and numerous other risks that face the system, the board has taken the following steps, on an ongoing basis, to help protect the system:

- Actuarial valuations are performed each year to ensure the system is on track to meet the funding objectives of the plan. In addition, every five years an external audit of the actuary is conducted to ensure that the assumptions being made and calculation methods being utilized are resulting in properly computed liabilities.

- Asset/liability studies are conducted at least once every five years. The purpose of these studies is to ensure that the current portfolio design is structured to meet the system's liabilities. During these studies, investment expectations are also reexamined in more detail.
- A governance policy, which incorporates investment limitations, is in place to ensure that board policies are clearly identified. Within these documents, desired outcomes are identified, responsibilities for individuals are identified in relation to particular areas of the portfolio's management, and details are provided for measuring outcomes. Reporting requirements are clearly identified to ensure appropriate checks and balances are in place. In addition, annual performance audits are conducted to ensure the performance measurement tools and methodologies being utilized are proper.

Performance Objectives and Monitoring Process

Generating returns net of expenses equaling the RRO (5.0% in FY18) plus inflation remains the primary performance objective for the total fund.

The reason for the long-term focus on this objective is to preclude the temptation to overreact to events in the marketplace that have no relevance in the management of the relationship between the system's assets and liabilities. The resulting dilemma is the conflicting need to evaluate investment policy implementation decisions over shorter time frames while maintaining the longer-term focus necessary to manage and measure the fund's performance relative to the RRO. To address this problem, the board evaluates performance relative to policy and strategy benchmarks. This helps to evaluate the board's broad policy decisions and the staff and external consultant's implementation decisions. Policy benchmarks measure broad investment opportunities of each sub-asset class in which MOSERS has chosen to invest. The strategy benchmarks represent decisions made by the CIO to strategically deviate from the policy asset allocation for each sub-asset class. The return of the strategy benchmarks are determined based upon the actual weight of the asset class multiplied by the appropriate benchmark.

The policy and strategy benchmarks are used in the following manner to evaluate board and staff decisions:

- **Board Decisions:** The value added through board policy decisions is measured by the difference between the total fund policy benchmark return and the RRO. This difference captures the value added by the board through their policy asset allocation decisions relative to the return necessary to fund the system's liabilities. A policy benchmark return greater than the RRO reflects value added through board decisions. A policy benchmark return less than the RRO reflects losses or shortfalls in performance in funding the liabilities. These policy decisions are measured over long periods of time.
- **CIO and External Consultants' Decisions:** There are two components to decisions made by the CIO and external consultants, which are monitored by the board on an ongoing basis. They are: 1) strategic allocation decisions, and 2) implementation decisions.

Strategy decisions are made by the CIO, with the approval of the general asset consultant, to deviate from the policy benchmark weight. The difference between the strategy benchmark return and the policy benchmark return captures the value added by the CIO through strategic decisions to overweight or underweight asset allocations relative to the board's policy allocation decisions. A strategy benchmark return greater than the policy benchmark return reflects value added through the sub-asset class allocation decisions. A strategy benchmark return less than the policy benchmark return reflects losses to the fund's performance based upon strategy decisions. Strategy decisions should be measured over all periods of time with majority weight placed on outcomes that have occurred over a market cycle.

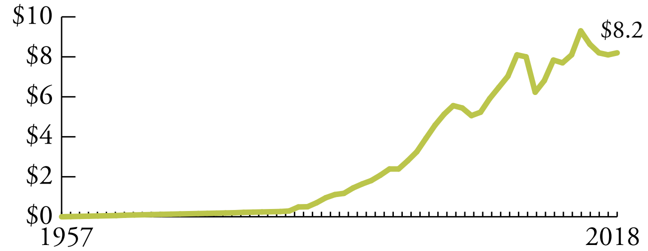
Implementation decisions are money manager selection choices made by the CIO with the approval of the appropriate external consultant that the decision was made in accordance with the board's adopted governance policy. The value added through these decisions is measured by the difference between the actual portfolio return and the strategy benchmark return. This difference captures the value added through these external manager selection decisions. An actual portfolio return greater than the strategy benchmark return reflects value added through these external manager selection decisions. An actual portfolio return less than the strategy benchmark return reflects losses to the fund's performance based upon implementation decisions. Implementation decisions should be measured over all periods of time with a majority weight placed on outcomes that have occurred over a market cycle.

The board reviews performance information on a quarterly basis to help ensure adequate monitoring of the fund's overall performance objectives.

Total Fund Review

As of June 30, 2018, the MOSERS investment portfolio had a fair value of $8.2 billion. The growth of MOSERS' portfolio since the system's inception is illustrated in the corresponding line graph.

Total Fund Growth (Billions)



Investment Performance

MOSERS' investments generated a time-weighted return of 7.4%, net of fees, for FY18. The total fund return exceeded the 1-year policy benchmark of 4.8%. This additional 2.6% investment return produced $200 million over what would have been earned if the fund had been invested passively in the policy benchmark.

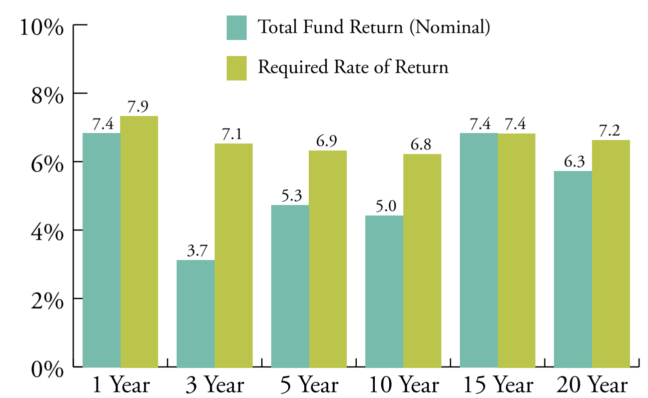
Investment Performance vs. Required Rate of Return

The total fund investment return is compared to a required rate of return. The required rate of return is established by the board to determine how well the fund is performing over the long term in order to meet future plan obligations after accounting for inflation. The required rate of return for FY18 is equal to the RRO of 5.0% plus inflation. The best known measure of inflation is the Consumer Price Index (CPI).[2]

Given the randomness of the investment markets, the portfolio should not be expected to meet the required rate of return every year. A review of long periods of time is best to evaluate whether or not the total return has kept pace with the system's funding objectives.

As indicated in the center graph, MOSERS' investment returns trailed the required rate of return by 0.9% over the 20-year period ended June 30, 2018.[3]

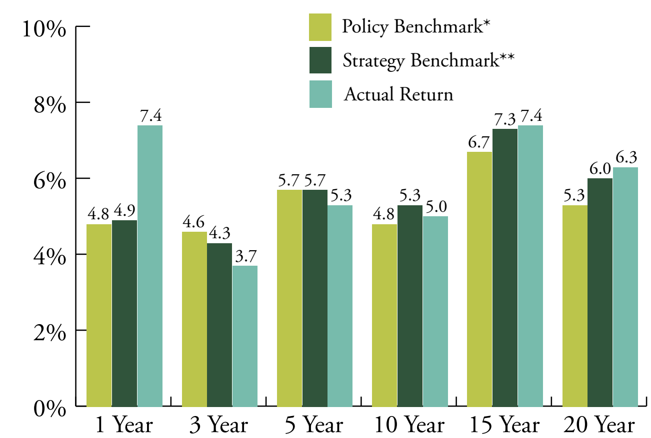
Total Fund Actual Return vs. Required Rate of Return



Investment Performance vs. Benchmark Comparisons

In addition to measuring performance relative to the required rate of return, the board also compares fund returns to the policy benchmark and the strategy benchmark. Returns for the total fund versus these benchmarks are displayed in the lower right graph.

Total Fund Actual Return vs. Benchmark Return



* As of June 30, 2018, the total fund policy benchmark was comprised of the following components: 38% MSCI ACWI Net + .75%, 44% Barclays Long Treasuries, 20% S&P GSCI/BCOM, 39% Barclays U.S. TIPS 1-10 YR, and 31% AQR Delta. All policy return components are adjusted for financing cost associated with the beta-balanced program.

** As of June 30, 2018, the strategy benchmark was comprised of the following components: 40.3% total opportunistic global equities strategy, 38.7% total nominal bonds strategy, 17.9% total commodities strategy, 36.7% total inflation-linked bonds strategy, and 27.8% total alternative beta strategy. All strategy return components are adjusted for financing cost associated with the beta-balanced program.

[2] CPI Source: United States Department of Labor, Bureau of Labor Statistics (not seasonally adjusted).

[3] Performance returns are calculated using a time-weighted rate of return on fair values.

The policy benchmark provides an indication of the returns that could have been achieved (excluding transaction costs) by a portfolio invested in the designated benchmarks for each asset class at the percentage weights allocated to each asset class in MOSERS' policy asset allocation. Comparison of the total return to the policy benchmark reflects the total value added or detracted by the CIO through strategic and manager implementation decisions. Value is added when the total fund return exceeds the policy benchmark return. The total fund 1-, 10-, 15-, and 20-year actual performance over performed its policy benchmark by 2.6%, 0.2%, 0.7% and 1.0% with the actual 3- and 5-year returns trailing the policy benchmarks by 0.9% and 0.4%, respectively.

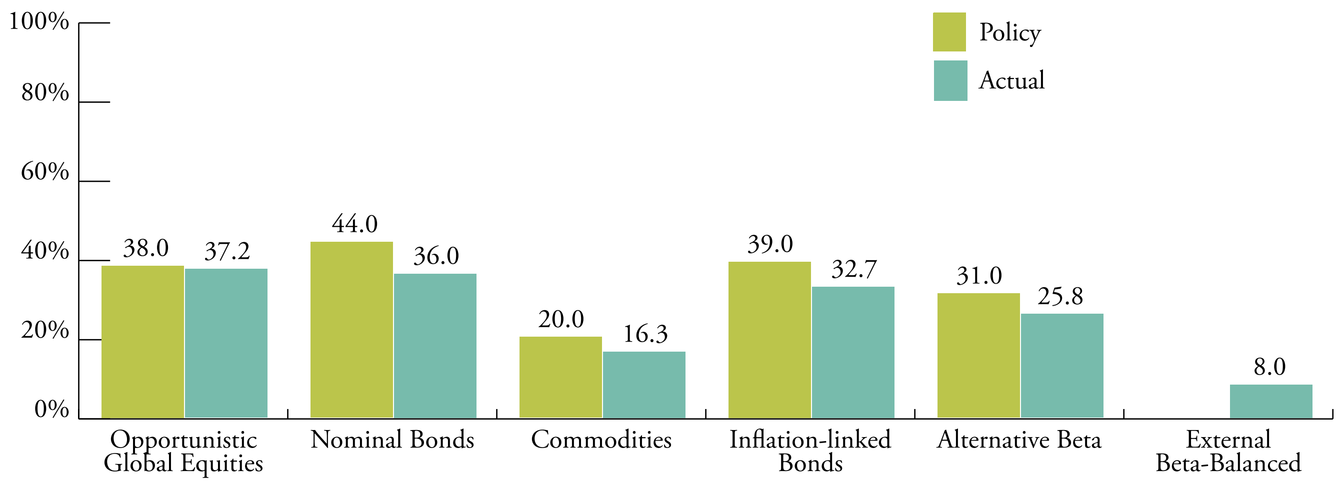
The strategy benchmark is more narrowly defined and focuses on sub-asset class allocation decisions made by the CIO. Comparison of the strategy benchmark to the policy benchmark reflects the component of value added or detracted which can be attributed to the strategic sub-class allocation decisions made by the CIO. Value is added when the strategy benchmark return exceeds the policy benchmark return. Comparison of the strategy benchmark to the total return reflects the component of the value added which can be attributed to the manager implementation (manager hiring and firing) decisions made by the CIO and approved by the external asset consultant. Value is added when the total fund return exceeds the strategy benchmark return.

Total Fund Policy Allocation Overview

As of June 30, 2018, the board's broad policy allocation mix was 38% opportunistic global equities, 44% nominal bonds, 20% commodities, 39% inflation linked bonds, and 31% alternative beta. The policy target, as of June 30, 2018, for each sub-asset class, along with the actual strategic allocation to each type of investment, is shown in the graph below.

The board has granted authority to the CIO to make strategic decisions. A strategic decision should be thought of as any decision that might cause MOSERS' actual portfolio to differ from the policy asset allocation. This has allowed MOSERS to capitalize on investment opportunities at the margin by overweighting asset classes that are viewed as "cheap" relative to their historical norm and underweighting asset classes that are "expensive" relative to their historical norm.

Total Fund Allocation | Policy vs. Actual (As a Percentage of the Total Fund)



The asset allocation is built upon the belief that diversification is critical. The tables below reflect the asset classes and their correlation to each other and the statistical performance data, net of fees, of the total fund, as of June 30, 2018.

Total Fund – Correlation Table (5 Years)

	Opportunistic Global Equities	Nominal Bonds	Commodities	Inflation-Linked Bonds	Alternative Beta
Opportunistic global equities	1.00				
Nominal bonds	(0.23)	1.00			
Commodities	0.46	(0.37)	1.00		
Inflation-linked bonds	0.17	0.63	0.13	1.00	
Alternative beta	0.38	0.18	(0.20)	0.16	1.00

Total Fund – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year	10 Year	15 Year	20 Year
Annualized return	7.4%	3.7%	5.3%	5.0%	7.4%	6.3%
Annualized standard deviation	5.1%	5.7%	6.1%	8.7%	7.8%	9.1%
Sharpe ratio	1.20	0.53	0.80	0.54	0.78	0.49
Excess return*	2.6%	(0.9)%	(0.4)%	0.2%	0.7%	1.0%
Beta*	0.73	0.81	0.85	0.75	0.76	0.83
Annualized alpha*	3.7%	0.0%	0.4%	1.3%	2.1%	1.8%
Correlation*	0.98	0.92	0.94	0.96	0.95	0.96
Value added in dollars**	$200M	$(283)M	$(242)M	$226M	$1.1B	$2.1B

* *As compared to the total fund policy benchmark.*

** *MOSERS' earnings above what would have been earned if assets had been invested passively.*

Schedule of Investment Portfolios by Asset Class | As of June 30, 2018

	Fair Value	Percentage of Investments at Fair Value	Market Exposure	Percentage of Investments at Market Exposure
Internal beta-balanced				
Opportunistic global equities	$ 2,901,667,761	35.6%	$ 3,040,786,070	37.2%
Nominal bonds	1,020,791,097	12.5	2,943,258,313	36.0
Commodities	446,412,239	5.5	1,327,951,329	16.3
Inflation-linked bonds	1,023,504,890	12.5	2,672,104,671	32.7
Alternative beta	2,110,615,527	25.8	2,110,615,527	25.8
Total internal beta-balanced	7,502,991,514	91.9	12,094,715,910	148.0
External beta-balanced	654,716,871	8.0	654,716,871	8.0
Residual accounts from old portfolio	2,132,751	0.0	2,132,751	0.0
Cash reserve	11,868,119	0.1	0	0.0
Grand total	$ 8,171,709,255	100.0%	$ 12,751,565,532	156.0%

Reconciliation to *Statements of Fiduciary Net Position*	
Total portfolio value	$ 8,171,709,255
Reverse repurchase agreements	3,853,968,794
Short-term investment fund (STIF)	(3,529,778,213)
Uninvested cash	(289,866)
Interest and dividends receivable	(49,694,604)
Other payables	2,915,084
Investment sales	(85,013,937)
Investment purchases payable	162,762,193
Fees payable	9,302,733
Investments per *Statements of Fiduciary Net Position*	$ 8,535,881,439

Schedule of Investment Advisors

Investment Advisors	Style	Portfolio Fair Value
Actis Emerging Markets	Opportunistic global equities – emerging markets	$ 40,813,422
AQR Capital Management	Alternative beta – multi-strategy	327,665,811
AQR Capital Management	External beta-balanced – risk parity	297,528,042
Axiom Asia Private Capital Associates	Opportunistic global equities – emerging markets	89,699,530
Axxon Group	Opportunistic global equities – emerging markets	29,342,341
Bayview Asset Management	Opportunistic global equities – opportunistic mortgages	7,459,811
Blackstone Alternative Asset Management	Alternative beta – fund-of-funds	205,209,053
Blackstone Real Estate Partners	Opportunistic global equities – active real estate	91,474,830
Blakeney Management	Opportunistic global equities – emerging markets	1,762,816
Bridgewater Associates	Alternative beta – global macro	115,220,885
Bridgewater Associates	External beta-balanced – risk parity	299,911,948
CarVal Investors	Opportunistic global equities – distressed real estate debt	13,900,000
Catalyst Capital Group	Opportunistic global equities – Canadian distressed debt	85,493,405
Cornwall Capital	Alternative beta – multi-strategy	17,262,998
DRI Capital	Opportunistic global equities – intellectual property	12,988,292
EIG Energy Partners	Opportunistic global equities – energy – mezzanine	69,427,634
Elliott Management Corporation	Alternative beta – multi-strategy	231,123,000
Farallon Capital Partners	Alternative beta – multi-strategy	1,880,474
Gaoling Fund	Opportunistic global equities – long/short – equity	160,352,387
Gateway Energy Partners	Opportunistic global equities – energy – diversified	12,511,704
Glenview Capital Management	Opportunistic global equities – long/short – equity	41,942,363
Glenview Capital Management Sidecar	Opportunistic global equities – active equity	66,620,964
Global Forest Partners	Opportunistic global equities – timberland	120,756,797
Harvest Fund Advisors	Opportunistic global equities – active MLP	40,510,071
HBK Capital Management	Alternative beta – merger arbitrage	121,279,322
JLL Partners	Opportunistic global equities – corporate buyout	22,849,074
King Street Capital Management	Alternative beta – credit driven	2,234,416
Linden Capital Partners	Opportunistic global equities – corporate buyout	28,807,406
Mast Capital Management	Alternative beta – credit driven	14,607,205
Merit Energy Company	Alternative beta – energy – oil & gas	4,910,313
MHR Fund Management	Alternerative beta – distressed debt	79,955,083
Millennium Technology Value Partners	Opportunistic global equities – direct secondaries	23,521,371
NISA Investment Advisors	Opportunistic global equities – passive equities	589,645,464
NISA Investment Advisors	Nominal bonds – passive long term U.S. treasuries	124,322,238
NISA Investment Advisors	Commodities – passive commodities	(34,554,106)
NISA Investment Advisors	Alternative beta – strategy	707,077,287
NISA Investment Advisors	Inflation linked bonds – passive TIPS	292,939,855
Oaktree Capital Management	Opportunistic global equities – corporate buyout	6,934,984
Oaktree Capital Management	Opportunistic global equities – distressed debt	20,135,858
Pharo Management	Alternative beta – global macro	57,167,960
Resource Management Service – Wildwood Timberlands	Opportunistic global equities – timberland	71,550,098
Silchester International Investors	Opportunistic global equities – active international equity	853,114,524
Silver Creek Capital Management	Opportunistic global equities – fund-of-funds (special situations)	20,007,255
Silver Lake Management Company	Opportunistic global equities – corporate buyout	2,283,614
SIR Capital Management	Alternative beta – equity market neutral	99,758,765
Siris Capital Group	Opportunistic global equities – corporate buyout	13,415,512
State Street Global Advisors	Opportunistic global equities – passive emerging markets	93,558,689
StepStone Group	Alternative beta – fund-of-funds corporate buyouts	12,293,716
Stone Harbor Investment Partners	Alternative beta – emerging market debt	50,879,885
TPG–Axon Capital Management	Alternative beta – multi-strategy	1,096,083
Visium Asset Management	Alternative beta – long/short – equity	1,344,567
Miscellaneous (each less than $1M)		3,616,044
Total investment advisors		$ 5,665,611,060

Total Fund – Top Ten Publicly Traded Separate Account Holdings

Ten Largest Holdings as of June 30, 2018*	Fair Value	Percent of the Total Fund
U.S. Treasury CPI Inflation – 1.250%, 2020	$ 155,556,149	1.89%
U.S. Treasury CPI Inflation – 0.250%, 2025	136,976,754	1.66
U.S. Treasury Bond – 2.500%, 2045	134,893,989	1.64
U.S. Treasury CPI Inflation – 0.125%, 2022	132,651,500	1.61
U.S. Treasury CPI Inflation – 0.125%, 2023	131,490,944	1.60
U.S. Treasury CPI Inflation – 0.375%, 2025	130,253,916	1.58
U.S. Treasury CPI Inflation – 0.125%, 2024	123,009,951	1.49
U.S. Treasury Bond – 3.000%, 2045	121,229,316	1.47
U.S. Treasury CPI Inflation – 0.625%, 2021	118,882,593	1.44
U.S. Treasury CPI Inflation – 0.125%, 2021	117,521,305	1.43

** For a complete list of holdings, contact MOSERS.*

Schedule of Investment Results* | 1-, 3-, 5-, 10-, 15- and 20-Year Periods

Total Fund – As of June 30, 2018, the total fund policy benchmark was comprised of the following components: 38% total opportunistic global equities policy, 44% total nominal bonds policy, 20% total commodities policy, 39% total inflation-linked bonds policy, and 31% total alternative beta policy. All policy return components are adjusted for financing cost associated with the beta-balanced program. This program did not begin until September 2012.

- *Opportunistic global equities* – As of June 30, 2018, the opportunistic global equities policy was MSCI ACWI Net + .75%. Legacy real estate and timber assets are benchmarked to the Dow Jones U.S. Select REIT Index and NCREIF Timber respectively.
- *Nominal bonds* – As of June 30, 2018, the total nominal bonds policy was Bloomberg Barclays Long Treasury.
- *Commodities* – As of June 30, 2018, the total commodities policy was 36.1% S&P GSCI and 63.9% BCOM.
- *Inflation-linked bonds* – As of June 30, 2018, the total inflation-linked bonds policy was Bloomberg Barclays U.S. TIPS 1-10 YR.
- *Alternative beta* – As of June 30, 2018, the total alternative beta policy was AQR Delta.

	1 Year	3 Year	5 Year	10 Year	15 Year	20 Year
Total fund*	7.4%	3.7%	5.3%	5.0%	7.4%	6.3%
Total fund policy benchmark	4.8%	4.6%	5.7%	4.8%	6.7%	5.3%
Opportunistic global equities	11.9%	7.5%	9.8%	7.9%	9.9%	N/A
Opportunistic global equities benchmark	10.2%	9.5%	11.1%	8.2%	9.2%	N/A
Nominal bonds	(1.3)%	2.7%	4.0%	N/A	N/A	N/A
Nominal bonds policy benchmark	(1.3)%	2.7%	4.0%	N/A	N/A	N/A
Commodities	14.8%	(10.1)%	(12.3)%	(11.5)%	(1.5)%	N/A
Commodities policy benchmark	16.9%	(7.7)%	(11.3)%	(13.3)%	(3.0)%	N/A
Inflation-linked bonds	0.0%	0.6%	0.6%	2.7%	4.0%	N/A
Inflation-linked bonds policy benchmark	0.5%	0.9%	0.8%	2.7%	4.0%	N/A
Alternative beta	3.0%	3.7%	5.2%	N/A	N/A	N/A
Alternative beta policy benchmark	(6.5)%	1.0%	2.6%	N/A	N/A	N/A
External beta-balanced	9.0%	4.9%	6.0%	N/A	N/A	N/A
Total fund policy benchmark	4.8%	4.6%	5.7%	N/A	N/A	N/A

* *Time-weighted rates of return on fair values adjusted for cash flows.*

Schedule of Investment Manager Fees | For the Year Ended June 30, 2018

	Total Fees	Manager Fees	Fund Pass Through Expenses (1)	Incentive Fees Earned and Paid in FY18	Portfolio Company Charges (2)
Actis Emerging Markets III	$ 407,000	$ 377,000	$ 30,000	$ 0	$ 0
Actis Emerging Markets IV	627,000	525,000	102,000	0	0
African Development Partners I, LLC	358,944	179,548	83,366	96,030	0
African Development Partners II, LLC	2,036,486	567,748	130,254	1,338,484	0
Alinda Infrastructure Fund I, LP	94,889	69,549	25,340	0	0
AQR DELTA Sapphire Fund, LP	3,970,165	3,534,269	435,896	0	0
AQR Global Risk Premium Fund IV, LP	2,446,877	2,082,827	364,050	0	0
AQR Style Premia Fund, LP	1,770,663	0	26,406	1,744,257	0
Astenbeck Capital Management	261,477	261,477	0	0	0
Axiom Asia Private Capital Fund II, LP	537,293	284,310	62,464	190,519	0
Axiom Asia Private Capital Fund III, LP	1,376,080	487,500	46,034	842,546	0
Axxon Brazil Private Equity Fund II B, LP	259,538	219,471	40,067	0	0
Bayview Opportunity Domestic III b, LP	1,154,333	353,011	216,887	584,435	0
Bayview Opportunity Domestic, LP	150,475	36,812	46,903	66,760	0
BlackRock Financial Management Bank Loans	(1,454)	(1,454)	0	0	0
Blackstone Real Estate Partners IV	175,361	0	36,902	138,459	0
Blackstone Real Estate Partners V	777,025	0	12,786	764,239	0
Blackstone Real Estate Partners VI	1,003,948	118,634	20,865	864,449	0
Blackstone Real Estate Partners VII	3,134,249	623,252	42,048	2,468,949	0
Blackstone Topaz Fund, LP	2,691,315	2,069,695	270,242	351,378	0
Blakeney Onyx, LP	615,832	334,494	242,566	38,772	0
Bridgewater Associates - All Weather @ 12%, LLC	1,997,733	1,681,375	316,358	0	0
Bridgewater Associates - Diamond Ridge Fund, LLC	3,949,106	3,784,820	164,286	0	0
Campbell Timber Fund II A, LP	1,238	1,238	0	0	0
CarVal Investors CVI Global Value Fund A, LP – private debt	27,375	0	27,375	0	0
CarVal Investors CVI Global Value Fund A, LP – real estate	27,375	0	27,375	0	0
Catalyst Fund III, LP	(2,839,875)	935,827	39,942	(3,815,644)	0
Catalyst Fund IV, LP	(748,308)	447,239	68,707	(1,264,254)	0
Catalyst Fund V, LP	1,844,167	1,977,504	173,938	(307,275)	0
Catterton Partners V, LP	47,473	37,212	8,443	0	1,818
Cornwall Domestic, LP	914,089	609,189	294,282	10,618	0
Davidson Kempner Institutional Partners, LP	378,889	146,240	54,901	177,748	0
DRI Capital - LSRC	367,620	0	167,321	200,299	0
EIG Energy Fund XIV, LP	305,486	274,260	31,226	0	0
EIG Energy Fund XV, LP	499,388	429,518	69,870	0	0
EIG Energy Fund XVI, LP	1,597,416	500,000	64,301	1,033,115	0
Elliott International, Ltd.	9,751,652	3,122,865	2,214,796	4,413,991	0
Farallon Capital Institutional Partners, LP	(129,633)	0	0	(129,633)	0
Gaoling Fund, LP	12,999,620	2,152,766	129,966	10,716,888	0
Garnet Sky Investors Company, Ltd.	8,838,921	505,966	120,840	8,212,115	0
Gateway Energy & Resource Holdings, LLC	377,385	7,602	355,763	14,021	0
Glenview Capital Opportunity Fund, LP	511,465	320,220	191,245	0	0
Glenview Sidecar	198,121	0	198,121	0	0

Schedule of Investment Manager Fees continued on page 88

Schedule of Investment Manager Fees continued from page 87

	Total Fees	Manager Fees	Fund Pass Through Expenses (1)	Incentive Fees Earned and Paid in FY18	Portfolio Company Charges (2)
Global Forest Partners GTI7 Institutional Investors Company, Ltd.	121,244	58,520	62,724	0	0
Harvest Fund Advisors, LLC	570,086	570,086	0	0	0
HBK Merger Strategies Offshore Fund, Ltd.	2,505,462	879,225	313,587	1,312,650	0
JLL Partners Fund V, LP	(1,922)	60,570	13,730	(76,222)	0
JLL Partners Fund VI, LP	3,154,025	338,083	26,947	2,788,995	0
King Street Capital, LP	204,519	69,290	0	135,229	0
King Street Capital, Ltd.	38,741	3,494	0	35,247	0
Linden Capital Partners II, LP	477,694	379,158	15,627	82,909	0
Mast Credit Opportunities I, LP	486,593	284,357	202,237	0	0
Merit Energy Partners F-II, LP	92,544	56,410	36,134	0	0
MHR Institutional Partners II A, LP	160,951	0	19,751	141,200	0
MHR Institutional Partners III, LP	740,674	319,643	26,790	394,241	0
MHR Institutional Partners IV, LP	922,593	853,761	68,832	0	0
Millennium Technology Value Partners II	1,437,893	438,750	36,640	962,503	0
NISA Investment Advisors	5,126,448	5,126,448	0	0	0
OCM Opportunities Fund IV b, LP	3,711	0	3,967	(256)	0
OCM Opportunities Fund VII b, LP	354,192	130,528	37,178	186,486	0
OCM Opportunities Fund VIII b, LP	326,616	250,631	49,295	26,690	0
OCM Power Opportunities III, LP	964,847	140,632	14,910	809,305	0
OCM Real Estate Opportunities Fund III, LP	9,859	0	27,714	(17,855)	0
OCM/GFI Power Opportunities Fund II, LP	(14,260)	0	31,517	(45,777)	0
Perry Partners, LP	282	282	0	0	0
Pharo Macro Fund, Ltd.	5,238,065	2,230,246	92,611	2,915,208	0
Resource Management Service – Wildwood Timberlands, LLC	675,303	372,580	28,606	274,116	0
Silchester International Investors	4,854,922	4,854,922	0	0	0
Silver Creek Special Opportunities Fund I, LP	27,112	0	27,112	0	0
Silver Creek Special Opportunities Fund II, LP	34,550	0	34,550	0	0
Silver Lake Partners II, LP	17,287	0	2,153	15,134	0
State Street Global Advisors	149,497	149,497	0	0	0
Standard Investment Research Hedged Equity Fund	3,389,191	1,979,894	165,935	1,243,361	0
StepStone Capital Buyout Fund I, LP	109,553	21,294	120,140	(31,881)	0
StepStone Capital Buyout Fund II, LP	913,355	64,752	30,664	817,939	0
StepStone Opportunities Fund II, LP	155,250	4,379	52,366	98,505	0
Stone Harbor Investment Partners	202,105	202,105	0	0	0
Viking Global Equities III, Ltd.	227,365	211,133	16,232	0	0
Grand totals	$98,440,547	$49,107,655	$8,512,081	$40,818,993	$ 1,818

(1) Fund Pass Through Expenses are administrative expenses charged to the fund and paid by the limited partners (including MOSERS), in addition to the management fee. These expenses may include, but are not limited to, accounting, audit, legal, and custody expenses directly related to the administration of the underlying fund investments.

(2) Portfolio Company Charges are fees/costs paid to the general partners of private equity funds which are not applied as offsets to gross management fees. These charges are paid by the underlying portfolio companies of the funds, and therefore, are indirectly paid by MOSERS.

Asset Class Summary

In general, an improved growth outlook and continued economic improvement led to positive returns for risk assets during the fiscal year. There was a divergence in asset class performance during the fiscal year with one asset class delivering a negative return and five delivering a positive return. Global equities returned 11.9% during the year after returning 15.3% during the past fiscal year. Nominal bonds were down 1.3% after being down 6.9% the prior fiscal year. Commodities were up 14.8% after being down 11.0% the prior fiscal year. Inflation-linked bonds returned just above 0% after being down 1.1% during the prior fiscal year. Alternative betas returned 3.0% during the fiscal year after being up 7.0% the prior fiscal year. The external beta-balanced portfolio returned 9.0% during the year after returning 6.7% the prior fiscal year.

Opportunistic Global Equities

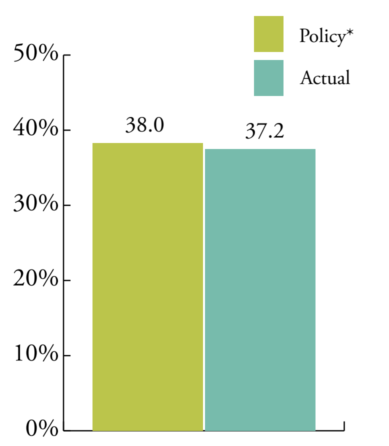
It is expected that investments in this asset class will perform well during periods of rising economic growth and/or falling inflation. Investments in this asset class include U.S. and non-U.S. equity investments with varying characteristics related to market capitalization and investment style. Because of the non-U.S. nature of some of these investments, foreign currency exposure will be part of this portfolio.

Global equities were up 11.9% during the fiscal year with most of it occurring in the first five months of the fiscal year. In a reversal from last year, equity returns were stronger in the U.S. than they were in international markets with U.S. equities up 14.5% for the fiscal year while developed international equities were up 7.0% and emerging markets were up 8.2%.

Within the U.S equity market, the information technology and consumer discretionary sectors performed best with returns of 31.3% and 23.5% during the fiscal year, respectively. The consumer staples and telecom sectors were the worst performing sectors with returns of negative 3.9% and positive 1.4%, respectively. Within developed equity markets (after adjusting for currency changes to the U.S. dollar), Norway and Portugal posted the best returns during the fiscal year with a 28.0% and 16.7% return, respectively. Israel and Sweden returned the least with (5.9%) and (3.8%), respectively.

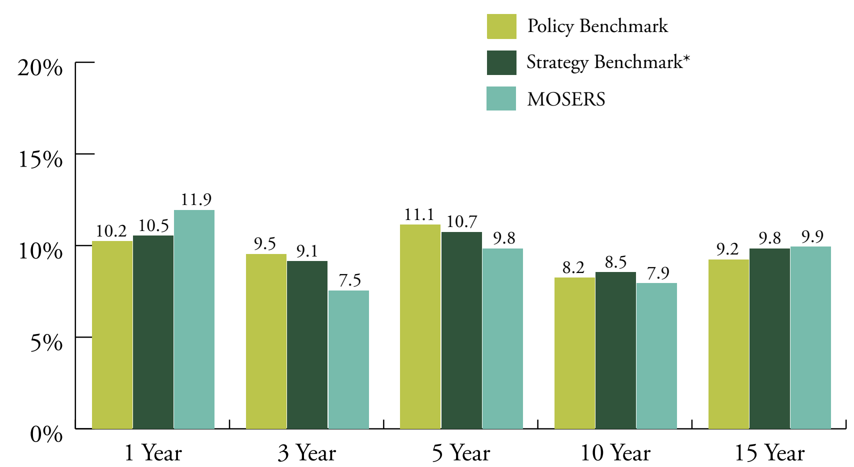
The market exposure of the equity portfolio on June 30, 2018, was $3,040,786,070, representing 37.2% of total fund market value. The graph below (left) illustrates the actual exposure compared to policy. For the fiscal year, the equity allocation returned 11.9% versus 10.2% for the global equity policy benchmark. The outperformance was driven by the opportunistic equity portfolio beating its benchmark by 4.2%. The graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.

Opportunistic Global Equities Allocation
(As a Percentage of the Total Fund)



* As of June 30, 2018, the opportunistic global equities policy was MSCI ACWI Net + .75%.

Opportunistic Global Equities Return vs. Benchmark Returns



* As of June 30, 2018, the total opportunistic global equities strategy benchmark was comprised of the following components: 32.6% actual return domestic equity exposure/MSCI US, 1.3% S&P MLP, 40.7% MSCI World ex. US (Net), 7.3% MSCI Emerging Markets (Net), 5.4% MSCI China, 6.4% Dow Jones Wilshire REIT, and 6.3% NCREIF Timber.

The tables below shows the schedule of brokerage activity and statistical performance that occurred within the opportunistic global equity portfolio in FY18.

Opportunistic Global Equities – Schedule of Brokerage Activity

	Shares Traded	Volume of Trades	Commissions Paid
Barclays Capital, Inc.	3,782	150,424	$ 106
Berstein Sanford C & Co.	214,541	5,357,899	1,073
Cantor Fitzgerald & Co.	100,000	1,649,962	3,000
Citigroup Global Markets, Inc.	1,037	32,418	31
Cowen and Co.	15,813	460,774	149
Credit Suisse	6,162	33,934,551	95,939
FBR Capital Markets	273,279	6,021,469	8,198
Goldman Sachs & Co.	2,863	68,032	59
Jefferies & Co., Inc.	889,815	22,475,044	4,449
Jonestrading Inst. Services	322	6,981	10
Merril Lynch Pierce Fenner Smith, Inc.	115,655	3,467,284	2,756
Morgan Stanley & Co., Inc.	64,418	341,348,395	488,853
National Financial Services Co.	229,507	3,552,008	6,885
RBC Capital Markets, LLC	592,755	17,201,485	3,214
UBS Securities, LLC	12,452	236,640	374
Weeden & Co.	40,435	1,168,091	447
Wells Fargo Securities, LLC	1,268,896	31,650,488	6,816
Total	3,831,732	468,781,946	$ 622,359

Opportunistic Global Equities – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year	10 Year	15 Year
Return	11.9%	7.5%	9.8%	7.9%	9.9%
Annualized standard deviation	6.9%	6.2%	6.2%	10.4%	9.6%
Sharpe ratio	1.53	1.11	1.51	0.73	0.90
Excess return*	1.7%	(2.0)%	(1.3)%	(0.3)%	0.7%
Beta*	0.91	0.59	0.60	0.68	0.70
Annualized alpha*	2.4%	1.9%	2.9%	2.1%	3.2%
Correlation*	0.92	0.85	0.87	0.94	0.93

* *As compared to the total opportunistic global equities policy benchmark.*

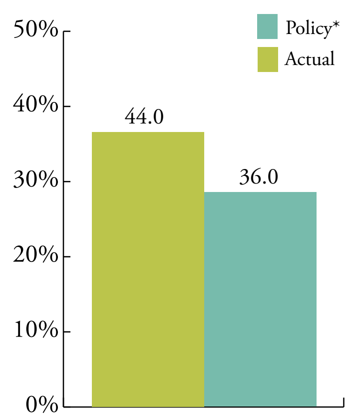
Nominal Bonds

It is expected that investments in this asset class will perform well in periods of falling economic growth and falling inflation. Investments in this asset class include U.S. bonds that have been issued, collateralized or guaranteed by the U.S. Government, its agencies, or its instrumentalities. Because this asset class is invested in all U.S. bonds, there is currently no foreign currency exposure as part of this portfolio.

The United States underperformed other developed countries' nominal bond markets over the past year. In the United States, the 10-year treasury rate increased a little over 0.5% as the Federal Reserve continued tightening monetary policy by increasing short-term interest rates. Longer-term treasuries outperformed shorter-term treasuries during the fiscal year. For example, treasuries with a maturity of 20 years and longer returned 0.03%, while treasuries with a maturity under 10 years returned (.76%). Among developed markets, Canada posted the worst 7- to 10-year maturity nominal bond performance with (2.5%), followed by South Africa with a (2.0%) return. The best performing developed markets were Spain and France with returns of 6.3% and 5.6%, respectively. This compares to the United States that returned (1.8%), which was below the global bond return of 2.2%.

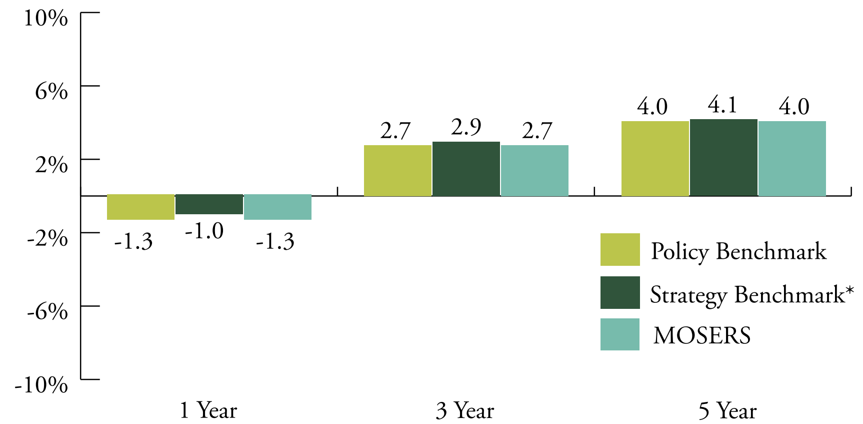
As of June 30, 2018, the market exposure of the nominal bond portfolio was $2,943,258,313, representing 36.0% of total market value. The graph below (left) illustrates the actual exposure compared to policy. For the fiscal year, the nominal bond allocation matched the nominal bond policy benchmark at (1.3%). A strategic decision preferring to own TIPS in lieu of nominal treasuries improved performance while implementation decisions were a small drag on performance, resulting in performance being in line with the benchmark. The graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.

Nominal Bonds Allocation
(As a Percentage of the Total Fund)



* As of June 30, 2018, the total nominal bonds policy was Bloomberg Barclays Long Treasury.

Nominal Bonds Return vs. Benchmark Returns



* As of June 30, 2018, the total nominal bonds strategy benchmark was comprised of the following components: 95.0% total nominal bonds policy and 5.0% Barclays U.S. Treasury Inflation Notes 10+ Year.

The table below shows the statistical performance that occurred within the nominal bond portfolio in FY18. There was no commission brokerage activity within the nominal bond portfolio in FY18.

Nominal Bonds – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year
Return	(1.3)%	2.7%	4.0%
Annualized standard deviation	7.7%	8.5%	9.3%
Sharpe ratio	(0.35)	0.24	0.39
Excess return*	0.0%	0.0%	0.0%
Beta*	0.97	0.95	0.96
Annualized alpha*	(0.1)%	0.2%	0.1%
Correlation*	1.00	1.00	1.00

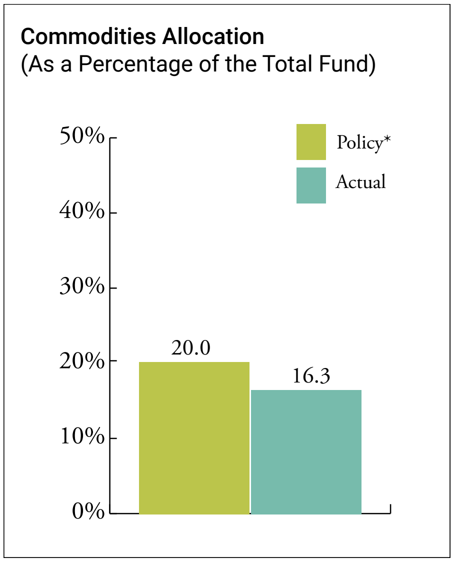
** As compared to the total nominal bonds policy benchmark.*

Commodities

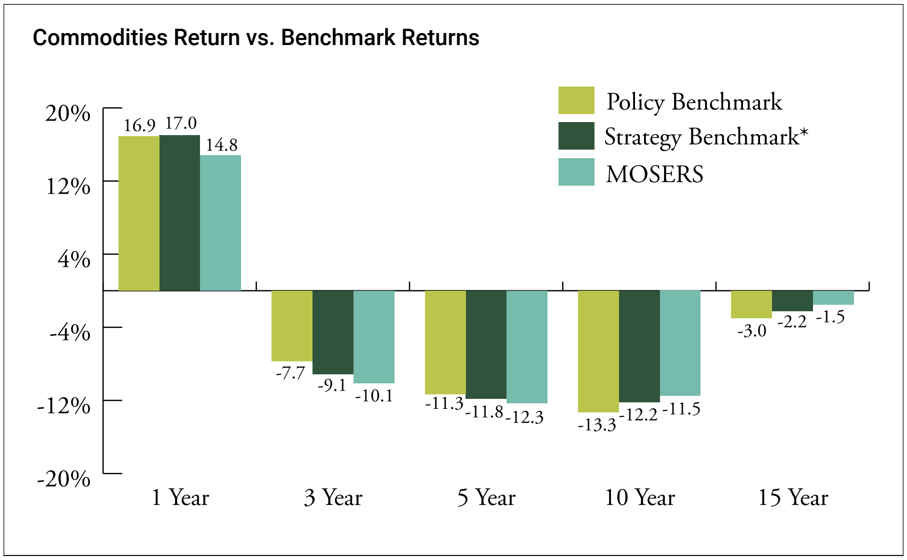
It is expected that investments in this asset class will perform well during periods of rising economic growth and rising inflation. Investments in the asset class may include investments in raw materials, materials required in the manufacturing of finished products, the owners of raw goods, and the producers of raw materials. Because this asset class is invested in all U.S. dollar denominated commodities there is no currency exposure as part of this portfolio.

Commodities reversed last year's poor performance as a result of two of the four commodity sectors producing positive returns this fiscal year. Energy, after producing the worst return in FY17 (14.8%), produced the best return in FY18 up 32.8%, followed by industrial metals at 13.6%. The two commodity sectors that were negative for the fiscal year were precious metals (2.2%) and agriculture (14.5%). Within these sectors, Brent crude oil and WTI crude oil performed best with 67.2% and 56.7% returns, respectively. The worst performing commodities during the fiscal year were wheat and natural gas with (22.1%) and (19.0%) returns respectively.

As of June 30, 2018, the market exposure of the commodities portfolio was $1,327,951,329, representing 16.3% of the total market value. The graph below (left) illustrates the actual exposure compared to policy. For the fiscal year, the commodity allocation returned 14.8% versus 16.9% for the commodity policy benchmark. The primary driver of the underperformance was an underweight to energy via an external active manager. The graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.



* As of June 30, 2018, the commodities policy was S&P GSCI and BCOM.



* As of June 30, 2018, the total commodities strategy benchmark was comprised of the following components: 19.2% Goldman Sachs Commodity Index, 10.0% Bloomberg Commodity Index, 60.8% Bloomberg Roll Select Commodity Index, 6.3% S&P GSCI Crude Oil Index and 3.7% S&P GSCI Brent Crude Index.

The table below shows the statistical performance that occurred within the commodities portfolio in FY18. There was no commission brokerage activity within the commodities portfolio in FY18.

Commodities – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year	10 Year	15 Year
Return	14.8%	(10.1)%	(12.3)%	(11.5)%	(1.5)%
Annualized standard deviation	7.1%	17.7%	18.6%	23.0%	22.8%
Sharpe ratio	1.89	(0.61)	(0.68)	(0.51)	(0.12)
Excess return*	(2.1)%	(2.4)%	(1.0)%	1.8%	1.5%
Beta*	0.94	1.07	1.06	1.02	1.01
Annualized alpha*	(1.0)%	(1.9)%	(0.3)%	2.4%	1.7%
Correlation*	0.99	0.99	0.99	0.98	0.98

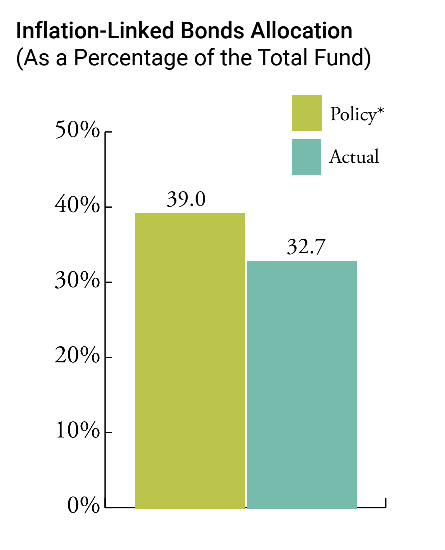
** As compared to the total commodities policy benchmark.*

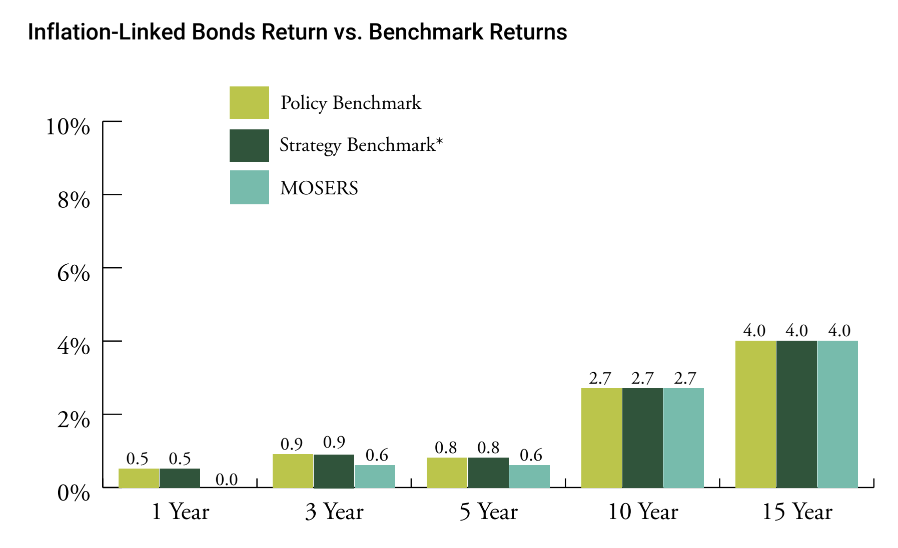
Inflation-Linked Bonds

It is expected that investments in this asset class will perform well during periods of falling economic growth and rising inflation. Investments in this asset class include U.S. bonds that have been issued, collateralized or guaranteed by the U.S. Government, its agencies, or its instrumentalities. All such securities must derive a significant portion of their value from changes in the respective issuer's domestic inflation. Because this asset class is invested in all U.S. bonds, there is no foreign currency exposure as part of this portfolio.

The United States underperformed other developed countries' inflation-linked bond markets over the past year. Inflation in the U.S. increased during the fiscal year to 2.9% year-over-year versus 1.6% as of June 30, 2017. The 10-year real rate (the interest rate after subtracting the inflation rate) on U.S. Treasury Inflation Protected Securities ("TIPS") increased about 0.2% during the fiscal year resulting in slightly lower performance for inflation-linked bonds. U.S. TIPS returned 2.1% as compared to inflation-linked bonds in Canada, 2.8%; Germany, 7.4%; Great Britain, 3.5%; and Japan, 3.0%.

As of June 30, 2018, the market exposure of the inflation-linked bond portfolio was $2,672,104,671, representing 32.7% of total market value. The graph below (left) illustrates the actual exposure compared to policy. For the fiscal year, the inflation-linked bond allocation returned just above 0% versus 0.5% for the inflation-linked bond policy benchmark. There was no internal or external active management strategy utilized during the year; thus providing a return that closely matched the benchmark. The graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.





* As of June 30, 2018, the inflation-linked bonds policy was Bloomberg Barclays U.S. TIPS 1-10 YR.

* As of June 30, 2018, the inflation-linked bonds strategy benchmark is equal to the inflation-linked bonds policy.

The table below shows the statistical performance that occurred within the inflation-linked bond portfolio in FY18. There was no commission brokerage activity within the inflation-linked bond portfolio in FY18.

Inflation-Linked Bonds – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year	10 Year	15 Year
Return	0.0%	0.6%	0.6%	2.7%	4.0%
Annualized standard deviation	1.7%	2.3%	2.9%	5.7%	6.1%
Sharpe ratio	(0.76)	(0.04)	0.06	0.41	0.45
Excess return*	(0.4)%	(0.4)%	(0.2)%	(0.1)%	0.0%
Beta*	0.98	0.99	1.00	1.00	1.00
Annualized alpha*	(0.4)%	(0.4)%	(0.2)%	(0.1)%	0.0%
Correlation*	1.00	1.00	1.00	1.00	1.00

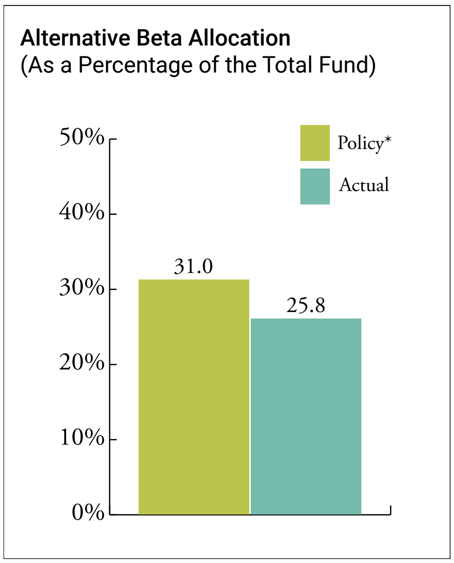
** As compared to the total inflation-linked bonds policy benchmark.*

Alternative Beta

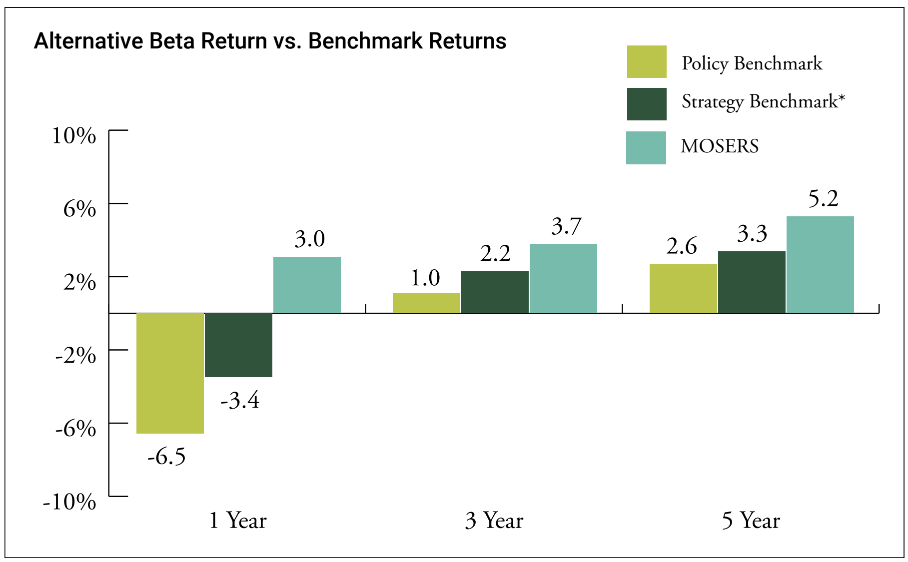
This asset class represents multiple hedge funds and alternative betas. The hedge funds have been selected because they invest in difficult to obtain risk premiums or they are expected to produce excess return over an otherwise easy to obtain risk premium. Hedge fund betas are expected to produce positive risk premia and are obtained passively at fees lower than active management fees. As a result of the multitude of strategies being deployed, it is expected that this asset class will provide meaningful diversification to the portfolio. While the sensitivities to economics will be dependent on positioning at the time, it expected that these betas will have their best returns in rising growth environments and their worst returns in falling growth environments. Because of the non-U.S. nature of some of these investments, foreign currency exposure will be part of this portfolio.

The alternative beta benchmark performed poorly during the fiscal year led by weak performance from dedicated short bias and equity market neutral strategies which returned (26.7%) and (17.8%), respectively. Long/short equity and event driven strategies had the best performance as they returned 19.9% and 4.9% during the fiscal year, respectively.

As of June 30, 2018, the market exposure of the alternative beta portfolio was $2,110,615,527, representing 25.8% of total market value. The graph below (left) illustrates the actual exposure compared to policy. The alternative beta allocation returned 3.0% for the fiscal year versus (6.5%) for the alternative beta policy benchmark. The outperformance was attributable to active hedge fund managers who collectively represented approximately 40% of the allocation and returned 7.6% for the year. There was also outperformance due to the passive alternative beta strategies that returned (0.5%) for the fiscal year. The graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.



* As of June 30, 2018, the alternative beta policy was AQR Delta.



* As of June 30, 2018, the total alternative beta strategy benchmark was comprised of the following components: 70.3% total alternative beta policy, 2.5% JPM GBI-EM Global Diversified, 11.3% S&P Systematic Global Macro Index, 15.3% Bloomberg Barclays U.S. Aggregate Excess Return plus 90-day T-bill and 0.7% actual return of one strategy.

The table below shows the statistical performance that occurred within the alternative betas portfolio in FY18. There was no commission brokerage activity within the alternative betas portfolio in FY18.

Alternative Beta – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year
Return	3.0%	3.7%	5.2%
Annualized standard deviation	2.5%	2.2%	2.5%
Sharpe ratio	0.65	1.41	1.94
Excess return*	9.5%	2.6%	2.6%
Beta*	0.30	0.19	0.25
Annualized alpha*	4.9%	3.4%	4.4%
Correlation*	0.87	0.53	0.62

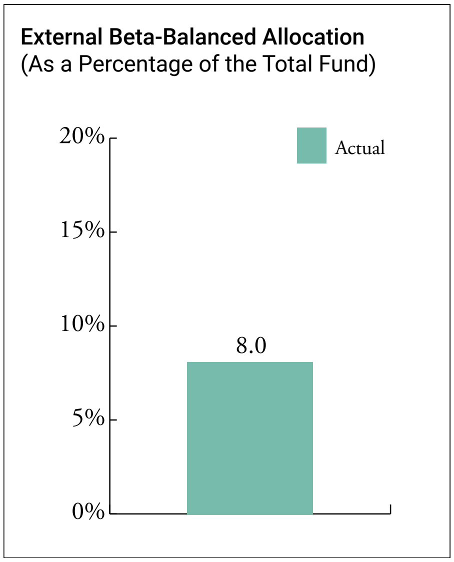
**As compared to the total alternative betas policy benchmark.*

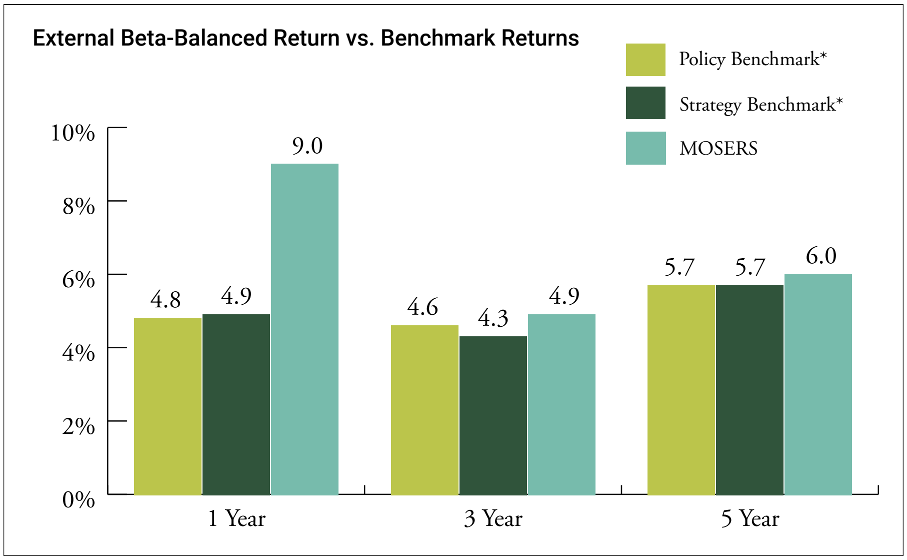
External Beta-Balanced

Bridgewater All-Weather and AQR Global Risk Premium are utilized for the external portion of the risk-balanced portfolio, while the internal portion is managed by staff utilizing NISA Investment Advisors to implement the trading and operational aspects of the program.

Bridgewater returned 8.9% for the fiscal year after returning 6.2% last fiscal year. AQR returned 9.1% for the fiscal year after returning 7.1% last fiscal year. This fiscal year performance of both managers was above median compared with other risk parity managers. These active managers invest in similar asset classes as the internal portfolio but hold them in different weights and implement different active portfolio management decisions.

As of June 30, 2018, the external beta-balanced portfolio returned 9.0% for the fiscal year and represented 8.0%, or $654,716,871 of market value. The graph below (left) illustrates the actual exposure of the allocation. There is no policy allocation to the external beta-balance. These managers hold similar asset classes but can have different weights to those asset classes as compared to their benchmark. As a portfolio, these two managers outperformed their benchmark for the year by 4.2%. The graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.





* As of June 30, 2018, the external beta-balanced policy benchmark was equal to the MOSERS' total fund policy benchmark and the strategy benchmark was equal to the MOSERS' total fund strategy benchmark.

The table below shows the statistical performance that occurred within the external risk parity portfolio in FY18. There was no commission brokerage activity within the external risk parity portfolio in FY18.

External Beta-Balanced – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year
Return	9.0%	4.9%	6.0%
Annualized standard deviation	6.0%	8.0%	8.5%
Sharpe ratio	1.28	0.53	0.67
Excess return*	4.2%	0.3%	0.3%
Beta*	0.83	1.10	1.17
Annualized alpha*	4.7%	(0.1)%	(0.5)%
Correlation*	0.95	0.90	0.92

**As compared to the total policy benchmark.*

Securities Lending Program

During the fiscal year ending June 30, 2018, MOSERS did not earn any income through its securities lending program. MOSERS lends its domestic equity, international equity and fixed income securities through Deutsche Bank which manages the program in an agent capacity. In an agent lending program, the agent lender is responsible for making the loans to various broker-dealers, investing the cash collateral associated with the loaned securities, marking the loans and collateral to market on a daily basis, and, in most cases, indemnifying the lender against the default of a broker-dealer to whom they have loaned securities on behalf of the beneficial owner.

In fiscal year 2018, there was no income from domestic equity, international equity or fixed income. There were no loans outstanding during the fiscal year. The tables as titled below show the last 10 years of activity for the securities lending program.

Domestic Equity

Fiscal Year	Average Lendable	Average on Loan	Average Utilization	Lending Margin (Basis Points)	Net Income (Loss)
2009	$ 307,082,718	$ 114,261,769	37.2%	52.0	$ 1,596,245
2010	321,114,801	83,944,408	26.1	26.9	864,401
2011	376,047,357	111,263,248	29.6	16.5	619,648
2012	424,041,044	145,373,164	34.3	19.1	810,972
2013	238,024,131	69,543,634	29.2	25.1	596,941
2014	187,154,236	62,768,614	33.5	22.6	422,422
2015	168,456,525	53,517,452	31.8	6.9	116,204
2016	117,553,687	36,503,528	31.1	0.0	(49)
2017	36,343,073	4,063,557	11.2	6.0	21,896
2018	0	0	0.0	0.0	0

International Equity

Fiscal Year	Average Lendable	Average on Loan	Average Utilization	Lending Margin (Basis Points)	Net Income
2009	$ 342,215,198	$ 32,267,851	9.4%	14.9	$ 510,622
2010	277,251,343	19,736,528	7.1	4.0	109,946
2011	320,082,404	88,623,017	27.7	10.4	333,000
2012	309,052,299	47,666,253	15.4	7.5	230,655
2013	192,359,434	49,525,171	25.7	5.6	108,379
2014	0	0	0.0	0.0	0
2015	0	0	0.0	0.0	0
2016	0	0	0.0	0.0	0
2017	0	0	0.0	0.0	0
2018	0	0	0.0	0.0	0

Fixed Income

Fiscal Year	Average Lendable	Average on Loan	Average Utilization	Lending Margin (Basis Points)	Net Income
2009	$ 859,512,525	$ 517,356,516	60.2%	43.3	$ 3,722,523
2010	836,242,270	190,547,907	22.8	2.8	230,031
2011	805,579,308	505,690,676	62.8	7.2	581,875
2012	776,256,144	516,553,974	66.5	6.4	496,074
2013	622,620,959	427,442,773	68.7	5.1	315,060
2014	247,256,630	185,527,243	75.0	4.4	108,552
2015	0	0	0.0	0.0	0
2016	0	0	0.0	0.0	0
2017	0	0	0.0	0.0	0
2018	0	0	0.0	0.0	0

Actuarial Section

Actuary's Certification Letter

Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

October 19, 2018

The Board of Trustees
Missouri State Employees' Retirement System
907 Wildwood Drive
Jefferson City, Missouri 65109

Dear Members of the Board:

At your request, we have performed an actuarial valuation of the Missouri State Employees' Retirement System (MOSERS) as of June 30, 2018, for the purpose of determining contribution rates for fiscal year 2020. Actuarial valuations are prepared annually for the Missouri State Employees' Plan (MSEP) and the Judicial Plan. The board of trustees is responsible for establishing and maintaining the funding policies for both plans. The major findings of the valuations are contained in this section, which reflects the plan provisions in place on June 30, 2018, as amended by legislation passed by the 2018 legislature.

There have been no new plan provisions reflected since the prior valuation. However, based on authority granted by legislation in 2017, the board of trustees established a voluntary buyout program for inactive-vested members. The program allowed members to voluntarily elect to cash out their future monthly benefit in exchange for a one-time lump sum payment equal to 60% of the actuarial present value of their retirement benefit.

In July 2018, after extensive analysis, the MOSERS board adopted a 7.25% assumed nominal rate of investment return, effective with the June 30, 2018 actuarial valuation, along with a schedule to systematically lower the assumed nominal rate of investment return by 15 basis points per year until reaching 6.95% in the June 30, 2020 actuarial valuation.

In preparing our report, we relied, without audit, on information (some oral and some in writing) supplied by the system's staff. This information includes, but is not limited to, statutory provisions, member data, and financial information. We found this information to be reasonably consistent and comparable with information used for other purposes. The valuation results depend on the integrity of this information. If any of this information is inaccurate or incomplete, our results may be different and our calculations may need to be revised.

We further certify that all costs, liabilities, and other factors for the plans have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of the plans and reasonable expectations); meet applicable Actuarial Standards of Practice (ASOPs); and which, in combination, offer our best estimate of anticipated experience affecting the plans. Nevertheless, the emerging costs of the plans will vary from those presented herein to the extent actual experience differs from that projected by the actuarial assumptions. The board of trustees has the final decision regarding the appropriateness of the assumptions and adopted them, as indicated in Appendix D of our *MSEP Actuarial Valuation Report* and Appendix C of our *Judges Actuarial Valuation Report*.

3906 Raynor Pkwy, Suite 106, Bellevue, NE 68123
Phone (402) 905-4461 • Fax (402) 905-4464
www.CavMacConsulting.com
Offices in Englewood, CO • Kennesaw, GA • Bellevue, NE

The Board of Trustees
October 19, 2018
Page 2

Future actuarial measurements may differ significantly from the current measurements presented in the June 30, 2018 valuation reports 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. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of future measurements.

Actuarial computations presented in this section are for purposes of determining the recommended and statutory funding amounts for the plans. The calculations have been made on a basis consistent with our understanding of the plans' funding requirements and goals. Determinations for purposes other than meeting these requirements may be significantly different from the results shown in the June 30, 2018 valuation reports. Accordingly, additional determinations may be needed for other purposes.

We provided the information used by staff to prepare the following schedules in the *Actuarial Section*: *Schedules of Funding Progress*, *Active Members by Attained Age and Years of Service*, *Schedules of Active Member Valuation Data*, *Short-Term Solvency Test*, and *Analysis of Financial Experience*. We also provided the information used by staff to prepare the following schedules in the *Financial Section*: *Schedule of Employers' Net Pension Liability*, *Sensitivity of Net Pension Liability to Changes in the Discount Rate*, *Schedule of Changes in Employers' Net Pension Liability* and the *Schedule of Employer Contributions*.

Actuarial computations, based on the actuarial valuations performed as of June 30, 2018, were also prepared as of June 30, 2018, for purposes of fulfilling financial accounting requirements for the plans under Governmental Accounting Standard Number 67 (GASB 67). The assumptions used in the funding valuation were also used for GASB 67 calculations (7.25% is the assumed rate of return used in the funding valuation). In addition, the entry age normal actuarial cost method, which is required to be used under GASB 67, is also used in the funding valuations. The actuarial assumptions and methods meet the parameters set by ASOPs, as issued by the Actuarial Standards Board, and generally accepted accounting principles (GAAP) applicable in the United States of America as promulgated by the Governmental Accounting Standards Board (GASB). Additional information related to GASB 67 can be found in the *Financial Section* of this report.

The consultants who worked on this assignment are pension actuaries. Cavanaugh Macdonald Consulting, LLC's advice is not intended to be a substitute for qualified legal or accounting counsel.

We certify that, to the best of our knowledge and belief, the June 30, 2018 actuarial valuation reports are complete and accurate and have been prepared in accordance with generally recognized and accepted actuarial principles and practices. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.

Patrice Beckham

Patrice A. Beckham, FSA, EA, FCA, MAAA
Principal and Consulting Actuary

Bryan K. Hoge, FSA, EA, FCA, MAAA
Senior Actuary

Summary of Actuarial Assumptions

Actuarial Methods

Calculation of normal cost and actuarial accrued liability

The funding method used to determine the normal cost and actuarial accrued liability was the entry age actuarial cost method described below.

- **Entry age actuarial cost method** – Under the entry age normal cost method, the actuarial present value of each member's projected benefit is allocated on a level basis over the member's compensation between the entry age of the member and their assumed exit age. The portion of the actuarial present value allocated to the valuation year is called the normal cost. The actuarial present value of benefits allocated to prior years of service is called the actuarial accrued liability. The unfunded actuarial accrued liability represents the difference between the actuarial accrued liability and the actuarial value of assets as of the valuation date. The unfunded actuarial accrued liability is calculated each year and reflects experience gains/losses.
- **Calculation of the actuarial value of assets (AVA)** – The board adopted a new asset smoothing method effective with the June 30, 2018 valuation. Under the new method, the difference between the actual and assumed investment return on the market value of assets is recognized evenly over a five-year period. No corridor is used with the new method. In addition, the total unrecognized investment experience as of June 30, 2017, will be recognized evenly over a seven-year period beginning June 30, 2018.
- **Amortization of the Unfunded Actuarial Accrued Liability (UAAL)** – Beginning with the June 30, 2018, valuation, the UAAL is amortized using a "layered" approach. Under this method, the "Legacy UAAL", as determined in the June 30, 2018 valuation, is amortized over a closed 30-year period. Any change in the system's benefit structure shall be amortized over a closed period of 20 years, as set out in state statutes. The total UAAL amortization payment is the sum of the payments for each of the amortization bases.

Changes in Methods and Assumptions Since the Prior Year

An experience study which analyzed the system's economic assumptions was performed in 2018 and the results were presented to the board. Below is a summary of the changes to methods and assumptions since the prior year:

- **Investment return** – The assumption was lowered from 7.50% to 7.25%.
- **General wage growth** – The assumption was lowered from 3.00% to 2.75%.
- **Payroll growth** – The assumption was lowered from 3.00% to 2.50%.
- **Unfunded actuarial accrued liability amortization method** – The method was changed from amortizing the entire unfunded actuarial accrued liability as a single base to using a "layered" bases approach.
- **Actuarial value of assets** – The value is calculated by recognizing the difference between the actual and expected return on the market value of assets each year over a closed five-year period. In addition, the total unrecognized investment experience as of June 30, 2017, will be recognized evenly over a seven-year period beginning June 30, 2018.

Actuarial Assumptions

Economic Assumptions

- **Investment return** – 7.25%, compounded annually, net of investment expenses. (7.50% June 30, 2017 valuation)
  - This assumption will change to 7.10% for the June 30, 2019 valuation and 6.95% for the June 30, 2020 valuation and thereafter, absent board action.
- **Inflation** – 2.50% per year
- **Payroll growth** – 2.50% per year
- **Cost-of-living adjustment (COLA)** – 4.00% on a compounded basis when a minimum COLA of 4.00% is in effect; 2.00% on a compounded basis when no minimum COLA is in effect
- **Interest on member contributions** – 1.50% per year

Demographic Assumptions

- **Mortality** – The mortality assumption includes an appropriate level of conservatism that reflects expected future mortality improvement

  MSEP/MSEP 2000/MSEP2011
  - **Post-retirement** – RP-2014 Healthy Annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 120%
  - **Pre-retirement** – RP-2014 Employee mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 95% for males and 90% for females
  - **Long-term disability** – RP-2014 Disabled mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 95% for males and 90% for females

  Judicial Plan
  - **Post-retirement** – RP-2014 Healthy Annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 98%
  - **Pre-retirement** – RP-2014 Employee mortality table, projected from 2006 to 2026 with Scale MP-2015
  - **Long-term disability** – RP-2014 Disabled mortality table, projected from 2006 to 2026 with Scale MP-2015

The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA). Assumptions were adopted based on the June 30, 2016 experience study and the June 30, 2018 Report on Economic Assumptions.

MSEP

Percent of Eligible Active Members Retiring Within the Next Year | June 30, 2018

	Normal Retirement				Early Retirement	
	MSEP/MSEP 2000			MSEP 2011	MSEP/MSEP 2000	MSEP 2011
	Percent Retiring					
Retirement Age	1st Year	2nd Year	3rd Year	Percent Retiring	Percent Retiring	Percent Retiring
48	20%					
49	20	10%				
50	20	10	21%			
51	20	10	21			
52	20	10	21			
53	20	10	21			
54	20	10	21			
55	20	10	21	45%		
56	20	10	21	45		
57	20	10	21	35	2.4%	
58	20	10	21	35	3.1	
59	20	10	21	30	3.0	
60	20	10	21	35	5.1	
61	19	10	21	25	6.0	
62	18	22	29	40	6.0	10.0%
63	16	18	24	30	6.0	10.0
64	15	17	17	20	6.0	10.0
65	19	19	27	30		50.0
66	24	25	28	25		50.0
67	10	25	23	20		
68	20	25	23	20		
69	20	25	23	20		
70	20	25	23	20		
71	20	25	23	20		
72	20	25	23	20		
73	20	25	23	20		
74	20	25	23	20		
75	50	50	23	50		
76	50	50	23	50		
77	75	75	23	75		
78	100	100	100	100		

Judicial Plan

Percent of Eligible Active Members Retiring Within the Next Year | June 30, 2018

	Normal Retirement				Early Retirement	
	Judicial Plan		Judicial Plan 2011		Judicial Plan	
	Percent Retiring		Percent Retiring		Percent Retiring	
Retirement Age	Male	Female	Male	Female	Male	Female
55	20%	3%				
56	16	3				
57	13	3				
58	9	3				
59	5	3				
60	8	8				
61	5	8				
62	8	8	30%	35%	6%	3%
63	10	8	20	20	6	3
64	12	8	15	20	6	3
65	12	15	30	50	6	3
66	20	15	25	25	6	3
67	20	15	20	25	6	3
68	30	15	20	25	6	3
69	30	15	30	50	6	3
70	100	100	100	100	100	100

Elected Officials and Legislators

Percent of Active Members Retiring Within the Next Year | June 30, 2018

	Percent Retiring	
Years of Service	Male	Female
0-1	8.0%	8.0%
1-2	8.0	8.0
2-3	8.0	8.0
3-4	8.0	8.0
4-5	12.0	12.0
5-6	12.0	12.0
6-7	12.0	12.0
7+	35.0	35.0

MSEP
Separations From Active Employment Before Service Retirement and Individual Pay Increase Assumptions | June 30, 2018

		Termination*		Disability		Death**	
Sample Ages	Years of Service	Male	Female	Male	Female	Male	Female
	0	24.0%	27.5%				
	1	19.0	21.5				
	2	15.5	16.3				
	3	13.3	13.5				
	4	11.2	11.3				
25	5+	13.5	14.0	0.10%	0.10%	0.03%	0.01%
30		10.6	11.0	0.10	0.10	0.03	0.02
35		8.2	8.5	0.10	0.10	0.04	0.03
40		5.8	6.0	0.36	0.36	0.05	0.03
45		4.3	4.5	0.41	0.41	0.07	0.05
50		2.9	3.0	0.57	0.57	0.13	0.08
55		2.9	3.0	0.77	0.77	0.22	0.14
60		2.9	3.0	1.02	1.02	0.40	0.20
65		2.9	3.0	1.23	1.23	0.70	0.30
70		2.9	3.0	1.23	1.23	1.17	0.50

* *Does not apply to elected officials and legislators.*
** *2% of the deaths in active service are assumed to be duty-related.*

MSEP
Pay Increase Assumptions | June 30, 2018

	Rates by Service*			
Years of Service	Inflation	Productivity	Merit	Total
1	2.50%	0.25%	5.75%	8.50%
2	2.50	0.25	2.50	5.25
3	2.50	0.25	1.50	4.25
4	2.50	0.25	1.25	4.00
5	2.50	0.25	1.00	3.75
9	2.50	0.25	0.75	3.50
10	2.50	0.25	0.50	3.25
21+	2.50	0.25	0.25	3.00

* *General Assembly members have a flat 2.75% assumption.*

Judicial Plan

Separations From Active Employment Before Service Retirement and Individual Pay Increase Assumptions | June 30, 2018

	Death		Disability		Termination		
Sample Ages	Male	Female	Male	Female	Service Index	Male	Female
25	0.03%	0.01%	0.01%	0.01%	1	0.040%	0.040%
30	0.03	0.02	0.02	0.01	2	0.010	0.023
35	0.04	0.03	0.03	0.02	3	0.013	0.023
40	0.05	0.04	0.04	0.03	4	0.013	0.023
45	0.07	0.05	0.05	0.04	5	0.013	0.023
50	0.13	0.09	0.08	0.07	6-10	0.013	0.023
55	0.24	0.16	0.13	0.12	11-15	0.017	0.023
60	0.42	0.23	0.20	0.19	16+	0.010	0.010
65	0.74	0.33	0.20	0.19			
70	1.23	0.55	0.20	0.19			

Judicial Plan

Pay Increase Assumptions | June 30, 2018

Sample Ages	Merit & Seniority	Inflation	Increase Next Year
25	2.45%	2.50%	4.95%
30	2.45	2.50	4.95
35	1.73	2.50	4.23
40	1.01	2.50	3.51
45	0.85	2.50	3.35
50	0.79	2.50	3.29
55	0.69	2.50	3.19
60	0.25	2.50	2.75
65	0.25	2.50	2.75
70	0.25	2.50	2.75

Miscellaneous Technical Assumptions | June 30, 2018

- **Form of payment**
  MSEP
  – 50% joint and survivor

  MSEP 2000/MSEP 2011
  – Straight life annuity

  Judicial Plan
  – **Hired before January 1, 2011** – 50% joint and survivor
  – **Hired on or after January 1, 2011** – Straight life annuity

- **Marital status**
  MSEP/MSEP 2000/MSEP 2011
  – **Percent married** – 70% married at retirement, 60% of those dying in active service are married
  – **Spouse's age** – Females assumed to be three years younger than males

  Judicial Plan
  – **Percent married** – 100% married
  – **Spouse's age** – Females assumed to be four years younger than males

- **Pay increase timing** – Pay increases are assumed to occur at the beginning of the fiscal year.
- **Decrement timing** – Decrements of all types are assumed to occur mid-year.
- **Eligibility testing** – Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
- **Benefit service** – Exact fractional service is used to determine the amount of the benefit payable.
- **Decrement relativity** – Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
- **Decrement operation** – Disability and withdrawal do not operate during normal retirement eligibility.
- **Other liability adjustments**
  MSEP/MSEP 2000/MSEP 2011
  – Pre-retirement survivor benefits for spouse of an inactive-vested member. These factors are used to estimate the cost of immediate unreduced survivor annuities upon the death of a vested member.

Age	Male	Female
<30	1.57	1.31
30-39	1.24	1.13
40-49	1.09	1.05
>50	1.02	1.01

- **Incidence of contributions** – Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report and the actual payroll payable at the time contributions are made. New entrant normal cost contributions are applied to the funding of new entrant benefits.
- **Retirement election**
  MSEP 2000
  – All regular state employees hired on or before June 30, 2000, are assumed to elect MSEP 2000 prior to age 62 and MSEP on or after age 62.
  – Elected officials, general assembly, and uniformed water patrol members hired before July 1, 2000, are assumed to elect MSEP at retirement.

- **Service adjustment**

  MSEP/MSEP 2000/MSEP 2011

  – It is assumed that each member will be granted eight months of service credit; four months for unused leave upon retirement and four months for military service purchases.

  MSEP 2011

  – For members hired on or after January 1, 2011, it is assumed that each member will be granted five months for unused leave.

- **Forfeitures**

  MSEP 2011

  – For those hired on or after January 1, 2011, 50% of state employees terminating at first vesting eligibility are assumed to take a refund and forfeit their deferred pension. This percentage decreases to 0% at first retirement eligibility.

  Judicial Plan

  – No vested members are assumed to take a refund of employee contributions.

- **Salary and benefit limits** – For purposes of the valuation, no limits were applied to member compensation or benefits.
- **Commencement age for deferred vested benefit** – normal retirement date
- **Data Adjustments**

  MSEP/MSEP 2000/MSEP 2011

  Active and retired member data was reported as of May 31, 2018. It was brought forward to June 30, 2018, by adding one month of service for all active members and the June COLA for certain retired members. Financial information continues to be reported annually as of June 30. This procedure was instituted to provide sufficient time for the board of trustees to certify the appropriate contribution rate prior to the statutory deadline.

  Active members reported with less than a $100 annualized salary were assumed to receive the average active member pay.

  When the option of choosing plans is available, inactive-vested members are reported with two records, one with benefits under the MSEP and one with benefits under the MSEP 2000. Because it is unknown what the member will elect at retirement, both records are valued and the plan that produces the higher present value of future benefits is used for valuation purposes.

  For any retired member who has elected a joint and survivor benefit, yet has no beneficiary date of birth provided, it was assumed that the beneficiary is three years younger for male retirees and three years older for female retirees.

  For members reported with no gender, the member is assumed to be male.

  Due to limitations in our valuation program, members who are not eligible for normal retirement prior to age 85 had their date of birth adjusted.

  Judicial Plan

  Active and retired member data was reported as of May 31, 2018. It was brought forward to June 30, 2018, by adding one month of service for all active members and the June COLA for certain retired members. Financial information continues to be reported annually as of June 30. This procedure was instituted to provide sufficient time for the board of trustees to certify the appropriate contribution rate prior to the statutory deadline.

  Active members reported no annualized salary were assumed to receive the average active member pay.

Other Technical Valuation Procedures

Salary increases are assumed to apply to annual amounts.

Decrements are assumed to occur mid-year, except that immediate retirement is assumed for those who are at or older than the age at which retirement rates are 100%. Standard adjustments are made for multiple decrements.

No actuarial liability is included for participants who terminated without being vested prior to the valuation date, except those due a refund of contributions.

Pension Trust Funds

Employer Schedule of Funding Progress | Last Ten Fiscal Years

MOSERS uses the entry-age normal actuarial cost method which allocates the actuarial present value of each member's projected benefits on a level basis over the member's pensionable compensation between the entry-age of the member and assumed exit ages.

MSEP

Actuarial Valuation Date as of June 30	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) Entry Age (b)	Unfunded AAL (UAAL) (b-a)	Percent Funded (a/b)	Annual Covered Payroll (c)	UAAL Percentage of Covered Payroll [(b-a)/c]
2009	$ 7,876,079,342	$ 9,494,806,715	$ 1,618,727,373	83.0%	$ 2,002,402,087	80.8%
2010	7,923,377,393	9,853,155,445	1,929,778,052	80.4	1,945,095,321	99.2
2011	8,022,481,408	10,123,544,043	2,101,062,635	79.2	1,875,569,816	112.0
2012	7,897,167,203	10,793,651,577	2,896,484,374	73.2	1,864,069,493	155.4
2013	8,096,436,929	11,134,637,484	3,038,200,555	72.7	1,880,212,950	161.6
2014	8,637,758,955	11,494,571,835	2,856,812,880	75.1	1,902,719,928	150.1
2015	8,792,485,658	11,727,618,410	2,935,132,752	75.0	1,918,527,768	153.0
2016	8,878,057,191	12,751,162,753	3,873,105,562	69.6	1,921,528,936	201.6
2017	8,872,381,848	13,152,273,895	4,279,892,047	67.5	1,941,969,786	220.4
2018	8,830,410,210	13,612,763,961	4,782,353,751	64.9	1,915,143,002	249.7

Judicial Plan

Actuarial Valuation Date as of June 30	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) Entry Age (b)	Unfunded AAL (UAAL) (b-a)	Percent Funded (a/b)	Annual Covered Payroll (c)	UAAL Percentage of Covered Payroll [(b-a)/c]
2009	$ 81,337,881	$ 369,106,841	$ 287,768,960	22.0%	$ 45,505,512	632.4%
2010	88,976,738	382,012,773	293,036,035	23.3	46,112,730	635.5
2011	98,398,628	393,484,589	295,085,961	25.0	45,888,020	643.1
2012	102,266,706	413,332,538	311,065,832	24.7	45,835,501	678.7
2013	111,140,339	435,378,358	324,238,019	25.5	48,697,726	665.8
2014	124,269,105	462,336,255	338,067,150	26.9	49,587,936	681.8
2015	134,349,908	482,969,311	348,619,403	27.8	55,656,457	626.4
2016	143,468,860	547,621,617	404,152,757	26.2	57,421,016	703.8
2017	151,828,631	564,417,925	412,589,294	26.9	58,150,935	709.5
2018	162,135,045	593,788,592	431,653,547	27.3	59,551,874	724.8

See *Required Schedule of Employer Contributions* on page 60.

Pension Trust Funds

Summary of Member Data Included in Valuations | June 30, 2018

Active Members

Plans	Number	Payroll	Group Averages: Salary	Group Averages: Age (Yrs.)	Group Averages: Service (Yrs.)
MSEP					
Regular state employees	45,288	$1,771,249,595	$ 39,111	45.1	10.6
Elected officials	6	659,976	109,996	45.0	2.2
Legislative clerks	10	348,806	34,881	67.2	19.8
Legislators	192	6,907,919	35,979	52.8	5.5
Uniformed water patrol	10	704,722	70,472	42.0	16.2
Conservation department	1,359	60,574,106	44,573	44.5	14.1
School-term salaried employees	923	72,540,065	78,592	57.9	22.0
Administrative law judges	18	2,157,813	119,879	60.4	23.8
Total MSEP	47,806	$1,915,143,002	40,061	45.4	10.9
Judicial Plan	415	$ 59,551,874	$ 143,498	56.4	11.5

Retired Lives

Type of Benefit Payment	Number	Annual Benefits	Group Averages: Benefit	Group Averages: Age (Yrs.)
MSEP				
Retirement	42,836	$ 680,963,952	$ 15,897	70.1
Disability	1	2,244	2,244	62.0
Survivor of active member	1,720	18,702,132	10,873	62.8
Survivor of retired member	3,650	45,203,520	12,385	75.7
Total MSEP	48,207	$ 744,871,848	15,452	70.3
Judicial Plan	569	$ 36,337,236	$ 63,862	76.5

Others

Plans	Inactive-Vested	Inactive-Nonvested	Leave of Absence	Long-Term Disability
MSEP	15,476	15,619	178	732
Judicial Plan	26	0	0	0

Active Members by Attained Age and Years of Service | June 30, 2018

MSEP

Attained Age	Years of Service to Valuation Date: 0-4	5-9	10-14	15-19	20-24	25-29	30-34	35+	Totals: No.	Valuation Payroll
< 24	2,285	12							2,297	$ 66,959,769
25-29	3,910	589	15						4,514	150,760,890
30-34	2,796	1,464	505	15					4,780	177,768,481
35-39	1,995	1,291	1,340	532	22				5,180	201,733,420
40-44	1,587	1,047	1,084	1,222	470	8			5,418	222,189,315
45-49	1,496	995	981	1,239	1,365	415	42		6,533	272,538,758
50-54	1,293	987	907	1,148	1,147	918	350	27	6,777	289,232,544
55-59	1,176	895	937	1,175	1,024	612	425	146	6,390	271,037,305
60-64	685	645	734	781	654	355	231	148	4,233	183,922,716
65+	199	303	300	288	227	135	104	128	1,684	78,999,804
Totals	17,422	8,228	6,803	6,400	4,909	2,443	1,152	449	47,806	$ 1,915,143,002

While not used in the financial computations, the following group averages are computed and shown because of their general interest.
Group Averages: Age – 45.4 years • Service – 10.9 years • Annual pay – $40,061

Judicial Plan

Attained Age	Years of Service to Valuation Date: 0-4	5-9	10-14	15-19	20-24	25-29	30+	Totals: No.	Valuation Payroll
< 39	19	2						21	$ 2,859,645
40-44	19	7	3					29	4,068,416
45-49	21	13	8	3				45	6,358,885
50-54	23	20	10	16	1			70	10,115,116
55-59	28	18	14	16	11	2		89	12,721,791
60-64	12	14	18	14	20	9	8	95	13,822,265
65+	1	7	15	21	11	5	6	66	9,605,756
Totals	123	81	68	70	43	16	14	415	$ 59,551,874

While not used in the financial computations, the following group averages are computed and shown because of their general interest.
Group Averages: Age – 56.4 years • Service – 11.5 years • Annual pay – $143,498

Schedules of Active Member Valuation Data | Last Ten Fiscal Years

MSEP

Valuation Date as of June 30	Schedule of Active Member Valuation Data			
	Number	Annual Payroll	Annual Average Pay	% Increase in Average Pay
2009	55,057	$ 2,002,402,087	$ 36,370	3.5%
2010	53,478	1,945,095,321	36,372	0.01
2011	51,660	1,875,569,816	36,306	(0.18)
2012	51,332	1,864,069,493	36,314	0.02
2013	50,833	1,880,212,950	36,988	1.86
2014	50,621	1,902,719,928	37,588	1.62
2015	49,980	1,918,527,768	38,386	2.12
2016	49,464	1,921,528,936	38,847	1.20
2017	48,910	1,941,969,786	39,705	2.21
2018	47,806	1,915,143,002	40,061	0.90

Judicial Plan

Valuation Date as of June 30	Schedule of Active Member Valuation Data			
	Number	Annual Payroll	Annual Average Pay	% Increase in Average Pay
2009	397	$ 45,505,512	$ 114,623	(20.12)%
2010	402	46,112,730	114,708	0.07
2011	399	45,888,020	115,008	0.26
2012	398	45,835,501	115,165	0.14
2013	400	48,697,726	121,744	5.71
2014	405	49,587,936	122,439	0.57
2015	405	55,656,457	137,423	12.24
2016	408	57,421,016	140,738	2.41
2017	410	58,150,935	141,832	0.80
2018	415	59,551,874	143,498	1.20

Retirees and Beneficiaries Added and Removed | Last Ten Fiscal Years

MSEP

Fiscal Year Ended June 30	Classification	Benefit Type	Added to Rolls: Number	Added to Rolls: Annual Allowances	Removed from Rolls: Number	Removed from Rolls: Annual Allowances
2009	General employees	Retirement	2,195	$ 37,338,992	852	$ 9,903,887
		Survivor of active	82	996,258	54	390,167
		Survivor of retired	251	3,077,466	110	827,564
		Disability	0	876	1	4,237
	Lincoln University - vested	Retirement	0	0	0	0
		Survivor of active	0	0	0	0
	Legislators	Retirement	21	746,414	8	120,396
		Survivor of active	0	5,137	1	14,128
		Survivor of retired	4	84,108	2	20,473
	Elected officials	Retirement	2	105,141	0	0
		Survivor of active	0	2,997	0	0
		Survivor of retired	0	1,274	0	0
	ALJs	Retirement	3	168,517	2	90,337
		Survivor of retired	2	57,238	1	27,354
2010	General employees	Retirement	2,298	34,755,192	833	9,979,318
		Survivor of active	83	1,054,292	49	276,401
		Survivor of retired	246	3,080,424	117	1,078,265
		Disability	0	830	1	2,985
	Lincoln University - vested	Retirement	1	5,671	0	0
		Survivor of active	0	0	0	0
	Legislators	Retirement	12	201,562	12	239,880
		Survivor of active	0	3,975	1	16,709
		Survivor of retired	5	78,765	0	0
	Elected officials	Retirement	0	0	1	66,911
		Survivor of active	0	3,117	0	0
		Survivor of retired	1	34,780	0	0
	ALJs	Retirement	3	113,877	1	46,794
		Survivor of retired	0	7,332	0	0

Source of Data: MOSERS benefit payment database as of June 30, 2018.
Other Actuarial Section information reported based on MOSERS data as of May 31, 2018.

Rolls at End of Year				
Number	Annual Allowances	Percentage Increase (Decrease) in Annual Allowances	Average Annual Allowances	Percentage Increase (Decrease) in Average Annual Allowances
27,942	$ 425,200,398	6.90%	$ 15,217	1.76%
1,364	12,095,246	5.28	8,867	3.10
2,259	22,538,130	11.09	9,977	4.15
10	33,055	(9.23)	3,306	(0.15)
13	55,953	0.00	4,304	0.00
1	2,624	0.00	2,624	0.00
262	5,207,953	13.66	19,878	8.03
13	146,210	(5.79)	11,247	1.45
56	771,979	8.98	13,785	5.09
14	620,135	20.42	44,295	3.21
1	77,924	4.00	77,924	4.00
1	33,117	4.00	33,117	4.00
26	1,177,522	7.11	45,289	2.99
11	275,852	12.15	25,077	1.95
29,407	449,976,272	5.83	15,302	0.56
1,398	12,873,137	6.43	9,208	3.85
2,388	24,540,289	8.88	10,277	3.01
9	30,900	(6.52)	3,433	3.84
14	61,624	10.14	4,402	2.28
1	2,624	0.00	2,624	0.00
262	5,169,635	(0.74)	19,731	(0.74)
12	133,476	(8.71)	11,123	(1.10)
61	850,744	10.20	13,947	1.18
13	553,224	(10.79)	42,556	(3.93)
1	81,041	4.00	81,041	4.00
2	67,897	105.02	33,949	2.51
28	1,244,605	5.70	44,450	(1.85)
11	283,184	2.66	25,744	2.66

Retirees and Beneficiaries Added and Removed continued on pages 112-113.

Retirees and Beneficiaries Added and Removed continued from pages 110-111.

MSEP

Fiscal Year Ended June 30	Classification	Benefit Type	Added to Rolls Number	Added to Rolls Annual Allowances	Removed from Rolls Number	Removed from Rolls Annual Allowances
2011	General employees	Retirement	2,850	$ 41,203,358	892	$ 10,670,476
		Survivor of active	65	914,689	46	261,503
		Survivor of retired	298	3,059,195	176	1,670,990
		Disability	0	79	1	1,732
	Lincoln University - vested	Retirement	1	1,780	0	0
		Survivor of active	0	0	0	0
	Legislators	Retirement	41	601,171	10	185,635
		Survivor of active	0	2,903	1	19,612
		Survivor of retired	5	73,841	2	16,628
	Elected officials	Retirement	0	0	0	0
		Survivor of active	0	3,242	0	0
		Survivor of retired	0	1,053	0	0
	ALJs	Retirement	4	212,519	0	0
		Survivor of retired	0	2,599	1	27,724
2012	General employees	Retirement	2,637	39,423,910	895	11,116,063
		Survivor of active	82	1,129,634	34	197,452
		Survivor of retired	282	3,665,503	158	1,416,283
		Disability	0	458	0	0
	Lincoln University - vested	Retirement	0	0	2	11,032
		Survivor of active	0	0	0	0
	Legislators	Retirement	13	229,979	8	139,545
		Survivor of active	0	3,531	0	0
		Survivor of retired	4	80,142	3	52,550
	Elected officials	Retirement	2	86,431	0	0
		Survivor of active	0	3,371	0	0
		Survivor of retired	0	1,336	0	0
	ALJs	Retirement	3	124,248	3	158,072
		Survivor of active	1	25,592	0	0
		Survivor of retired	2	57,704	0	0

Source of Data: MOSERS benefit payment database as of June 30, 2018.
Other Actuarial Section information reported based on MOSERS data as of May 31, 2018.

Rolls at End of Year				
Number	Annual Allowances	Percentage Increase (Decrease) in Annual Allowances	Average Annual Allowances	Percentage Increase (Decrease) in Average Annual Allowances
31,365	$ 480,509,154	6.79%	$ 15,320	0.12%
1,417	13,526,323	5.07	9,546	3.67
2,510	25,928,494	5.66	10,330	0.52
8	29,247	(5.35)	3,656	6.50
15	63,404	2.89	4,227	(3.98)
1	2,624	0.00	2,624	0.00
293	5,585,171	8.04	19,062	(3.39)
11	116,767	(12.52)	10,615	(4.57)
64	907,957	6.73	14,187	1.72
13	553,224	0.00	42,556	0.00
1	84,283	4.00	84,283	4.00
2	68,950	1.55	34,475	1.55
32	1,457,124	17.08	45,535	2.44
10	258,059	(8.87)	25,806	0.24
33,107	508,817,001	5.89	15,369	0.32
1,465	14,458,505	6.89	9,869	3.38
2,634	28,177,714	8.67	10,698	3.56
8	29,705	1.57	3,713	1.56
13	52,372	(17.40)	4,029	(4.68)
1	2,624	0.00	2,624	0.00
298	5,675,605	1.62	19,046	(0.08)
11	120,298	3.02	10,936	3.02
65	935,549	3.04	14,393	1.45
15	639,655	15.62	42,644	0.21
1	87,654	4.00	87,654	4.00
2	70,286	1.94	35,143	1.94
32	1,423,300	(2.32)	44,478	(2.32)
1	25,592	0.00	25,592	0.00
12	315,763	22.36	26,314	1.97

Retirees and Beneficiaries Added and Removed continued on pages 114-115.

Retirees and Beneficiaries Added and Removed continued from pages 112-113.

MSEP

			Added to Rolls		Removed from Rolls	
Fiscal Year Ended June 30	Classification	Benefit Type	Number	Annual Allowances	Number	Annual Allowances
2013	General employees	Retirement	2,632	$ 40,416,533	983	$ 12,869,826
		Survivor of active	97	1,080,366	64	400,983
		Survivor of retired	323	4,085,887	150	1,363,799
		Disability	0	696	1	3,854
	Lincoln University - vested	Retirement	2	5,980	0	0
		Survivor of active	0	0	0	0
	Legislators	Retirement	37	442,937	15	320,292
		Survivor of active	0	3,851	0	0
		Survivor of retired	9	176,283	6	88,725
	Elected officials	Retirement	1	53,873	0	0
		Survivor of active	0	3,506	0	0
		Survivor of retired	0	1,458	0	0
	ALJs	Retirement	4	233,124	2	111,466
		Survivor of active	0	1,024	0	0
		Survivor of retired	2	65,892	1	22,759
2014	General employees	Retirement	2,612	37,411,991	944	12,205,892
		Survivor of active	90	1,095,464	34	262,401
		Survivor of retired	324	3,954,360	157	1,504,423
		Disability	0	408	2	7,391
	Lincoln University - vested	Retirement	0	0	0	0
		Survivor of active	0	0	0	0
	Legislators	Retirement	18	239,904	7	95,748
		Survivor of active	0	3,680	0	0
		Survivor of retired	5	39,520	5	44,445
	Elected officials	Retirement	0	0	1	19,605
		Survivor of active	0	2,788	0	0
		Survivor of retired	1	10,811	0	0
	ALJs	Retirement	1	50,072	2	78,138
		Survivor of active	1	27,358	0	0
		Survivor of retired	0	7,404	1	30,930

Source of Data: MOSERS benefit payment database as of June 30, 2018.
Other Actuarial Section information reported based on MOSERS data as of May 31, 2018.

Rolls at End of Year				
Number	Annual Allowances	Percentage Increase (Decrease) in Annual Allowances	Average Annual Allowances	Percentage Increase (Decrease) in Average Annual Allowances
34,756	$ 536,363,708	5.41%	$ 15,432	0.41%
1,498	15,137,889	4.70	10,105	2.39
2,807	30,899,802	9.66	11,008	2.90
7	26,546	(10.63)	3,792	2.13
15	58,351	11.42	3,890	(3.45)
1	2,623	(0.04)	2,623	(0.04)
320	5,798,251	2.16	18,120	(4.86)
11	124,149	3.20	11,286	3.20
68	1,023,107	9.36	15,046	4.54
16	693,528	8.42	43,346	1.65
1	91,160	4.00	91,160	4.00
2	71,744	2.07	35,872	2.07
34	1,544,957	8.55	45,440	2.16
1	26,615	4.00	26,615	4.00
13	358,896	13.66	27,607	4.91
36,424	561,569,807	4.70	15,418	(0.09)
1,554	15,970,952	5.50	10,277	1.70
2,974	33,349,739	7.93	11,214	1.87
5	19,563	(26.31)	3,913	3.19
15	58,351	0.00	3,890	0.00
1	2,623	0.00	2,623	0.00
331	5,942,407	2.49	17,953	(0.92)
11	127,829	2.96	11,621	2.97
68	1,018,182	(0.48)	14,973	(0.49)
15	673,923	(2.83)	44,928	3.65
1	93,948	3.06	93,948	3.06
3	82,555	15.07	27,518	(23.29)
33	1,516,891	(1.82)	45,966	1.16
2	53,973	102.79	26,987	1.40
12	335,370	(6.56)	27,948	1.24

Retirees and Beneficiaries Added and Removed continued on pages 116-117.

Retirees and Beneficiaries Added and Removed continued from pages 114-115.

MSEP

			Added to Rolls		Removed from Rolls	
Fiscal Year Ended June 30	Classification	Benefit Type	Number	Annual Allowances	Number	Annual Allowances
2015	General employees	Retirement	2,865	$ 43,527,132	1,061	$ 13,940,436
		Survivor of active	111	1,160,798	56	434,928
		Survivor of retired	350	4,399,848	180	1,673,736
		Disability	0	180	1	5,220
	Lincoln University - vested	Retirement	1	2,340	0	0
		Survivor of active	0	0	0	0
	Legislators	Retirement	16	236,916	4	130,116
		Survivor of active	0	3,432	1	15,180
		Survivor of retired	3	61,956	9	79,944
	Elected officials	Retirement	0	0	0	0
		Survivor of active	1	15,802	0	0
		Survivor of retired	0	0	0	0
	ALJs	Retirement	3	128,952	0	0
		Survivor of active	0	1,452	0	0
		Survivor of retired	0	6,612	0	0
2016	General employees	Retirement	2,815	40,917,948	1,147	15,381,612
		Survivor of active	101	1,023,096	56	377,484
		Survivor of retired	365	4,493,892	222	2,073,192
		Disability	0	108	0	0
	Lincoln University - vested	Retirement	1	3,444	1	3,936
		Survivor of active	0	0	0	0
	Legislators	Retirement	8	107,412	15	427,428
		Survivor of active	0	3,084	0	0
		Survivor of retired	7	173,760	3	50,448
	Elected officials	Retirement	0	0	0	0
		Survivor of active	0	0	0	0
		Survivor of retired	0	0	0	0
	ALJs	Retirement	5	230,472	2	150,888
		Survivor of active	0	1,176	0	0
		Survivor of retired	2	84,588	2	62,220

Source of Data: MOSERS benefit payment database as of June 30, 2018.
Other Actuarial Section information reported based on MOSERS data as of May 31, 2018.

Rolls at End of Year				
Number	Annual Allowances	Percentage Increase (Decrease) in Annual Allowances	Average Annual Allowances	Percentage Increase (Decrease) in Average Annual Allowances
38,227	$ 591,156,503	5.27%	$ 15,464	0.30%
1,608	16,696,822	4.54	10,384	1.04
3,144	36,075,851	8.17	11,475	2.33
4	14,523	(25.76)	3,631	(7.21)
16	60,691	4.01	3,793	(2.49)
1	2,623	0.00	2,623	0.00
339	6,049,207	1.80	17,844	(0.61)
10	116,081	(9.19)	11,608	(0.11)
66	1,000,194	(1.77)	15,154	1.21
15	673,923	0.00	44,928	0.00
2	109,750	16.82	54,875	(41.59)
3	82,555	0.00	27,518	0.00
36	1,645,843	8.50	45,718	(0.54)
2	55,425	2.69	27,713	2.69
12	341,982	1.97	28,499	1.97
39,895	616,692,839	4.32	15,458	(0.04)
1,653	17,342,434	3.87	10,491	1.03
3,287	38,496,551	6.71	11,712	2.07
4	14,631	0.74	3,658	0.74
16	60,199	(0.81)	3,762	(0.82)
1	2,623	0.00	2,623	0.00
332	5,729,191	(5.29)	17,257	(3.29)
10	119,165	2.66	11,917	2.66
70	1,123,506	12.33	16,050	5.91
15	673,924	0.00	44,928	0.00
2	112,085	2.13	56,043	2.13
3	83,954	1.69	27,985	1.70
39	1,725,427	4.84	44,242	(3.23)
2	56,601	2.12	28,301	2.12
12	364,350	6.54	30,363	6.54

Retirees and Beneficiaries Added and Removed continued on pages 118-119.

Retirees and Beneficiaries Added and Removed continued from pages 116-117.

MSEP

			Added to Rolls		Removed from Rolls	
Fiscal Year Ended June 30	Classification	Benefit Type	Number	Annual Allowances	Number	Annual Allowances
2017	General employees	Retirement	2,774	$ 43,603,596	1,266	$17,194,704
		Survivor of active	83	1,067,292	52	491,640
		Survivor of retired	381	4,701,360	220	2,029,572
		Disability	0	72	1	3,216
	Lincoln University - vested	Retirement	0	0	0	0
		Survivor of active	0	0	0	0
	Legislators	Retirement	28	347,844	15	354,564
		Survivor of active	0	1,512	1	5,328
		Survivor of retired	7	103,872	3	73,068
	Elected officials	Retirement	3	135,531	1	53,873
		Survivor of active	0	0	0	0
		Survivor of retired	0	0	0	0
	ALJs	Retirement	8	445,728	0	0
		Survivor of active	1	31,080	0	0
		Survivor of retired	1	48,108	0	0
2018	General employees	Retirement	2,863	50,678,574	1,285	17,257,968
		Survivor of active	85	1,002,108	57	538,308
		Survivor of retired	391	5,294,100	271	2,498,204
		Disability	0	36	2	9,288
	Lincoln University - vested	Retirement	0	0	1	2,340
		Survivor of active	0	0	0	0
	Legislators	Retirement	7	105,972	6	107,556
		Survivor of active	0	1,764	1	3,516
		Survivor of retired	4	68,712	4	45,684
	Elected officials	Retirement	1	17,958	0	0
		Survivor of active	0	0	0	0
		Survivor of retired	0	0	1	38,332
	ALJs	Retirement	4	293,460	1	51,984
		Survivor of active	0	1,704	0	0
		Survivor of retired	0	4,692	0	0

Source of Data: MOSERS benefit payment database as of June 30, 2018.
Other Actuarial Section information reported based on MOSERS data as of May 31, 2018.

Rolls at End of Year				
Number	Annual Allowances	Percentage Increase (Decrease) in Annual Allowances	Average Annual Allowances	Percentage Increase (Decrease) in Average Annual Allowances
41,403	$ 643,101,731	4.28%	$ 15,533	0.49%
1,684	17,918,086	3.32	10,640	1.42
3,448	41,168,339	6.94	11,940	1.95
3	11,487	(21.49)	3,829	4.67
16	60,199	0.00	3,762	0.00
1	2,623	0.00	2,623	0.00
345	5,722,471	(0.12)	16,587	(3.88)
9	115,349	(3.20)	12,817	7.55
74	1,154,310	2.74	15,599	(2.81)
17	755,582	12.12	44,446	(1.07)
2	112,176	0.08	56,088	0.08
3	84,372	0.50	28,124	0.50
47	2,171,155	25.83	46,195	4.41
3	87,681	54.91	29,227	3.27
13	412,458	13.20	31,728	4.50
42,979	676,440,679	5.42	15,739	1.34
1,712	18,381,886	2.67	10,737	0.92
3,568	43,964,235	7.26	12,322	3.26
1	2,235	(63.24)	2,235	(43.58)
15	57,859	(3.89)	3,857	2.53
1	2,623	0.00	2,623	0.00
346	5,720,887	(0.03)	16,534	(0.31)
8	113,597	(1.47)	14,200	11.61
74	1,177,338	2.05	15,910	1.94
18	773,540	2.66	42,974	(3.28)
2	112,176	0.00	56,088	0.00
2	46,040	(46.43)	23,020	(18.55)
50	2,412,631	14.00	48,253	4.65
3	89,385	3.01	29,795	2.01
13	417,150	1.29	32,088	1.19

Retirees and Beneficiaries Added and Removed | Last Ten Fiscal Years

Judicial Plan

		Added to Rolls		Removed from Rolls	
Fiscal Year Ended June 30	Benefit Type	Number	Annual Allowances	Number	Annual Allowances
2009	Retirement	30	$ 1,922,615	15	$ 957,943
	Survivor of active	1	59,484	0	0
	Survivor of retired	9	418,266	2	61,344
2010	Retirement	12	1,137,305	13	750,021
	Survivor of active	0	32,700	2	32,399
	Survivor of retired	11	436,312	5	130,920
2011	Retirement	36	2,501,248	9	563,214
	Survivor of active	0	14,893	1	35,792
	Survivor of retired	4	167,535	9	206,465
2012	Retirement	18	1,490,554	14	1,074,572
	Survivor of active	0	22,717	0	0
	Survivor of retired	8	371,622	6	218,310
2013	Retirement	27	2,233,387	13	851,802
	Survivor of active	0	28,591	1	33,778
	Survivor of retired	8	355,101	10	288,980
2014	Retirement	18	1,671,667	8	443,807
	Survivor of active	2	66,272	0	0
	Survivor of retired	5	254,117	7	216,813
2015	Retirement	39	3,599,880	21	1,395,888
	Survivor of active	0	34,344	0	0
	Survivor of retired	18	705,444	5	198,348
2016	Retirement	16	1,671,084	14	1,078,356
	Survivor of active	0	15,072	1	43,032
	Survivor of retired	8	368,868	10	354,144
2017	Retirement	21	2,128,128	16	1,239,612
	Survivor of active	0	9,852	0	0
	Survivor of retired	12	497,508	2	87,936
2018	Retirement	23	2,642,868	15	1,074,540
	Survivor of active	0	18,660	1	27,540
	Survivor of retired	9	452,040	7	294,660

Retirees and Beneficiaries Added and Removed continued from page 120

Rolls at End of Year				
Number	Annual Allowances	Percentage Increase (Decrease) in Annual Allowances	Average Annual Allowances	Percentage Increase (Decrease) in Average Annual Allowances
326	$ 19,624,545	5.17%	$ 60,198	0.33%
37	1,056,425	5.97	28,552	3.10
103	3,139,829	12.83	30,484	5.16
325	20,011,829	1.97	61,575	2.29
35	1,056,726	0.03	30,192	5.74
109	3,445,221	9.73	31,608	3.69
352	21,949,863	9.68	62,358	1.27
34	1,035,827	(1.98)	30,466	0.91
104	3,406,291	(1.13)	32,753	3.62
356	22,365,845	1.90	62,825	0.75
34	1,058,544	2.19	31,134	2.19
106	3,559,603	4.50	33,581	2.53
370	23,747,431	6.18	64,182	2.16
33	1,053,358	(0.49)	31,920	2.52
104	3,625,723	1.86	34,863	3.82
380	24,975,291	5.17	65,724	2.40
35	1,119,630	6.29	31,989	0.22
102	3,663,027	1.03	35,912	3.01
398	25,951,423	9.28	65,205	1.59
35	1,087,702	3.26	31,077	(2.64)
115	4,132,819	13.99	35,938	3.08
400	26,544,151	2.28	66,360	1.77
34	1,059,742	(2.57)	31,169	0.30
113	4,147,543	0.36	36,704	2.13
405	27,432,667	3.35	67,735	2.07
34	1,069,594	0.93	31,459	0.93
123	4,557,115	9.88	37,050	0.94
408	28,112,479	5.91	68,903	3.83
33	1,050,862	(0.84)	31,844	2.17
115	4,304,923	3.79	37,434	1.99

Short-Term Solvency Test | Last Ten Fiscal Years

MSEP

Fiscal Year	Actuarial Accrued Liabilities for: Member Contributions* (1)	Current Retirees and Beneficiaries (2)	Active and Inactive Members, Employer Financed Portion* (3)	Actuarial Value of Assets Available for Benefits	Percentage of Actuarial Liabilities Covered by Actuarial Value of Assets Available for (1)	(2)	(3)
2009	$ 0	$ 4,737,859,976	$4,756,946,739	$ 7,876,079,342	100.0%	100.0%	66.0%
2010	0	5,012,677,769	4,840,477,676	7,923,377,393	100.0	100.0	60.1
2011	599,761	5,357,794,617	4,765,149,665	8,022,481,408	100.0	100.0	55.9
2012	5,431,451	5,749,411,068	5,038,809,058	7,897,167,203	100.0	100.0	42.5
2013	14,507,994	6,062,654,441	5,057,475,049	8,096,436,929	100.0	100.0	39.9
2014	27,111,467	6,347,728,717	5,119,731,651	8,637,758,955	100.0	100.0	44.2
2015	42,731,658	6,695,631,737	4,989,255,015	8,792,485,658	100.0	100.0	41.2
2016	60,618,379	7,305,895,284	5,384,649,090	8,878,057,191	100.0	100.0	28.1
2017	78,979,370	7,559,623,100	5,513,671,425	8,872,381,848	100.0	100.0	22.4
2018	103,784,514	8,073,692,664	5,435,286,783	8,830,410,210	100.0	100.0	12.0

Judicial Plan

Fiscal Year	Actuarial Accrued Liabilities for: Member Contributions* (1)	Current Retirees and Beneficiaries (2)	Active and Inactive Members, Employer Financed Portion* (3)	Actuarial Value of Assets Available for Benefits	Percentage of Actuarial Liabilities Covered by Actuarial Value of Assets Available for (1)	(2)	(3)
2009	$ 0	$ 231,505,591	$137,601,250	$ 81,337,881	100.0%	35.1%	0.0%
2010	0	236,113,077	145,899,696	88,976,738	100.0	37.7	0.0
2011	59,958	251,532,354	141,892,277	98,398,628	100.0	39.1	0.0
2012	209,817	258,642,149	154,480,572	102,266,706	100.0	39.5	0.0
2013	421,753	274,911,416	160,045,189	111,140,339	100.0	40.3	0.0
2014	716,564	285,124,436	176,495,255	124,269,105	100.0	43.3	0.0
2015	1,204,757	316,042,514	165,722,040	134,349,908	100.0	42.1	0.0
2016	1,855,955	354,715,048	191,050,614	143,468,860	100.0	39.9	0.0
2017	2,232,405	377,099,534	185,085,986	151,828,631	100.0	39.7	0.0
2018	3,124,482	401,725,610	188,938,500	162,135,045	100.0	39.6	0.0

Analysis of Financial Experience | Year Ended June 30, 2018

Actual experience will never coincide exactly with assumed experience (except by coincidence). Gains and losses may offset each other over a period of years, but sizable year-to-year variations from assumed experience are common. Detail on the analysis of the financial experience is shown below.

MSEP

	$ Millions
Unfunded actuarial accrued liability (UAAL) at beginning of year	$ 4,279.9
Asset adjustment for GASB 75	3.7
Normal cost from last valuation	146.4
Actual employer and member contributions	(407.9)
Administrative expenses	9.8
Interest accrual	317.6
Expected UAAL before changes	4,349.5
Change from voluntary buyout program	(40.5)
Change from any changes in benefits, assumptions, or methods	354.3
Expected UAAL after changes	4,663.3
Less: Actual UAAL at end of year	(4,782.3)
Gain (loss) during year from experience	$ (119.0)
Gain (loss) as a percent of actuarial accrued liabilities at start of year ($13,445)	(0.9)%

Valuation Date June 30	Actuarial Gain (Loss)as a % of Beginning Accrued Liabilities
2009	(5.2)
2010	(4.0)
2011	(2.4)
2012	(4.7)
2013	(2.8)
2014	2.1
2015	(0.9)
2016	(3.2)
2017	(1.6)
2018	(0.9)

Judicial

	$ Millions
Unfunded actuarial accrued liability (UAAL) at beginning of year	$412.6
Asset adjustment for GASB 75	0.1
Normal cost from last valuation	12.1
Actual employer and member contributions	(37.8)
Administrative expenses	0.2
Interest accrual	30.5
Expected UAAL before changes	417.7
Change from any changes in benefits, assumptions, or methods	12.3
Expected UAAL after changes	430.0
Less: Actual UAAL at end of year	(431.6)
Gain (loss) during year from experience	$ (1.6)
Gain (loss) as a percent of actuarial accrued liabilities at start of year ($582.8)	(0.3)%

Valuation Date June 30	Actuarial Gain (Loss)as a % of Beginning Accrued Liabilities
2009	(1.8)
2010	(1.1)
2011	(0.4)
2012	(0.6)
2013	(2.6)
2014	1.5
2015	(1.5)
2016	0.1
2017	(0.3)
2018	(0.3)

Comparison of Plans for General State Employees | June 30, 2018

MSEP

Benefit Provisions	MSEP (closed plan)
Membership eligibility	• Employed prior to July 1, 2000 in a permanent position normally requiring at least 1,040 hours of work per year and vested in MSEP.
Vesting	• 5 years
Base benefit formula	• .016 x FAP x service *In the past, formula increases have been passed along to MSEP retirees.*
Temporary benefit formula	• Not available
Benefit payment options	• Life income annuity • *Unreduced* joint & 50% survivor • Joint & 100% survivor • Life income with 60 guaranteed payments • Life income with 120 guaranteed payments
Cost-of-living adjustment (COLA)	• If hired before August 28, 1997, will receive 4-5% each year until reaching the 65% cap. After COLA cap is met the rate is based on 80% of the percentage increase in the average CPI (0-5%). • If hired on or after August 28, 1997, annual COLA will be based on 80% of the percentage increase in the average CPI (0-5%).
Normal retirement eligibility	• Age 65 with 5 years of service • Age 60 with 15 years of service "Rule of 80" – at least age 48 with age and service equaling 80 or more *Age 50 if first became eligible prior to August 28, 2003*
Early retirement eligibility	• Age 55 with 10 years of service *Base benefit will be reduced ½ of 1% (.005) for each month member's age is younger than normal retirement.*
Death before retirement	• Non duty-related death *(vested members)* – Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children. • Duty-related death *(no minimum service requirement)* – Survivor benefit to eligible spouse or children no less than 50% of average compensation.
In-service COLA	• COLA given for service beyond age 65. COLA provisions are determined by employment date.
BackDROP	• Must work at least 2 years beyond normal retirement eligibility to be eligible for BackDROP.
Service purchases	• May purchase up to 4 years of active-duty military service or qualifying public sector service at subsidized rate. May also purchase qualifying public sector service at full actuarial cost.
Service transfers	• May transfer state service to other positions covered by MOSERS under 104.800.
Member contributions	• None

MSEP 2000	MSEP 2011
• Employed for the first time on or after July 1, 2000, but prior to January 1, 2011, in a permanent position normally requiring at least 1,040 hours of work per year. • If left state employment prior to becoming vested and returned to employment on or after July 1, 2000, in a permanent position normally requiring at least 1,040 hours of work per year.	• Employed for the first time on or after January 1, 2011, in a permanent position normally requiring at least 1,040 hours of work per year.
• 5 years	• 5 years*
• .017 x FAP x service *Future formula increases, if any, will not be passed along to retirees.*	• .017 x FAP x service *Future formula increases, if any, will not be passed along to retirees.*
• .008 x FAP x service *Available to those who retire under the "Rule of 80."*	• .008 x FAP x service *Available to those who retire under the "Rule of 90."*
• Life income annuity • Joint & 50% survivor • Joint & 100% survivor • Life income with 120 guaranteed payments • Life income with 180 guaranteed payments	• Life income annuity • Joint & 50% survivor • Joint & 100% survivor • Life income with 120 guaranteed payments • Life income with 180 guaranteed payments
• Based on 80% of the percentage increase in the average CPI (0-5%).	• Based on 80% of the percentage increase in the average CPI (0-5%).
• Age 62 with 5 years of service "Rule of 80" – at least age 48 with age and service equaling 80 or more *Age 50 if first became eligible prior to August 28, 2003* *Inactive-vested members not eligible for "Rule of 80."*	• Age 67 with 5 years of service* • "Rule of 90" – at least age 55 with age and service equaling 90 or more *Inactive-vested members not eligible for "Rule of 90."*
• Age 57 with 5 years of service *Base benefit will be reduced ½ of 1% (.005) for each month member's age is younger than normal retirement.*	• Age 62 at the time of termination with 5 years of service* *Base benefit will be reduced ½ of 1% (.005) for each month member's age is younger than normal retirement.* *Inactive-vested members are not eligible.*
• Non duty-related death *(vested members)* – Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children. • Duty-related death *(no minimum service requirement).* – Survivor benefit to eligible spouse or children no less than 50% of average compensation.	• Non duty-related death *(vested members)* – Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children. • Duty-related death *(no minimum service requirement).* – Survivor benefit to eligible spouse or children no less than 50% of average compensation.
• Not available	• Not available
• Must work at least 2 years beyond normal retirement eligibility to be eligible for BackDROP.	• Not available
• May purchase up to 4 years of active-duty military service or qualifying public sector service at subsidized rate. May also purchase qualifying public sector service at full actuarial cost.	• May purchase qualifying public sector service at full actuarial cost.
• May transfer service under 104.1090 from other systems with written agreements to transfer required funds.	• Not available
• None	• 4% of pay

* *Effective January 1, 2018*

Comparison of Plans for Legislators | June 30, 2018

MSEP

Benefit Provisions	MSEP (closed plan)
Membership eligibility	• Elected to the General Assembly and employed prior to July 1, 2000 and vested in MSEP.
Vesting	• 3 full-biennial assemblies (6 years)
Base benefit formula	• Biennial assemblies x $150 *In the past, formula increases have been passed along to MSEP retirees.*
Temporary benefit formula	• Not available
Benefit payment options	• Life income annuity • *Unreduced* joint & 50% survivor • Joint & 100% survivor • Life income with 60 guaranteed payments • Life income with 120 guaranteed payments
Cost-of-living adjustment (COLA)	• If sworn in before August 28, 1997, will receive 4-5% each year until reaching 65% cap. After COLA cap is met the rate is based on 80% of the percentage increase in the average CPI (0-5%). • If sworn in on or after August 28, 1997, COLA will be based on 80% of the percentage increase in the average CPI (0-5%).
Normal retirement eligibility	• Age 55 with 3 full-biennial assemblies or • "Rule of 80" – at least age 48 with age and service equaling 80 or more
Early retirement eligibility	• Not available
Death before retirement	• Non duty-related death *(vested members)* – Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children. • Duty-related death *(no minimum service requirement)* – Survivor benefit to eligible spouse or children no less than 50% of the rate of compensation.
In-service COLA	• COLA given for service beyond age 65. COLA provisions are determined by employment date.
BackDROP	• Not available
Service purchases	• May purchase up to 4 years of active-duty military service or qualifying public sector service at subsidized rate. May also purchase qualifying public sector service at full actuarial cost.
Service transfers	• May transfer state service to other positions covered by MOSERS under 104.800.
Member contributions	• None

MSEP 2000	MSEP 2011
• Elected to the General Assembly and employed on or after July 1, 2000, but prior to January 1, 2011	• Elected to the General Assembly and first employed in a benefit-eligible position on or after January 1, 2011
• 3 full-biennial assemblies (6 years)	• 3 full-biennial assemblies (6 years)
• (Active legislator's pay ÷ 24) x service *Capped at 100% of pay; future formula increases, if any, will not be passed along to retirees.*	• (Active legislator's pay ÷ 24) x service *Capped at 100% of pay; future formula increases, if any, will not be passed along to retirees.*
• Not available	• Not available
• Life income annuity • Joint & 50% survivor • Joint & 100% survivor • Life income with 120 guaranteed payments • Life income with 180 guaranteed payments	• Life income annuity • Joint & 50% survivor • Joint & 100% survivor • Life income with 120 guaranteed payments • Life income with 180 guaranteed payments
• Benefit adjustment based on increase in pay for an active member of the general assembly.	• Benefit adjustment based on increase in pay for an active member of the general assembly.
• Age 55 with 3 full-biennial assemblies or • "Rule of 80" – at least age 50 with age and service equaling 80 or more *Inactive-vested members not eligible for "Rule of 80."*	• Age 62 at time of termination with 3 full-biennial assemblies or • "Rule of 90" – at least age 55 with age and service equaling 90 or more *Inactive-vested members not eligible for "Rule of 90."*
• Not available	• Not available
• Non duty-related death *(vested members)* – Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children. • Duty-related death *(no minimum service requirement)* – Survivor benefit to eligible spouse or children no less than 50% of rate of compensation.	• Non duty-related death *(vested members)* – Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children. • Duty-related death *(no minimum service requirement)* – Survivor benefit to eligible spouse or children no less than 50% of rate of compensation.
• Not available	• Not available
• Not available	• Not available
• May purchase up to 4 years of active-duty military service or qualifying public sector service at subsidized rate. May also purchase qualifying public sector service at full actuarial cost.	• May purchase qualifying public sector service at full actuarial cost.
• May transfer service under 104.1090 from other systems with written agreements to transfer required funds.	• Not available
• None	• 4% of pay

Comparison of Plans for Statewide Elected Officials | June 30, 2018

MSEP

Benefit Provisions	MSEP (closed plan)
Membership eligibility	• Elected to state office and employed prior to July 1, 2000, and vested in MSEP
Vesting	• 4 years (1 term)
Base benefit formula	• Less than 12 years of service FAP x .016 x service • 12 or more years of service Monthly statutory compensation x .50 *In the past, formula increases have been passed along to MSEP retirees.*
Temporary benefit formula	• Not available
Benefit payment options	• Life income annuity • *Unreduced* joint & 50% survivor • Joint & 100% survivor • Life income with 60 guaranteed payments • Life income with 120 guaranteed payments
Cost-of-living adjustment (COLA)	• Less than 12 years of service – If sworn in before August 28, 1997, will receive 4-5% each year until they reach 65% cap. After COLA cap is met the rate is based on 80% of the percentage increase in the average CPI (0-5%). – If sworn in between August 28, 1997, and June 30, 2000, will receive a COLA equal to 80% of percentage increase in the average CPI (0 5%). • 12 or more years of service – 12 or more years of service will receive a COLA based on increases in statutory compensation for the highest position held. – Sworn in before August 28, 1997 will receive 4-5% each year until they reach 65% cap. After COLA cap is met the rate is based on 80% of the percentage increase in the average CPI (0-5%). – Sworn in between August 28, 1997 and June 30, 2000, will receive a COLA equal to 80% of percentage increase in the average CPI (0-5%).
Normal retirement eligibility	• Age 60 with 15 years of service or • "Rule of 80" – at least age 50 with age and service equaling 80 or more
Early retirement eligibility	• Age 55 with 10 years of service
Death before retirement	• Non duty-related death *(vested members)* – Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children. • Duty-related death *(no minimum service requirement)* – Survivor benefit to eligible spouse or children no less than 50% of current pay.
In-service COLA	• COLA provisions determined by amount of service relative to 12 years and date of employment.
BackDROP	• Not available
Service purchases	• May purchase up to 4 years of active-duty military service or qualifying public sector service at subsidized rate. May also purchase qualifying public sector service at full actuarial cost.
Service transfers	• May transfer state service to other positions covered by MOSERS under 104.800.
Member contributions	• None

MSEP 2000	MSEP 2011
• Elected to state office and employed for the first time on or after July 1, 2000, but prior to January 1, 2011	• Elected to state office and employed for the first time in a benefit-eligible position on or after January 1, 2011
• 4 years (1 term)	• 4 years (1 term)
• (Active elected official's pay ÷ 24) x service *Capped at 12 years of service or 50% of pay; future formula increases, if any, will not be passed along to retirees.*	• (Active elected official's pay ÷ 24) x service *Capped at 12 years of service or 50% of pay; future formula increases, if any, will not be passed along to retirees.*
• Not available	• Not available
• Life income annuity • Joint & 50% survivor • Joint & 100% survivor • Life income with 120 guaranteed payments • Life income with 180 guaranteed payments	• Life income annuity • Joint & 50% survivor • Joint & 100% survivor • Life income with 120 guaranteed payments • Life income with 180 guaranteed payments
• Benefit adjustment based on increase in pay for an active statewide elected official.	• Benefit adjustment based on increase in pay for an active statewide elected official.
• Age 55 with 4 years of service or • "Rule of 80" – at least age 50 with age and service equaling 80 or more *Inactive-vested members not eligible for "Rule of 80."*	• Age 62 with 4 years of service or • "Rule of 90" – at least age 55 with age and service equaling 90 or more at the time of termination *Inactive-vested members not eligible for "Rule of 90."*
• Not available	• Not available
• Non duty-related death *(vested members)* – Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children. • Duty-related death *(no minimum service requirement)* – Survivor benefit to eligible spouse or children no less than 50% of current pay.	• Non duty-related death *(vested members)* – Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children. • Duty-related death *(no minimum service requirement)* – Survivor benefit to eligible spouse or children no less than 50% of current pay.
• Not available	• Not available
• Not available	• Not available
• May purchase up to 4 years of active-duty military service or qualifying public sector service at subsidized rate; may also purchase qualifying public sector service at full actuarial cost.	• May purchase qualifying public sector service at full actuarial cost.
• May transfer service under 104.1090 from other systems with written agreements to transfer required funds.	• Not available
• None	• 4% of pay

Comparison of Plans for Judges | June 30, 2018

Judicial Plan

Benefit Provisions	Judicial Plan (closed plan)
Membership eligibility	• Must be a judge or commissioner of the supreme court or the court of appeals, a judge of any circuit court, probate court, magistrate court, court of common pleas, court of criminal corrections, a justice of the peace, or a commissioner or deputy commissioner of the circuit court appointed after February 29, 1972; a commissioner of the juvenile division of the circuit court appointed pursuant to Section 211.023, RSMo; a commissioner of the drug court; or a commissioner of any family court.
Vesting	• Immediate
Base benefit formula	• Monthly pay x .50 = monthly base benefit
Temporary benefit formula	• Not available
Benefit payment options	• Life income annuity • Automatic *unreduced* joint and 50% survivor option *If married at least two continuous years immediately preceding judges death.*
Cost-of-living adjustment (COLA)	• If hired before August 28, 1997, will receive 4-5% each year until reaching 65% cap. After COLA cap is met the rate is based on 80% of the percentage increase in the average CPI (0-5%) • If hired on or after August 28, 1997, based on 80% of the percentage increase in the average CPI (0-5%).
Normal retirement eligibility	• Age 62 with 12 years service • Age 60 with 15 years service • Age 55 with 20 years service
Reduced retirement eligibility	• Age 60 if less than 15 years service • Age 62 if less than 12 years service
Death before retirement	• Non duty-related death – Survivor benefit to eligible spouse equal to 50% of the benefit the member would have received based on service to age 70.
In-service COLA	• Judges who are at least age 60 and work beyond the date first eligible for unreduced benefits will receive COLAs for each year worked beyond normal retirement eligibility. COLA provisions are determined by date of employment.
BackDROP	• Not available
Service purchases	• May purchase up to 4 years of active-duty military service or qualifying public sector service at subsidized rate. May also purchase qualifying public sector service at full actuarial cost.
Service transfers	• May transfer state service to other positions covered by MOSERS under 104.800.
Member contributions	• None

Judicial Plan 2011
• Must be a judge or commissioner of the supreme court or the court of appeals, a judge of any circuit court, probate court, magistrate court, court of common pleas, court of criminal corrections, a justice of the peace, or a commissioner or deputy commissioner of the circuit court; a commissioner of the juvenile division of the circuit court appointed pursuant to Section 211.023, RSMo; a commissioner of the drug court; or a commissioner of any family court appointed or elected a judge and employed in a benefit-eligible position as a judge for the first time on or after January 1, 2011.
• Immediate
• Monthly pay x .50 = monthly base benefit
• Not available
• Life income annuity • Joint & 50% survivor • Joint & 100% survivor • Life income with 120 guaranteed payments • Life income with 180 guaranteed payments
• Based on 80% of the percentage increase in the average CPI (0-5%)
• Age 67 with 12 years service • Age 62 with 20 years service
• Age 67 if less than 12 years service • Age 62 if less than 20 years service
• Non duty-related death – Survivor benefit to eligible spouse equal to 50% of the benefit the member would have received based on service to age 70.
• Not available
• Not available
• May purchase qualifying public sector service at full actuarial cost.
• May transfer state service to other positions covered by MOSERS under 104.800.
• 4% of pay

Comparison of Plans for Uniformed Members of the Water Patrol* | June 30, 2018

MSEP

Benefit Provisions	MSEP (closed plan)	MSEP 2000
Membership eligibility	• Employed prior to July 1, 2000 in a permanent position normally requiring at least 1,040 hours of work a year, and vested in MSEP.	• Employed for the first time on or after July 1, 2000, in a permanent position normally requiring at least 1,040 hours of work a year. • Members who left state employment prior to becoming vested and returned to work on or after July 1, 2000, in a permanent position normally requiring at least 1,040 hours of work a year.
Vesting	• 5 years of service	• 5 years of service
Base benefit formula	• 1.6% x FAP x service increased by 33.3%	• 1.7% x FAP x service
Temporary benefit formula	• Not available	• 0.8% x FAP x service *(must retire under "Rule of 80")*
Benefit payment options	• Life income annuity • *Unreduced* joint and 50% survivor • Joint & 100% survivor • 60 or 120 guaranteed payments	• Life income annuity • Joint & 50% survivor • Joint & 100% survivor • 120 or 180 guaranteed payments
Cost-of-living adjustment (COLA)	• If hired before August 28, 1997, will receive 4-5% each year until reaching 65% cap. After COLA cap is met, the rate is based on 80% of the percentage increase in the average CPI (0-5%). • If hired on or after August 28, 1997, based on 80% of the percentage increase in the average CPI (0-5%).	• Based on 80% of the percentage increase in the average CPI (0-5%).
Normal retirement eligibility	• Age 55 with 5 years of service • "Rule of 80" – minimum age 48	• Age 62 with 5 years of service • "Rule of 80" – minimum age 48
Early retirement eligibility	• Not available	• Age 57 with 10 years of service
Death before retirement	• Non duty-related death *(vested members)* – Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children. • Duty-related death *(no minimum service requirement)* – Survivor benefit to eligible spouse or children no less than 50% of current pay.	• Non duty-related death *(vested members)* – Survivor benefit to eligible spouse calculated using the joint & 100% survivor option or 80% of the member's life income annuity paid to eligible children. • Duty-related death *(no minimum service requirement)* – Survivor benefit to eligible spouse or children no less than 50% of current pay.
In-service COLA	• COLA given for service beyond age 65. COLA provisions are determined by employment date.	• Not available
BackDROP	• Must work at least two years beyond normal retirement eligibility to be eligible for BackDROP.	• Must work at least two years beyond normal retirement eligibility to be eligible for BackDROP.
Service purchases	• May purchase up to 4 years of active-duty military service or qualifying public sector service at subsidized rate. May also purchase qualifying public sector service at full actuarial cost.	• May purchase up to 4 years of active-duty military service or qualifying public sector service at subsidized rate. May also purchase qualifying public sector service at full actuarial cost.
Service transfers	• May transfer state service to other positions covered by MOSERS under 104.800.	• May transfer state service to other positions covered by MOSERS under 104.1090.
Member contributions	• None	• None

* *Eligibility for membership in the MSEP and MSEP 2000 is closed for uniformed members of the water patrol. Employees hired on or after January 1, 2011, are members of the Missouri Department of Transportation and Patrol Employees' Retirement System (MPERS).*

Life Insurance Plans | June 30, 2018

MOSERS administers basic and optional term life insurance plans for eligible state employees and retirees.

Active Members*

Plan Provision	Requirement
• **Basic life insurance** - An amount equal to one times annual salary (with a minimum of $15,000) while actively employed.	• Actively employed in an eligible state position resulting in membership in MOSERS.
• **Duty-related death benefit** - Duty-related death benefit equivalent to two times the annual salary the member was earning at the time of death in addition to the basic life insurance amount of one times annual salary.	• Actively employed in an eligible state position resulting in membership in MOSERS.
• **Optional life insurance** - Additional life insurance may be purchased in a flat amount in multiples of $10,000 not to exceed the maximum (lesser of six times annual salary or $800,000). Spouse coverage may be purchased in multiples of $10,000 up to a maximum of $100,000; however, the amount of spouse coverage cannot exceed the amount of optional life insurance coverage the member has purchased. Coverage for children is available in a flat amount of $10,000 per child.	• Actively employed in an eligible state position resulting in membership in MOSERS.

* *Terminating employees may convert coverage up to the amount they had as an active employee at individual rates. Not available to employees of the Department of Conservation or colleges and universities except Lincoln University and State Technical College of Missouri.*

Retired Members

Plan Provision	Requirement
• **Basic life insurance at retirement** - $5,000 basic life insurance during retirement.	• Must retire directly from active employment.
• **Optional life insurance at retirement** (MSEP) - An employee may retain up to the lesser of $60,000 or the amount of optional life insurance coverage held at the time of retirement at the group rate and may convert any remaining basic and optional life insurance at individual rates. Coverage for spouse ends at member's retirement and may be converted at individual rates.	• Must retire directly from active employment.
• **Optional life insurance at retirement** (MSEP 2000) - Under "Rule of 80", an employee may retain the current amount of coverage prior to retirement until age 62 at which time coverage is reduced to $60,000, and may convert any remaining basic and optional life insurance at individual rates. Coverage for spouse ends at member's retirement and may be converted at individual rates.	• Must retire directly from active employment.
• **Optional life insurance at retirement** (MSEP 2011) - Under "Rule of 90", an employee may retain the current amount of coverage prior to retirement until age 62 at which time coverage is reduced to $60,000, and may convert any remaining basic and optional life insurance at individual rates. Coverage for spouse ends at member's retirement and may be converted at individual rates.	• Must retire directly from active employment.

Note: Insured employees may port their life insurance and their dependent life insurance when their coverage has been reduced or terminated if they meet certain qualifications.

Long-Term Disability (LTD) Insurance Plans | June 30, 2018

MOSERS administers the LTD Plan for eligible state employees who become disabled during active employment.

Active Members

Classification	Requirement
General state employees, legislators, and elected state officials - Members of MOSERS in a position normally requiring 1,040 hours of work a year are covered under the LTD plan, unless they work for a state agency which has its own LTD plan.	• Eligible participants receive 60% of their compensation minus primary social security, workers' compensation, and employer provided income. Benefits commence after 90 days of disability or when sick leave benefits are no longer payable, whichever occurs last. LTD benefits cease upon the earliest of (i) when disability ends, (ii) when the member is first eligible for normal retirement benefits or is receiving early retirement benefits, (iii) upon a member's death, (iv) the date benefits become payable under any other group long-term disability insurance plan, or, (v) the date the member fails to provide proof of continued disability and entitlement to LTD benefits.
Water patrol	• Uniformed members who are eligible for statutory occupational disability receive benefits equal to 50% of compensation with no offset for social security at the time of disability. For nonoccupational disabilities, eligible participants receive the same benefit as general employees.
Judges	• In addition to the disability benefits provided to general employees, judges may receive benefits under the state constitution. Participants may receive 50% of salary until the current term expires.

Changes in Plan Provisions

There were no changes in the MSEP or Judicial benefit plan provisions this year.

Actuarial Present Values | June 30, 2018

MSEP

Actuarial Present Value June 30, 2018	Actuarial Present Value	Portion Covered by Future Normal Cost Contributions	Actuarial Accrued Liabilities
Active members			
Service retirement benefits based on services rendered before and likely to be rendered after valuation date	$ 5,333,470,332	$ 740,784,567	$ 4,592,685,765
Disability benefits likely to be paid to present active members who become totally and permanently disabled	158,683,272	100,701,244	57,982,028
Survivor benefits likely to be paid to widow(er)s and children of present active members who die before retiring	63,062,882	17,164,086	45,898,796
Separation benefits likely to be paid to present active members	224,061,215	149,538,530	74,522,685
Active member totals	$ 5,779,277,701	$ 1,008,188,427	4,771,089,274
Members on leave of absence & LTD			
Service retirement benefits based on service rendered before the valuation date			98,279,095
Inactive-vested members			
Service retirement benefits based on service rendered before the valuation date			649,828,722
Retired lives			8,073,692,664
Pending refunds			19,874,206
Total actuarial accrued liability			13,612,763,961
Less: actuarial value of assets			8,830,410,210
Unfunded actuarial accrued liability			$ 4,782,353,751
Funded ratio			64.9%

Actuarial Present Values | June 30, 2018

Judicial Plan

Actuarial Present Value June 30, 2018	Actuarial Present Value	Portion Covered by Future Normal Cost Contributions	Actuarial Accrued Liabilities
Active members			
Service retirement benefits based on services rendered before and likely to be rendered after valuation date	$ 253,121,720	$ 75,009,370	$ 178,112,350
Disability benefits likely to be paid to present active members who become totally and permanently disabled	1,436,998	1,300,956	136,042
Survivor benefits likely to be paid to widow(er)s and children of present active members who die before retiring	5,389,300	3,350,950	2,038,350
Separation benefits likely to be paid to present active members	8,848,882	9,298,238	(449,356)
Active member totals	$ 268,796,900	$ 88,959,514	179,837,386
Inactive-vested members			12,225,596
Retired lives			401,725,610
Total actuarial accrued liability			593,788,592
Less: actuarial value of assets			162,135,045
Unfunded actuarial accrued liability			$ 431,653,547
Funded ratio			27.3%

Statistical Section

Summary

Plan Membership

Membership in the pension trusts administered by MOSERS increased by 12,076. Active members decreased by 1,099, and retired members and their beneficiaries increased by 1,657. Inactive-vested members decreased by 4,101 due to the buyout program offered during the year. Prior to January 1, 2011, inactive-nonvested members (currently 15,619), were not included in the membership data as they were no longer eligible for a future benefit. With the implementation of MSEP 2011, members who contribute to the system and who have not requested a refund of their employee contributions are still participants of the system and will be included beginning in FY18. Membership data for the last 10 years ended June 30, 2018, can be found on page 146. The location of benefit recipients, showing that the majority remain in the state of Missouri after retirement, is depicted on page 147.

Valuation Assets vs Pension Liabilities

The charts on 142-144 graphically represent the funding progress of the pension plans for the 10 years ended June 30, 2018. The bar charts in the middle of the pages show the portion of the pension liabilities that are unfunded compared to the portion covered by assets in the trust funds. The bar charts on the bottom of the pages illustrate the funded ratio of the plans for the ten years ended June 30, 2018.

The existence of the unfunded actuarial accrued liabilities is not necessarily an indication of financial problems, but the fluctuations are important and must be monitored and controlled.

The remainder of this section contains various statistical and historical data considered useful in evaluating the condition of the plans.

All nonaccounting data is taken from MOSERS' internal sources except for that information which is derived from the actuarial valuations (pages 142-144, 150-152, and 162-163). Member data may differ between some schedules since the valuations are performed using data as of May 31 each year.

Changes in Net Position | Last Ten Fiscal Years

	2009	2010	2011	2012
MSEP				
Additions				
Employer contributions	$ 252,105,008	$ 251,226,187	$ 263,418,048	$ 263,373,924
Employee contributions	0	0	599,761	4,955,399
Member service purchases	3,235,999	3,576,954	2,814,551	2,869,085
Service transfer contributions	28,075	10,009	142,248	2,675,339
Investment income (net of expenses)	(1,508,376,715)	859,898,512	1,395,677,299	158,102,123
Other	619,060	639,901	659,474	448,463
Total additions to plan net position	(1,252,388,573)	1,115,351,563	1,663,311,381	432,424,333
Deductions				
Benefits	511,466,555	543,284,289	597,424,954	611,522,451
Refunds	0	3,106	0	123,709
Service transfers out	0	462,970	17,745,828	588,180
Administrative expenses	7,088,483	7,064,544	7,054,581	7,017,057
Total deductions from plan net position	518,555,038	550,814,909	622,225,363	619,251,397
Change in net position	$(1,770,943,611)	$ 564,536,654	$ 1,041,086,018	$ (186,827,064)
Judicial Plan				
Additions				
Employer contributions	$ 27,725,882	$ 27,029,198	$ 27,702,682	$ 26,324,526
Employee contributions	0	0	59,958	149,859
Investment income (net of expenses)	(15,847,382)	9,909,718	17,460,050	2,061,916
Other	6,504	7,374	8,250	5,849
Total additions to plan net position	11,885,004	36,946,290	45,230,940	28,542,150
Deductions				
Benefits	23,232,088	24,230,545	25,488,531	26,821,412
Refunds	0	0	0	0
Administrative expenses	74,473	81,414	88,253	91,514
Total deductions from plan net position	23,306,561	24,311,959	25,576,784	26,912,926
Change in net position	$ (11,421,557)	$ 12,634,331	$ 19,654,156	$ 1,629,224
Internal Service Fund				
Operating revenues				
Premium receipts	$ 28,990,057	$ 29,098,799	$ 28,829,638	$ 28,578,326
Deferred compensation receipts	75,661,047	69,143,267	54,221,226	17,500,476
Miscellaneous income	1,027,380	1,039,369	981,404	608,187
Total operating revenues	105,678,484	99,281,435	84,032,268	46,686,989
Operating expenses				
Premium disbursements	28,968,981	29,077,825	28,804,638	28,556,036
Deferred compensation disbursements	75,683,218	69,143,267	54,221,226	17,500,476
Premium refunds	21,076	20,974	24,999	22,291
Administrative expenses	819,581	797,020	826,809	778,529
Total operating expenses	105,492,856	99,039,086	83,877,672	46,857,332
Nonoperating revenues				
Investment income	20,755	9,816	11,071	11,068
Change in net position	$ 206,383	$ 252,165	$ 165,667	$ (159,275)

Changes in Net Position continued from page 138

2013	2014	2015	2016	2017	2018
$ 274,655,284	$ 326,370,336	$ 329,752,832	$ 329,957,369	$ 335,217,422	$ 379,557,962
9,698,883	14,025,328	18,099,455	21,684,920	25,439,343	28,303,993
3,475,123	2,909,423	1,859,005	2,815,749	1,691,046	2,020,720
2,446,627	2,252,206	3,575,815	2,107,873	3,977,803	3,297,251
778,008,348	1,484,709,539	(237,603,530)	1,194,422	272,073,643	578,883,501
489,193	450,453	533,001	545,847	522,025	538,600
1,068,773,458	1,830,717,285	116,216,578	358,306,180	638,921,282	992,602,027
646,708,308	677,097,411	723,994,041	750,440,412	787,300,328	879,148,738
622,341	1,421,856	2,479,264	3,798,199	4,820,737	5,502,698
1,911,665	1,916,840	1,792,495	3,071,892	1,843,792	2,060,037
7,575,883	7,336,922	8,077,692	8,489,375	8,759,341	10,024,178
656,818,197	687,773,029	736,343,492	765,799,878	802,724,198	896,735,651
$ 411,955,261	$1,142,944,256	$ (620,126,914)	$ (407,493,698)	$ (163,802,916)	$ 95,866,376
$ 28,330,649	$ 29,264,877	$ 32,696,686	$ 33,642,497	$ 34,246,826	$ 36,892,203
211,936	294,810	488,193	661,206	786,745	902,320
10,724,252	21,388,261	(3,618,469)	19,273	4,671,168	10,727,603
6,743	6,489	8,117	8,808	8,963	9,981
39,273,580	50,954,437	29,574,527	34,331,784	39,713,702	48,532,107
27,802,871	29,406,625	31,245,906	32,979,706	33,979,837	35,651,489
0	0	0	10,008	4,888	5,760
104,428	105,693	123,015	136,983	150,387	185,763
27,907,299	29,512,318	31,368,921	33,126,697	34,135,112	35,843,012
$ 11,366,281	$ 21,442,119	$ (1,794,394)	$ 1,205,087	$ 5,578,590	$ 12,689,095
$ 28,961,637	$ 29,563,054	$ 30,177,918	$ 30,360,162	$ 28,779,398	$ 31,119,232
0	1,000,000	0	0	700,000	800,000
480,120	480,120	480,120	480,120	480,120	480,120
29,441,757	31,043,174	30,658,038	30,840,282	29,959,518	32,399,352
28,930,950	29,544,110	30,157,271	30,328,802	28,769,588	31,100,612
0	0	0	0	0	0
30,687	18,942	20,646	31,360	9,810	14,211
805,457	755,945	960,827	1,015,578	950,121	1,587,344
29,767,094	30,318,997	31,138,744	31,375,740	29,729,519	32,702,167
12,075	11,886	12,549	18,777	36,497	85,806
$ (313,262)	$ 736,063	$ (468,157)	$ (516,681)	$ 266,496	$ 278,112

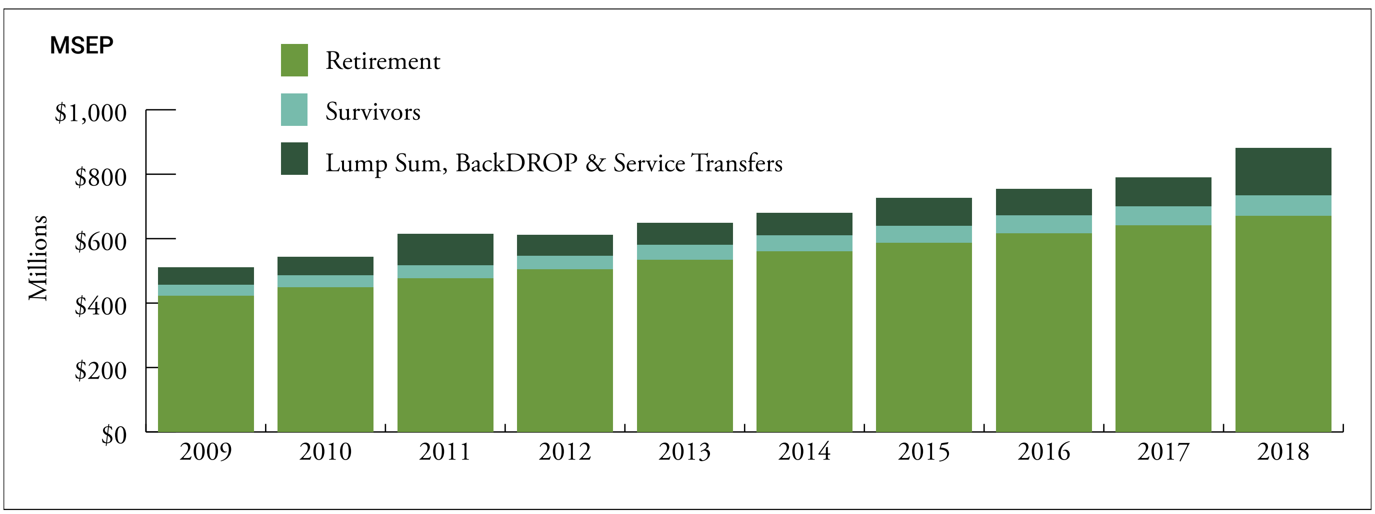
Deductions from Net Position for Benefits and Refunds by Type | Last Ten Fiscal Years

MSEP

Type of benefit	2009	2010	2011	2012
Retirement	$ 421,847,017	$ 448,880,110	$ 476,841,741	$ 504,555,055
Survivors	34,615,979	37,718,898	39,968,601	42,963,959
Disability	33,812	33,403	29,191	29,503
Lump sum	272,189	409,787	293,147	229,650
BackDROP and service transfers	54,697,557	56,705,060	98,038,103	64,332,464
Total benefits	$ 511,466,554	$ 543,747,258	$ 615,170,783	$ 612,110,631
Refunds	$ 0	$ 3,106	$ 0	$ 123,709

Judicial Plan

Type of benefit	2009	2010	2011	2012
Retirement	$ 19,143,753	$ 19,784,720	$ 21,025,904	$ 22,284,844
Survivors	4,088,335	4,445,825	4,462,627	4,536,569
Total benefits	$ 23,232,088	$ 24,230,545	$ 25,488,531	$ 26,821,413
Refunds	$ 0	$ 0	$ 0	$ 0

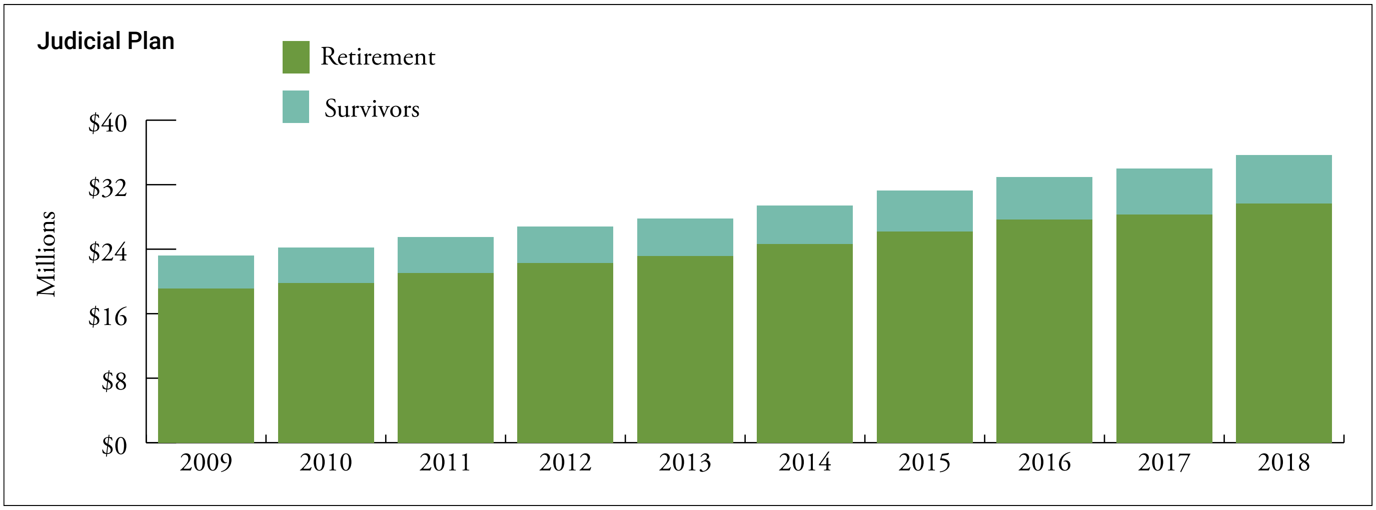


** Disability benefits are included, but amounts are too minimal to visually display in graph.*

Deductions from Net Position for Benefits and Refunds by Type continued from page 140

2013	2014	2015	2016	2017	2018
$ 533,962,630	$ 560,553,490	$ 586,597,187	$ 615,708,229	$640,637,749	$ 670,663,932
46,659,381	49,922,170	52,940,062	56,495,787	59,628,687	63,081,129
27,255	22,468	16,857	15,470	14,821	5,223
191,320	286,184	57,525	267,198	123,005	61,041,258
67,779,388	68,229,937	86,174,905	81,025,620	88,739,858	86,417,233
$ 648,619,974	$ 679,014,249	$ 725,786,536	$ 753,512,304	$ 789,144,120	$ 881,208,775
$ 622,341	$ 1,421,856	$ 2,479,264	$ 3,798,199	$ 4,820,737	$ 5,502,698

2013	2014	2015	2016	2017	2018
$ 23,123,707	$ 24,609,421	$ 26,181,505	$ 27,641,108	$ 28,304,733	$ 29,655,995
4,679,169	4,797,204	5,064,400	5,338,598	5,675,104	5,995,494
$ 27,802,876	$ 29,406,625	$ 31,245,905	$ 32,979,706	$ 33,979,837	$ 35,651,489
$ 0	$ 0	$ 0	$ 10,008	$ 4,888	$ 5,760



** Disability benefits are included, but amounts are too minimal to visually display in graph.*

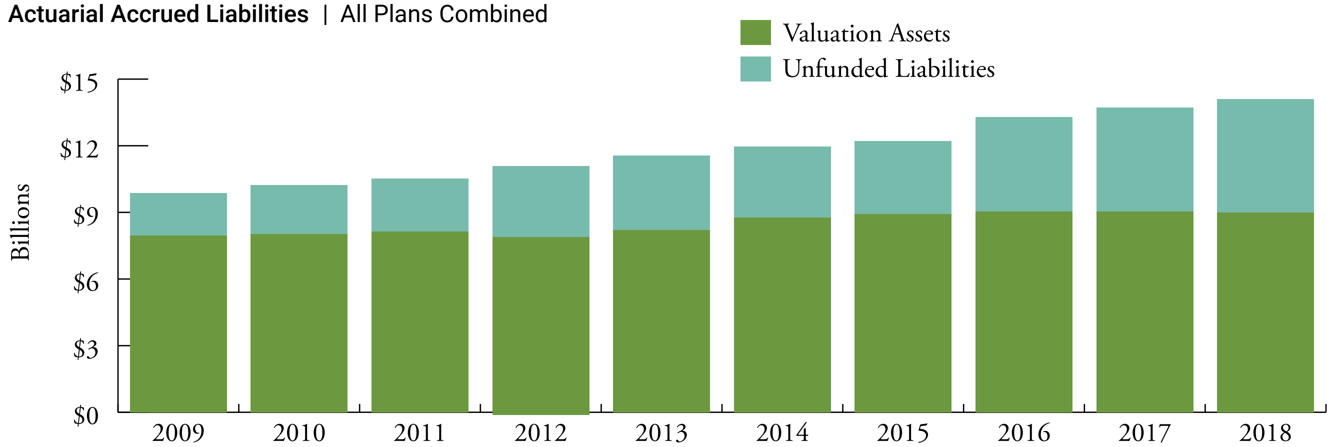
Pension Trust Funds

Valuation Assets (Smoothed Market) vs. Pension Liabilities | Last Ten Fiscal Years

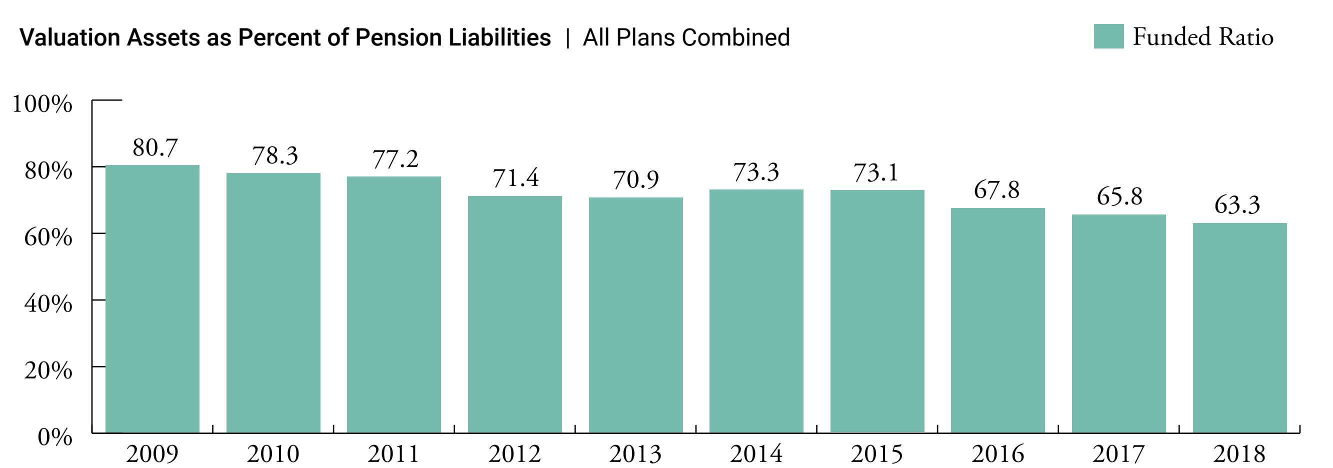
MSEP & Judicial Plans Combined

	Dollars in Billions			
Fiscal Year	Valuation Assets	Unfunded Liabilities	Accrued Liabilities	Funded Ratios
2009	$ 7.9574	$ 1.9065	$ 9.8639	80.7%
2010	8.0123	2.2228	10.2350	78.3
2011	8.1210	2.3960	10.5170	77.2
2012	7.9994	3.2076	11.2070	71.4
2013	8.2075	3.3624	11.5700	70.9
2014	8.7621	3.1949	11.9569	73.3
2015	8.9268	3.2838	12.2106	73.1
2016	9.0216	4.2772	13.2988	67.8
2017	9.0242	4.6925	13.7167	65.8
2018	8.9925	5.2141	14.2066	63.3

Actuarial Accrued Liabilities | All Plans Combined



Valuation Assets as Percent of Pension Liabilities | All Plans Combined

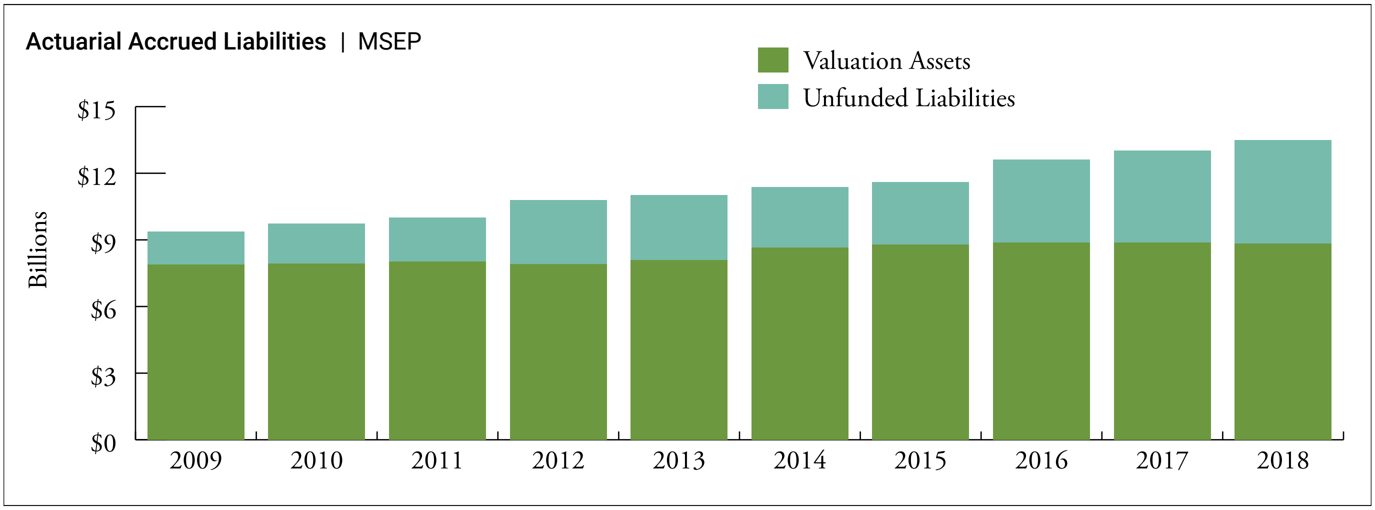


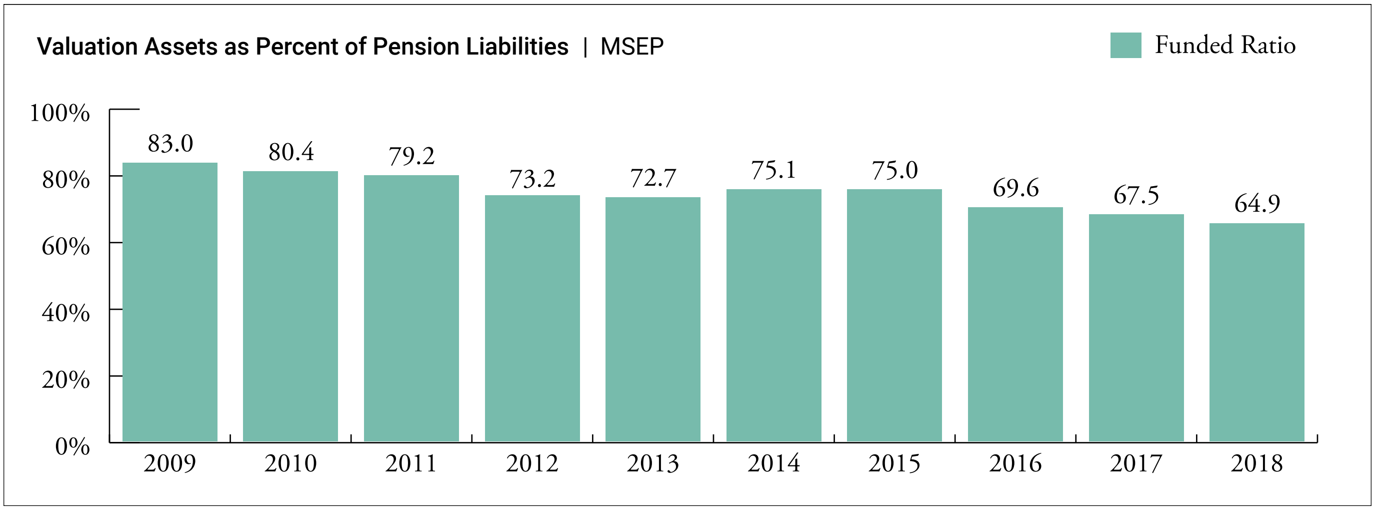
Pension Trust Funds

Valuation Assets (Smoothed Market) vs. Pension Liabilities | Last Ten Fiscal Years

MSEP

	Dollars in Billions			
Fiscal Year	Valuation Assets	Unfunded Liabilities	Accrued Liabilities	Funded Ratios
2009	$ 7.8761	$ 1.6187	$ 9.4948	83.0%
2010	7.9234	1.9300	9.8532	80.4
2011	8.0225	2.1010	10.1240	79.2
2012	7.8972	2.8965	10.7937	73.2
2013	8.0964	3.0382	11.1346	72.7
2014	8.6378	2.8568	11.4946	75.1
2015	8.7925	2.9351	11.7276	75.0
2016	8.8781	3.8731	12.7512	69.6
2017	8.8724	4.2799	13.1523	67.5
2018	8.8304	4.7824	13.6128	64.9





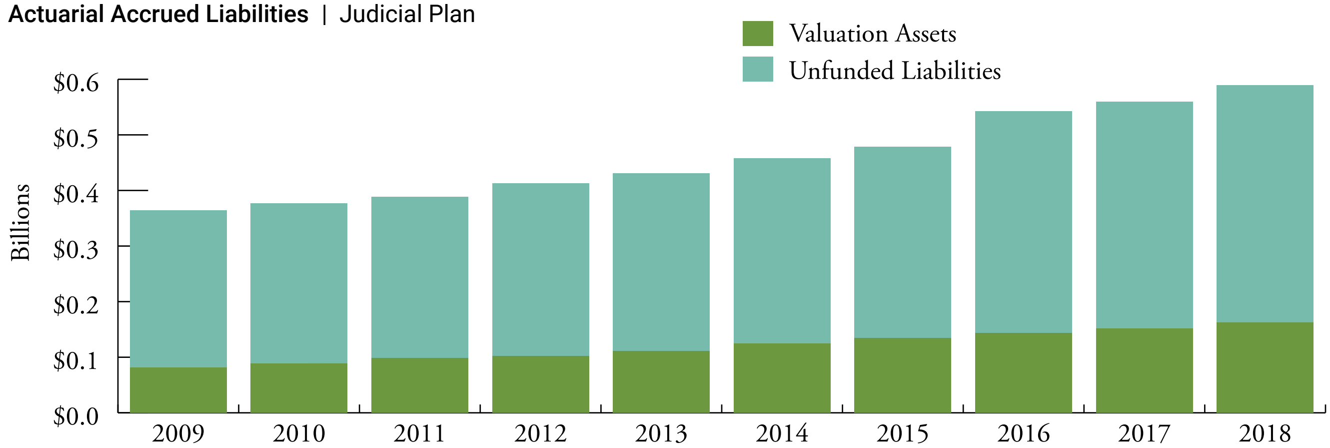
Pension Trust Funds

Valuation Assets (Smoothed Market) vs. Pension Liabilities | Last Ten Fiscal Years

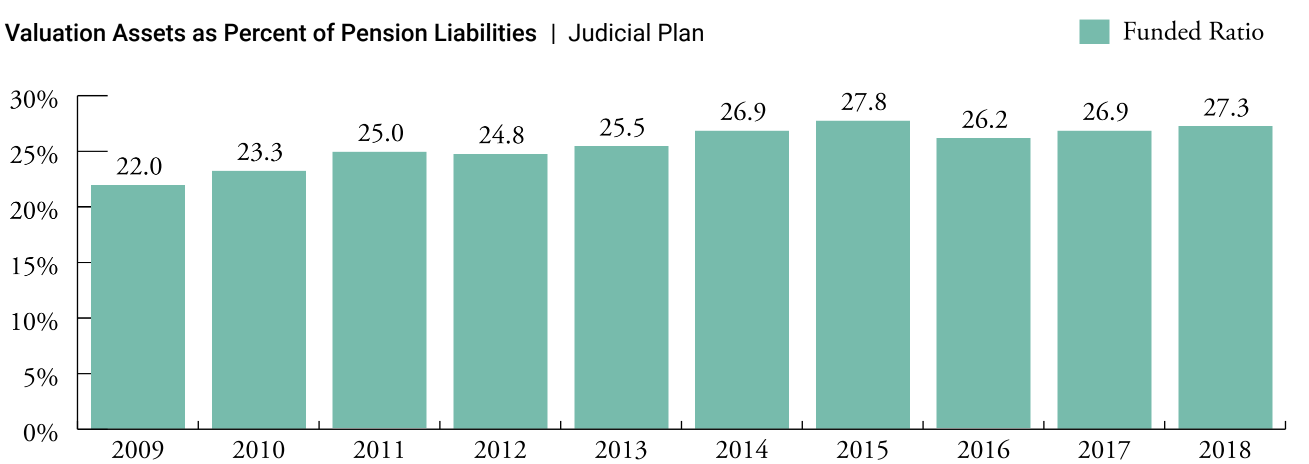
Judicial Plan

Fiscal Year	Valuation Assets	Unfunded Liabilities	Accrued Liabilities	Funded Ratios
	Dollars in Billions			
2009	$ 0.0813	$ 0.2878	$ 0.3691	22.0%
2010	0.0890	0.2930	0.3820	23.3
2011	0.0984	0.2951	0.3935	25.0
2012	0.1023	0.3111	0.4133	24.8
2013	0.1111	0.3242	0.4354	25.5
2014	0.1243	0.3381	0.4623	26.9
2015	0.1343	0.3486	0.4830	27.8
2016	0.1435	0.4041	0.5476	26.2
2017	0.1518	0.4126	0.5644	26.9
2018	0.1621	0.4317	0.5938	27.3

Actuarial Accrued Liabilities | Judicial Plan

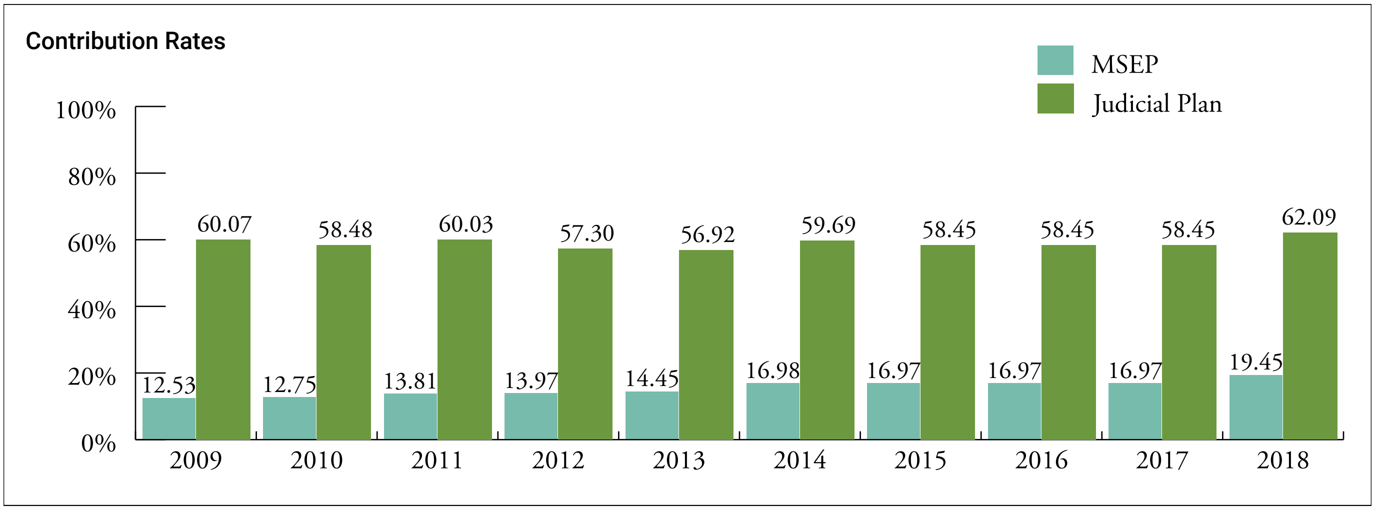


Valuation Assets as Percent of Pension Liabilities | Judicial Plan



Contribution Rates as a Percent of Payroll | Last Ten Fiscal Years

Fiscal Year	MSEP	Judicial Plan
2009	12.53%	60.07%
2010	12.75	58.48
2011	13.81	60.03
2012	13.97	57.30
2013	14.45	56.92
2014	16.98	59.69
2015	16.97	58.45
2016	16.97	58.45
2017	16.97	58.45
2018	19.45	62.09



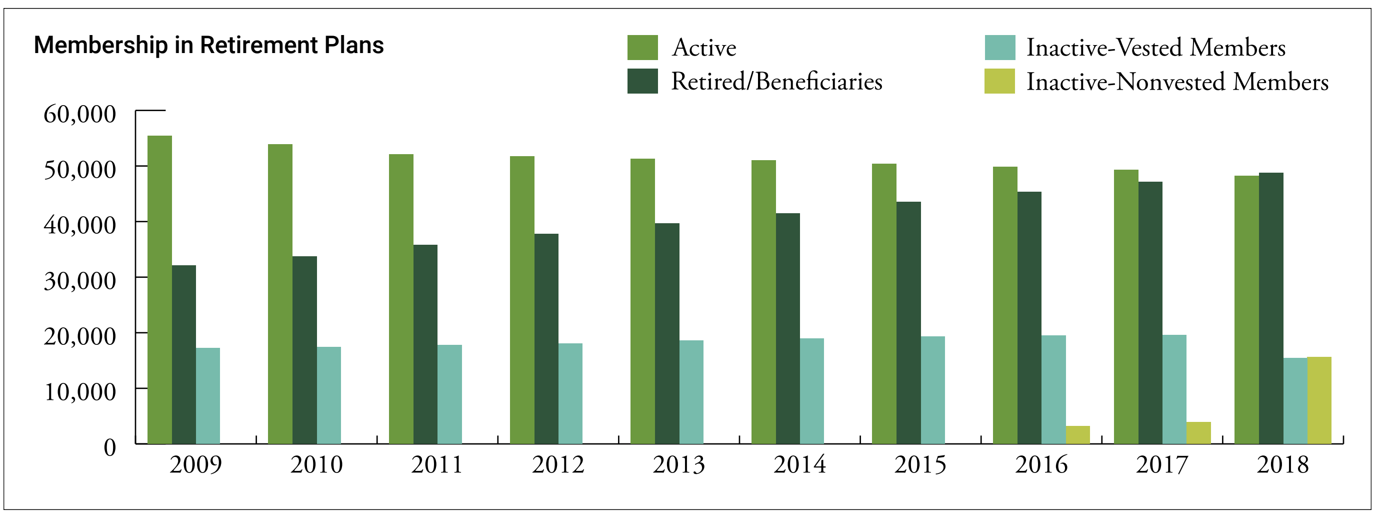
Membership in Retirement Plans | Last Ten Fiscal Years

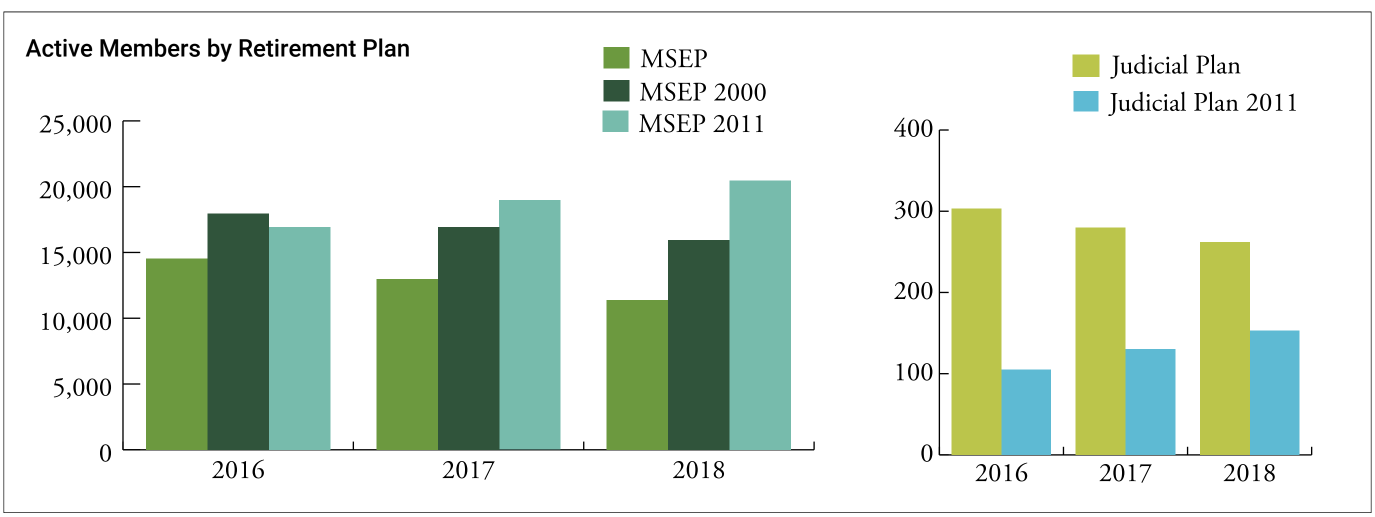
MSEP & Judicial Plans Combined

Fiscal Year	Active Members	Retirees and Beneficiaries	Inactive-Vested Members*	Inactive-Nonvested Members**	Totals
2009	55,454	32,100	17,304		104,858
2010	53,880	33,716	17,441		105,037
2011	52,059	35,801	17,757		105,617
2012	51,730	37,796	18,075		107,601
2013	51,233	39,636	18,581		109,450
2014	51,026	41,511	18,957		111,494
2015	50,385	43,503	19,319		113,207
2016	49,872	45,368	19,538		114,778
2017	49,320	47,119	19,603		116,042
2018	48,221	48,776	15,502	15,619	128,118

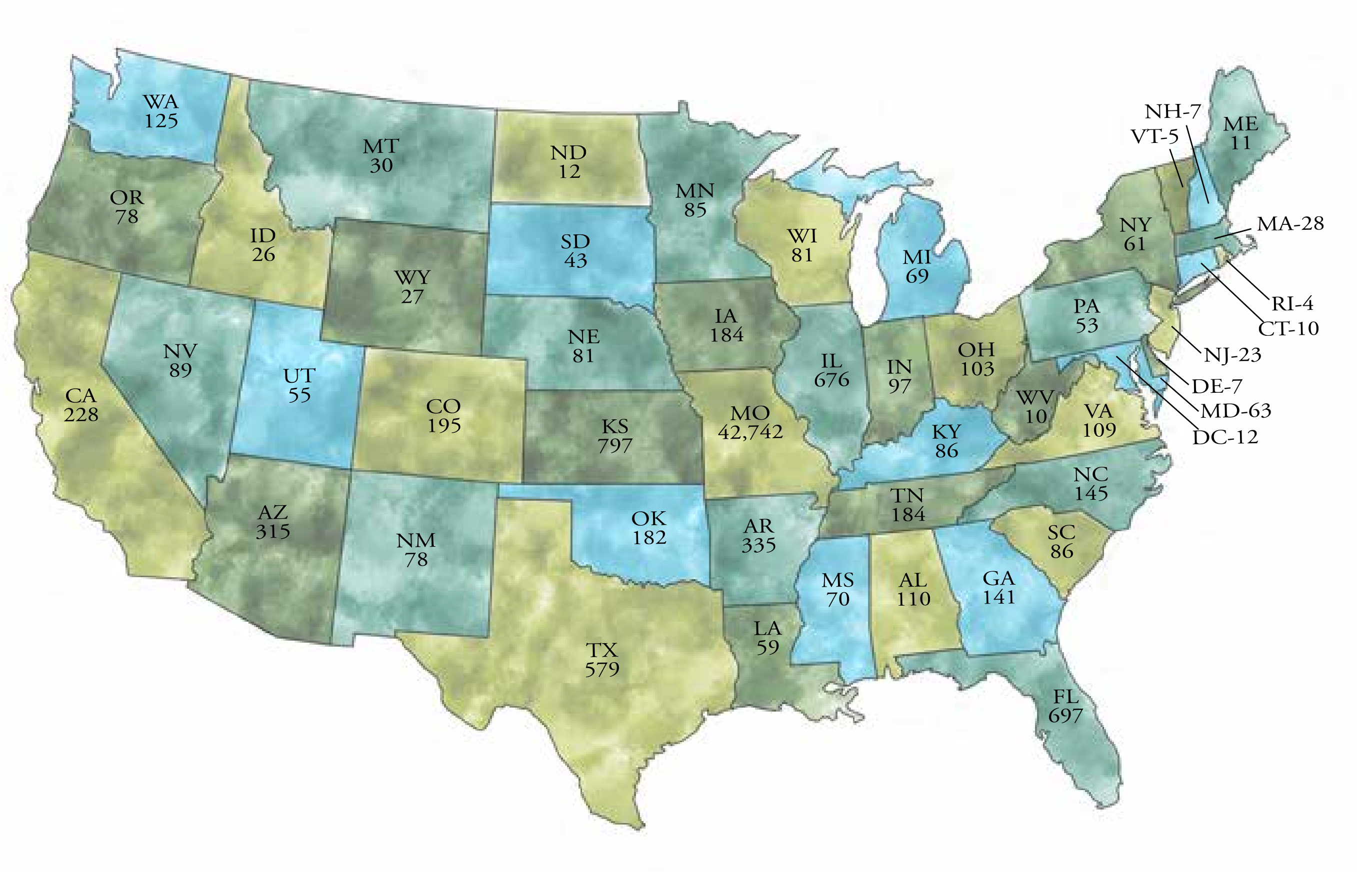
* *Excludes members on leave of absence and long-term disability.*

** *Inactive-nonvested members of the MSEP 2011 who have not requested a refund of their contributions are now being included in the membership data.*





Distribution of Benefit Recipients by Location



Benefit Recipients Outside the Continental United States

16	Alaska	1	Ecuador	2	P. R. China
7	Hawaii	1	Germany	1	Philippines
1	Army Post Office	1	Guam	1	Sri Lanka
1	Argentina	1	Hong Kong	1	Sweden
2	Australia	1	India	1	Thailand
1	Brazil	2	Ireland	1	The Netherlands
12	Canada	2	Israel	3	United Kingdom
1	Costa Rica	2	Italy	2	Virgin Islands
1	Croatia	1	Latvia		
1	Czech Republic	1	Marshall Islands		

Benefit Recipients by Type of Retirement and Option Elected | June 30, 2018

MSEP

Amount of Monthly Benefit	Number of Benefit Recipients	Type of Retirement A	B	C	D	E	F	G
1-250	5,624	2,066	2,640	260	559	1	0	98
251-500	8,184	3,981	2,885	442	770	0	0	106
501-750	5,753	3,365	1,426	320	599	0	0	43
751-1000	5,147	3,792	678	202	436	0	0	39
1001-1250	4,666	3,878	324	129	319	0	0	16
1251-1500	4,003	3,506	141	113	235	0	0	8
1501-1750	3,222	2,914	85	56	163	0	0	4
1751-2000	2,607	2,391	49	46	118	0	0	3
Over 2000	9,578	8,883	79	157	455	0	0	4
Total	48,784	34,776	8,307	1,725	3,654	1	0	321

Judicial Plan

Amount of Monthly Benefit	Number of Benefit Recipients	Type of Retirement A	B	C	D	E	F	G
1-250	4	0	2	0	2	0	0	0
251-500	7	0	5	0	1	0	0	1
501-750	7	0	3	0	3	0	0	1
751-1000	5	1	1	1	1	0	0	1
1001-1250	5	0	3	0	2	0	0	0
1251-1500	7	0	5	1	0	0	0	1
1501-1750	8	1	3	0	2	0	0	2
1751-2000	4	0	1	3	0	0	0	0
Over 2000	530	319	61	29	117	0	0	4
Total	577	321	84	34	128	0	0	10

Type of Retirement
A - Normal retirement
B - Early retirement
C - Survivor of active
D - Survivor of retired
E - Disability
F - Occupational disability (Water Patrol)
G - Ex-spouse

Benefit Recipients by Type of Retirement and Option Elected continued from page 148

Option Elected

1	2	3	4	5	6	7	8	9	10
0	18	264	232	323	0	1,210	403	51	3,123
8	34	280	249	504	1	1,773	762	31	4,542
9	27	152	103	360	1	1,212	974	8	2,907
7	27	87	57	366	1	1,206	991	3	2,402
8	19	64	38	490	0	1,054	786	2	2,205
7	10	53	38	486	0	913	596	3	1,897
6	8	51	30	406	0	702	416	0	1,603
9	4	28	15	386	0	573	319	0	1,273
70	18	96	46	1,323	0	2,630	1,277	0	4,118
124	165	1,075	808	4,644	3	11,273	6,524	98	24,070

Option Elected

1	2	3	4	5	6	7	8	9	10
4	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	1
5	0	0	0	1	0	0	0	0	1
2	0	0	0	0	0	1	0	0	2
4	0	0	0	0	0	0	0	0	1
6	0	0	0	0	0	0	0	0	1
6	0	0	0	0	0	0	0	0	2
2	0	0	0	0	0	0	0	0	2
495	0	0	0	23	0	0	0	1	11
530	0	0	0	24	0	1	0	1	21

Option Elected
1 - Automatic 50% joint & survivor
2 - 60 guaranteed payments
3 - 120 guaranteed payments
4 - 180 guaranteed payments
5 - 50% joint & survivor
6 - 75% joint & survivor
7 - 100% joint & survivor
8 - Unreduced 50% joint & survivor
9 - Automatic minor survivor
10 - No survivor option (includes pop-ups)

Benefits Payable Tabulated by Type of Benefit and by Option

MSEP Combined

Type of Benefit	Number	Annual Benefits	Average Annual Benefits
Service retirement			
Life annuity	23,563	$ 334,897,248	$ 14,213
Joint and 50% survivor	9,392	182,803,128	19,464
Joint and 100% survivor	8,083	145,911,576	18,052
Life income with 60 guaranteed payments	163	1,966,356	12,064
Life income with 120 guaranteed payments	968	9,899,592	10,227
Life income with 180 guaranteed payments	667	5,486,052	8,225
Survivor beneficiary	3,651	45,208,908	12,383
Total	46,487	726,172,860	15,621
Disability retirement	1	2,244	2,244
Death-in-service	1,719	18,696,744	10,877
Grand totals	48,207	$ 744,871,848	15,452

Judicial Plan Combined

Type of Benefit	Number	Annual Benefits	Average Annual Benefits
Service retirement			
Life annuity	5	$ 333,408	$ 66,682
Joint and 50% survivor	399	29,872,236	74,868
Joint and 100% survivor	1	10,848	10,848
Survivor beneficiary	130	4,961,220	38,163
Total	535	35,177,712	65,753
Death-in-service	34	1,159,524	34,104
Grand totals	569	$ 36,337,236	63,862

Benefits Payable Tabulated by Type of Benefit and by Option

MSEP (Closed Plan)

Type of Benefit	Number	Annual Benefits	Average Annual Benefits
Service retirement			
Life annuity	5,933	$ 88,848,780	$ 14,975
Joint and 50% survivor (unreduced)	5,184	100,354,656	19,359
Joint and 100% survivor	3,098	68,325,516	22,055
Life income with 60 guaranteed payments	142	1,646,952	11,598
Life income with 120 guaranteed payments	170	2,062,296	12,131
Survivor beneficiary	2,585	34,987,944	13,535
Total	17,112	296,226,144	17,311
Disability retirement	1	2,244	2,244
Death-in-service	1,461	17,487,312	11,969
Grand totals	18,574	$ 313,715,700	16,890

MSEP 2000

Type of Benefit	Number	Annual Benefits	Average Annual Benefits
Service retirement			
Life annuity	17,619	$ 246,004,212	$ 13,962
Joint and 50% survivor	4,206	82,437,900	19,600
Joint and 100% survivor	4,980	77,567,532	15,576
Life income with 60 guaranteed payments	21	319,404	15,210
Life income with 120 guaranteed payments	795	7,829,184	9,848
Life income with 180 guaranteed payments	664	5,477,460	8,249
Survivor beneficiary	1,066	10,220,964	9,588
Total	29,351	429,856,656	14,645
Death-in-service	257	1,193,628	4,644
Grand totals	29,608	$ 431,050,284	14,559

MSEP 2011

Type of Benefit	Number	Annual Benefits	Average Annual Benefits
Service retirement			
Life annuity	11	$ 44,256	$ 4,023
Joint and 50% survivor	2	10,572	5,286
Joint and 100% survivor	5	18,528	3,706
Life income with 60 guaranteed payments	0	0	0
Life income with 120 guaranteed payments	3	8,112	2,704
Life income with 180 guaranteed payments	3	8,592	2,864
Survivor beneficiary	0	0	0
Total	24	90,060	3,753
Death-in-service	1	15,804	15,804
Grand totals	25	$ 105,864	4,235

Benefits Payable Tabulated by Type of Benefit and by Option

Judicial Plan

Type of Benefit	Number	Annual Benefits	Average Annual Benefits
Service retirement			
Life annuity	4	$ 320,748	$ 80,187
Joint and 50% survivor	399	29,872,236	74,868
Joint and 100% survivor	0	0	0
Survivor beneficiary	130	4,961,220	38,163
Total	533	35,154,204	65,955
Death-in-service	34	1,159,524	34,104
Grand totals	567	$ 36,313,728	64,045

Judicial Plan 2011

Type of Benefit	Number	Annual Benefits	Average Annual Benefits
Service retirement			
Life annuity	1	$ 12,660	$ 12,660
Joint and 50% survivor	0	0	0
Joint and 100% survivor	1	10,848	10,848
Survivor beneficiary	0	0	0
Total	2	23,508	11,754
Death-in-service	0	0	0
Grand totals	2	$ 23,508	11,754

Average Monthly Benefit Amounts | Ten Years Ended June 30, 2018

MSEP

Members Retiring During Fiscal Year		Years Credited Service by Category <5	5-10	11-15	16-20	21-25	26-30	31+	All Members
2009	Average monthly benefit	$ 111	$ 292	$ 489	$ 748	$ 1,226	$ 1,637	$ 2,191	$ 976
	Average final average salary	$ 1,596	$ 2,435	$ 2,463	$ 2,855	$ 3,212	$ 3,462	$ 3,993	$ 2,966
	Number of retirees	1	461	391	322	416	388	180	2,159
2010	Average monthly benefit	$ 442	$ 287	$ 488	$ 777	$ 1,186	$ 1,606	$ 2,138	$ 940
	Average final average salary	$ 6,215	$ 2,523	$ 2,535	$ 2,890	$ 3,167	$ 3,455	$ 3,845	$ 2,968
	Number of retirees	2	500	449	351	394	338	222	2,256
2011	Average monthly benefit	$ 367	$ 336	$ 492	$ 819	$ 1,220	$ 1,652	$ 2,142	$ 1,006
	Average final average salary	$ 1,442	$ 2,631	$ 2,507	$ 3,063	$ 3,234	$ 3,523	$ 3,884	$ 3,063
	Number of retirees	4	601	498	444	495	495	280	2,817
2012	Average monthly benefit	$ 126	$ 303	$ 521	$ 818	$ 1,232	$ 1,624	$ 2,271	$ 939
	Average final average salary	$ 7,854	$ 2,572	$ 2,648	$ 3,050	$ 3,295	$ 3,488	$ 4,109	$ 3,055
	Number of retirees	5	592	537	407	473	373	196	2,583
2013	Average monthly benefit	$ 251	$ 326	$ 523	$ 753	$ 1,243	$ 1,697	$ 2,017	$ 928
	Average final average salary	$ 3,744	$ 2,665	$ 2,593	$ 2,814	$ 3,314	$ 3,637	$ 3,689	$ 3,011
	Number of retirees	5	600	558	386	438	388	204	2,579
2014	Average monthly benefit	$ 280	$ 308	$ 520	$ 809	$ 1,199	$ 1,691	$ 2,207	$ 937
	Average final average salary	$ 4,426	$ 2,675	$ 2,614	$ 3,029	$ 3,229	$ 3,650	$ 3,999	$ 3,066
	Number of retirees	5	636	507	370	436	392	199	2,545
2015	Average monthly benefit	$ 219	$ 315	$ 522	$ 801	$ 1,268	$ 1,723	$ 2,217	$ 999
	Average final average salary	$ 5,058	$ 2,596	$ 2,624	$ 2,954	$ 3,416	$ 3,729	$ 4,016	$ 3,119
	Number of retirees	6	644	519	437	450	487	250	2,793
2016	Average monthly benefit	$ 151	$ 307	$ 506	$ 819	$ 1,300	$ 1,838	$ 2,360	$ 1,016
	Average final average salary	$ 3,284	$ 2,623	$ 2,600	$ 3,020	$ 3,445	$ 3,968	$ 4,204	$ 3,175
	Number of retirees	6	611	502	430	505	423	215	2,692
2017	Average monthly benefit	$ 309	$ 339	$ 562	$ 946	$ 1,365	$ 1,860	$ 2,391	$ 1,116
	Average final average salary	$ 4,658	$ 2,731	$ 2,849	$ 3,426	$ 3,641	$ 4,030	$ 4,291	$ 3,406
	Number of retirees	9	518	508	459	440	477	239	2,650
2018	Average monthly benefit	$ 402	$ 338	$ 584	$ 922	$ 1,420	$ 1,887	$ 2,511	$ 1,148
	Average final average salary	$ 5,977	$ 2,815	$ 2,899	$ 3,323	$ 3,802	$ 4,096	$ 4,538	$ 3,488
	Number of retirees	7	523	475	486	520	515	208	2,734
Ten Years Ended June 30, 2018									
	Average monthly benefit	$ 271	$ 315	$ 522	$ 827	$ 1,269	$ 1,730	$ 2,243	$ 1,003
	Average final average salary	$ 4,675	$ 2,629	$ 2,637	$ 3,059	$ 3,385	$ 3,724	$ 4,054	$ 3,139
	Number of retirees	50	5,686	4,944	4,092	4,567	4,276	2,193	25,808

Note: COLA increases and temporary benefits payable under MSEP 2000 until age 62 are excluded from the above for comparison purposes.

Average Monthly Benefit Amounts | Last Ten Fiscal Years

General Employees in the MSEP*

Members Retiring During Fiscal Year		<5	5-10	11-15	16-20	21-25	26-30	31+	All Members
		Years Credited Service by Category							
2009	Average monthly benefit	$ 111	$ 267	$ 470	$ 740	$ 1,209	$ 1,635	$ 2,175	$ 965
	Average final average salary	$ 1,596	$ 2,404	$ 2,440	$ 2,854	$ 3,187	$ 3,460	$ 3,971	$ 2,952
	Number of retirees	1	447	387	320	413	387	179	2,134
2010	Average monthly benefit	$ 60	$ 281	$ 475	$ 773	$ 1,179	$ 1,601	$ 2,113	$ 932
	Average final average salary	$ 4,258	$ 2,519	$ 2,519	$ 2,890	$ 3,154	$ 3,456	$ 3,815	$ 2,957
	Number of retirees	1	496	446	350	393	337	220	2,243
2011	Average monthly benefit	$ 39	$ 302	$ 472	$ 802	$ 1,217	$ 1,622	$ 2,124	$ 992
	Average final average salary	$ 925	$ 2,612	$ 2,486	$ 3,052	$ 3,234	$ 3,518	$ 3,862	$ 3,055
	Number of retirees	3	571	491	440	494	492	278	2,769
2012	Average monthly benefit	$ 126	$ 290	$ 502	$ 805	$ 1,232	$ 1,617	$ 2,271	$ 932
	Average final average salary	$ 7,854	$ 2,557	$ 2,626	$ 3,036	$ 3,295	$ 3,475	$ 4,109	$ 3,045
	Number of retirees	5	584	532	404	473	372	196	2,566
2013	Average monthly benefit	$ 169	$ 301	$ 502	$ 746	$ 1,234	$ 1,697	$ 1,995	$ 921
	Average final average salary	$ 4,244	$ 2,653	$ 2,568	$ 2,813	$ 3,295	$ 3,637	$ 3,645	$ 3,001
	Number of retirees	3	574	551	384	437	388	203	2,540
2014	Average monthly benefit	$ 262	$ 298	$ 514	$ 803	$ 1,195	$ 1,691	$ 2,207	$ 935
	Average final average salary	$ 5,382	$ 2,663	$ 2,612	$ 3,029	$ 3,230	$ 3,650	$ 3,999	$ 3,065
	Number of retirees	3	629	503	368	435	392	199	2,529
2015	Average monthly benefit	$ 219	$ 301	$ 517	$ 786	$ 1,268	$ 1,723	$ 2,208	$ 994
	Average final average salary	$ 5,058	$ 2,581	$ 2,623	$ 2,947	$ 3,416	$ 3,729	$ 4,007	$ 3,116
	Number of retirees	6	633	517	433	450	487	249	2,775
2016	Average monthly benefit	$ 151	$ 297	$ 506	$ 819	$ 1,285	$ 1,838	$ 2,343	$ 1,011
	Average final average salary	$ 3,284	$ 2,617	$ 2,600	$ 3,020	$ 3,420	$ 3,968	$ 4,184	$ 3,168
	Number of retirees	6	603	502	430	502	423	213	2,679
2017	Average monthly benefit	$ 230	$ 313	$ 551	$ 934	$ 1,355	$ 1,853	$ 2,379	$ 1,109
	Average final average salary	$ 5,026	$ 2,710	$ 2,839	$ 3,414	$ 3,624	$ 4,016	$ 4,265	$ 3,395
	Number of retirees	6	500	504	456	439	476	238	2,619
2018	Average monthly benefit	$ 220	$ 329	$ 577	$ 921	$ 1,397	$ 1,887	$ 2,511	$ 1,142
	Average final average salary	$ 5,477	$ 2,813	$ 2,889	$ 3,321	$ 3,762	$ 4,096	$ 4,538	$ 3,477
	Number of retirees	6	517	474	485	517	515	208	2,722
Ten Years Ended June 30, 2018									
	Average monthly benefit	$ 178	$ 298	$ 510	$ 819	$ 1,260	$ 1,725	$ 2,231	$ 996
	Average final average salary	$ 4,746	$ 2,616	$ 2,624	$ 3,054	$ 3,371	$ 3,721	$ 4,037	$ 3,131
	Number of retirees	40	5,554	4,907	4,070	4,553	4,269	2,183	25,576

** Excludes legislators, elected officials, water patrol, and administrative law judges.*
Note: COLA increases and temporary benefits payable under MSEP 2000 until age 62 are excluded from the above for comparison purposes.

Average Monthly Benefit Amounts | Last Ten Fiscal Years

Legislators in the MSEP

Members Retiring During Fiscal Year		Years Credited Service by Category <5	5-10	11-15	16-20	21-25	26-30	31+	All Members
2009	Average monthly benefit	$ 0	$ 910	$ 1,496	$ 2,057	$ 2,395	$ 0	$ 0	$ 1,201
	Average final average salary	$ 0	$ 2,993	$ 2,993	$ 2,993	$ 2,993	$ 0	$ 0	$ 2,993
	Number of retirees	0	13	3	2	1	0	0	19
2010	Average monthly benefit	$ 0	$ 982	$ 1,496	$ 2,245	$ 0	$ 3,242	$ 0	$ 1,559
	Average final average salary	$ 0	$ 2,993	$ 2,993	$ 2,993	$ 0	$ 2,993	$ 0	$ 2,993
	Number of retirees	0	4	1	1	0	1	0	7
2011	Average monthly benefit	$ 0	$ 992	$ 1,512	$ 2,021	$ 2,744	$ 3,242	$ 0	$ 1,247
	Average final average salary	$ 0	$ 2,993	$ 2,993	$ 2,993	$ 2,993	$ 2,993	$ 0	$ 2,993
	Number of retirees	0	30	4	4	1	1	0	40
2012	Average monthly benefit	$ 0	$ 1,069	$ 1,659	$ 2,225	$ 0	$ 0	$ 0	$ 1,335
	Average final average salary	$ 0	$ 2,993	$ 2,993	$ 2,993	$ 0	$ 0	$ 0	$ 2,993
	Number of retirees	0	7	3	1	0	0	0	11
2013	Average monthly benefit	$ 374	$ 907	$ 1,513	$ 2,120	$ 0	$ 0	$ 0	$ 1,036
	Average final average salary	$ 2,993	$ 2,993	$ 2,993	$ 2,993	$ 0	$ 0	$ 0	$ 2,993
	Number of retirees	2	25	5	2	0	0	0	34
2014	Average monthly benefit	$ 307	$ 1,051	$ 1,496	$ 1,995	$ 2,744	$ 0	$ 0	$ 1,296
	Average final average salary	$ 2,993	$ 2,993	$ 2,993	$ 2,993	$ 2,993	$ 0	$ 0	$ 2,993
	Number of retirees	2	6	3	2	1	0	0	14
2015	Average monthly benefit	$ 0	$ 977	$ 1,735	$ 2,162	$ 0	$ 0	$ 0	$ 1,315
	Average final average salary	$ 0	$ 2,993	$ 2,993	$ 2,993	$ 0	$ 0	$ 0	$ 2,993
	Number of retirees	0	10	2	3	0	0	0	15
2016	Average monthly benefit	$ 0	$ 1,048	$ 0	$ 0	$ 0	$ 0	$ 0	$ 1,048
	Average final average salary	$ 0	$ 2,993	$ 0	$ 0	$ 0	$ 0	$ 0	$ 2,993
	Number of retirees	0	7	0	0	0	0	0	7
2017	Average monthly benefit	$ 499	$ 954	$ 1,580	$ 1,995	$ 0	$ 0	$ 0	$ 1,041
	Average final average salary	$ 2,993	$ 2,993	$ 2,993	$ 2,993	$ 0	$ 0	$ 0	$ 2,993
	Number of retirees	2	17	3	1	0	0	0	23
2018	Average monthly benefit	$ 0	$ 1,122	$ 0	$ 0	$ 0	$ 0	$ 0	$ 1,122
	Average final average salary	$ 0	$ 2,993	$ 0	$ 0	$ 0	$ 0	$ 0	$ 2,993
	Number of retirees	0	6	0	0	0	0	0	6
Ten Years Ended June 30, 2018									
	Average monthly benefit	$ 393	$ 976	$ 1,553	$ 2,086	$ 2,628	$ 3,242	$ 0	$ 1,190
	Average final average salary	$ 2,993	$ 2,993	$ 2,993	$ 2,993	$ 2,993	$ 2,993	$ 0	$ 2,993
	Number of retirees	6	125	24	16	3	2	0	176

Note: COLA increases and temporary benefits payable under MSEP 2000 until age 62 are excluded from the above for comparison purposes.

Average Monthly Benefit Amounts | Last Ten Fiscal Years

Elected Officials in the MSEP

Members Retiring During Fiscal Year		Years Credited Service by Category <5	5-10	11-15	16-20	21-25	26-30	31+	All Members
2009	Average monthly benefit	$ 0	$ 3,336	$ 4,852	$ 0	$ 0	$ 0	$ 0	$ 4,094
	Average final average salary	$ 0	$ 8,979	$ 9,703	$ 0	$ 0	$ 0	$ 0	$ 9,341
	Number of retirees	0	1	1	0	0	0	0	2
2010	Average monthly benefit	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
	Average final average salary	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
	Number of retirees	0	0	0	0	0	0	0	0
2011	Average monthly benefit	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
	Average final average salary	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
	Number of retirees	0	0	0	0	0	0	0	0
2012	Average monthly benefit	$ 0	$ 0	$ 3,781	$ 0	$ 0	$ 0	$ 0	$ 3,781
	Average final average salary	$ 0	$ 0	$ 8,093	$ 0	$ 0	$ 0	$ 0	$ 8,093
	Number of retirees	0	0	2	0	0	0	0	2
2013	Average monthly benefit	$ 0	$ 0	$ 4,489	$ 0	$ 0	$ 0	$ 0	$ 4,489
	Average final average salary	$ 0	$ 0	$ 8,979	$ 0	$ 0	$ 0	$ 0	$ 8,979
	Number of retirees	0	0	1	0	0	0	0	1
2014	Average monthly benefit	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
	Average final average salary	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
	Number of retirees	0	0	0	0	0	0	0	0
2015	Average monthly benefit	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
	Average final average salary	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
	Number of retirees	0	0	0	0	0	0	0	0
2016	Average monthly benefit	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
	Average final average salary	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
	Number of retirees	0	0	0	0	0	0	0	0
2017	Average monthly benefit	$ 0	$ 2,993	$ 3,099	$ 0	$ 5,576	$ 0	$ 0	$ 3,889
	Average final average salary	$ 0	$ 8,979	$ 7,207	$ 0	$ 11,152	$ 0	$ 0	$ 9,113
	Number of retirees	0	1	1	0	1	0	0	3
2018	Average monthly benefit	$ 1,496	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
	Average final average salary	$ 8,979	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
	Number of retirees	1	0	0	0	0	0	0	1
Ten Years Ended June 30, 2018									
	Average monthly benefit	$ 0	$ 3,165	$ 4,000	$ 0	$ 5,576	$ 0	$ 0	$ 3,545
	Average final average salary	$ 0	$ 8,979	$ 8,415	$ 0	$ 11,152	$ 0	$ 0	$ 7,910
	Number of retirees	1	2	5	0	1	0	0	9

Note: COLA increases are excluded from the above for comparison purposes.

Average Monthly Benefit Amounts | Last Ten Fiscal Years

Uniformed Water Patrol in the MSEP

Members Retiring During Fiscal Year		Years Credited Service by Category <5	5-10	11-15	16-20	21-25	26-30	31+	All Members
2009	Average monthly benefit	$ 0	$ 0	$ 0	$ 0	$ 0	$ 2,351	$ 5,113	$ 3,732
	Average final average salary	$ 0	$ 0	$ 0	$ 0	$ 0	$ 4,173	$ 7,902	$ 6,038
	Number of retirees	0	0	0	0	0	1	1	2
2010	Average monthly benefit	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 4,886	$ 4,886
	Average final average salary	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 7,184	$ 7,184
	Number of retirees	0	0	0	0	0	0	2	2
2011	Average monthly benefit	$ 0	$ 0	$ 721	$ 0	$ 0	$ 3,086	$ 4,553	$ 3,200
	Average final average salary	$ 0	$ 0	$ 2,964	$ 0	$ 0	$ 5,077	$ 6,912	$ 5,388
	Number of retirees	0	0	1	0	0	2	2	5
2012	Average monthly benefit	$ 0	$ 0	$ 0	$ 959	$ 0	$ 0	$ 0	$ 959
	Average final average salary	$ 0	$ 0	$ 0	$ 2,794	$ 0	$ 0	$ 0	$ 2,794
	Number of retirees	0	0	0	1	0	0	0	1
2013	Average monthly benefit	$ 0	$ 69	$ 0	$ 0	$ 0	$ 0	$ 0	$ 69
	Average final average salary	$ 0	$ 1,291	$ 0	$ 0	$ 0	$ 0	$ 0	$ 1,291
	Number of retirees	0	1	0	0	0	0	0	1
2014	Average monthly benefit	$ 0	$ 0	$ 780	$ 0	$ 0	$ 0	$ 0	$ 780
	Average final average salary	$ 0	$ 0	$ 2,507	$ 0	$ 0	$ 0	$ 0	$ 2,507
	Number of retirees	0	0	1	0	0	0	0	1
2015	Average monthly benefit	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 4,539	$ 4,539
	Average final average salary	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 6,321	$ 6,321
	Number of retirees	0	0	0	0	0	0	1	1
2016	Average monthly benefit	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 4,221	$ 4,221
	Average final average salary	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 6,375	$ 6,375
	Number of retirees	0	0	0	0	0	0	2	2
2017	Average monthly benefit	$ 0	$ 0	$ 0	$ 1,079	$ 0	$ 0		$ 1,079
	Average final average salary	$ 0	$ 0	$ 0	$ 2,846	$ 0	$ 0		$ 2,846
	Number of retirees	0	0	0	1	0	0		1
2018	Average monthly benefit	$ 0	$ 0	$ 0	$ 1,492	$ 0	$ 0	$ 0	$ 1,492
	Average final average salary	$ 0	$ 0	$ 0	$ 4,347	$ 0	$ 0	$ 0	$ 4,347
	Number of retirees	0	0	0	1	0	0	0	1
Ten Years Ended June 30, 2018									
	Average monthly benefit	$ 0	$ 69	$ 751	$ 1,177	$ 0	$ 2,841	$ 4,622	$ 2,976
	Average final average salary	$ 0	$ 1,291	$ 2,736	$ 3,329	$ 0	$ 4,776	$ 6,896	$ 5,073
	Number of retirees	0	1	2	3	0	3	8	17

Note: COLA increases and temporary benefits payable under MSEP 2000 until age 62 are excluded from the above for comparison purposes.

Average Monthly Benefit Amounts | Last Ten Fiscal Years

Administrative Law Judges and Legal Advisors in the MSEP

Members Retiring During Fiscal Year		Years Credited Service by Category: <5	5-10	11-15	16-20	21-25	26-30	31+	All Members
2009	Average monthly benefit	$ 0	$ 0	$ 0	$ 0	$ 4,200	$ 0	$ 0	$ 4,200
	Average final average salary	$ 0	$ 0	$ 0	$ 0	$ 8,400	$ 0	$ 0	$ 8,400
	Number of retirees	0	0	0	0	2	0	0	2
2010	Average monthly benefit	$ 823	$ 0	$ 2,827	$ 0	$ 4,101	$ 0	$ 0	$ 2,645
	Average final average salary	$ 8,172	$ 0	$ 5,851	$ 0	$ 8,202	$ 0	$ 0	$ 7,019
	Number of retirees	1	0	2	0	1	0	0	4
2011	Average monthly benefit	$ 0	$ 0	$ 3,216	$ 4,101	$ 0	$ 0	$ 0	$ 3,511
	Average final average salary	$ 0	$ 0	$ 6,433	$ 8,202	$ 0	$ 0	$ 0	$ 7,023
	Number of retirees	0	0	2	1	0	0	0	3
2012	Average monthly benefit	$ 0	$ 2,493	$ 0	$ 4,378	$ 0	$ 4,204	$ 0	$ 3,692
	Average final average salary	$ 0	$ 8,756	$ 0	$ 8,756	$ 0	$ 8,408	$ 0	$ 8,640
	Number of retirees	0	1	0	1	0	1	0	3
2013	Average monthly benefit	$ 0	$ 0	$ 2,657	$ 0	$ 4,134	$ 0	$ 4,450	$ 3,747
	Average final average salary	$ 0	$ 0	$ 5,314	$ 0	$ 8,267	$ 0	$ 8,900	$ 7,494
	Number of retirees	0	0	1	0	1	0	1	3
2014	Average monthly benefit	$ 0	$ 2,433	$ 0	$ 0	$ 0	$ 0	$ 0	$ 2,433
	Average final average salary	$ 0	$ 8,146	$ 0	$ 0	$ 0	$ 0	$ 0	$ 8,146
	Number of retirees	0	1	0	0	0	0	0	1
2015	Average monthly benefit	$ 0	$ 2,259	$ 0	$ 3,012	$ 0	$ 0	$ 0	$ 2,636
	Average final average salary	$ 0	$ 7,936	$ 0	$ 6,023	$ 0	$ 0	$ 0	$ 6,980
	Number of retirees	0	1	0	1	0	0	0	2
2016	Average monthly benefit	$ 0	$ 853	$ 0	$ 0	$ 3,811	$ 0	$ 0	$ 3,072
	Average final average salary	$ 0	$ 3,508	$ 0	$ 0	$ 7,623	$ 0	$ 0	$ 6,594
	Number of retirees	0	1	0	0	3	0	0	4
2017	Average monthly benefit	$ 401	$ 0	$ 0	$ 5,065	$ 0	$ 5,298	$ 5,273	$ 4,009
	Average final average salary	$ 5,777	$ 0	$ 0	$ 10,129	$ 0	$ 10,596	$ 10,546	$ 9,262
	Number of retirees	1	0	0	1	0	1	1	4
2018	Average monthly benefit	$ 0	$ 0	$ 3,860	$ 0	$ 5,313	$ 0	$ 0	$ 4,950
	Average final average salary	$ 0	$ 0	$ 7,720	$ 0	$ 10,625	$ 0	$ 0	$ 9,899
	Number of retirees	0	0	1	0	3	0	0	4
Ten Years Ended June 30, 2018									
	Average monthly benefit	$ 612	$ 2,010	$ 3,101	$ 4,139	$ 4,401	$ 4,751	$ 4,862	$ 3,589
	Average final average salary	$ 6,975	$ 7,087	$ 6,267	$ 8,278	$ 8,801	$ 9,502	$ 9,723	$ 7,982
	Number of retirees	2	4	6	4	10	2	2	30

Note: COLA increases are excluded from the above for comparison purposes.

Average Monthly Benefit Amounts | Last Ten Fiscal Years

Judicial Plan

Members Retiring During Fiscal Year		<5	5-10	11-15	16-20	21-25	26-30	31+	All Members
		Years Credited Service by Category							
2009	Average monthly benefit	$ 494	$ 1,786	$ 3,663	$ 4,528	$ 5,286	$ 5,127	$ 5,020	$ 3,559
	Average final average salary	$ 5,775	$ 7,469	$ 7,811	$ 9,012	$ 10,572	$ 10,255	$ 10,040	$ 8,361
	Number of retirees	5	2	7	7	3	3	1	28
2010	Average monthly benefit	$ 458	$ 1,333	$ 4,507	$ 3,802	$ 0	$ 5,181	$ 4,973	$ 3,972
	Average final average salary	$ 6,597	$ 8,000	$ 9,577	$ 7,604	$ 0	$ 10,362	$ 9,946	$ 9,047
	Number of retirees	1	1	2	2	0	2	3	11
2011	Average monthly benefit	$ 0	$ 2,188	$ 4,615	$ 4,566	$ 4,807	$ 4,866	$ 4,650	$ 4,384
	Average final average salary	$ 0	$ 7,994	$ 9,299	$ 9,132	$ 9,613	$ 9,732	$ 9,299	$ 9,187
	Number of retirees	0	4	9	10	5	3	5	36
2012	Average monthly benefit	$ 1,740	$ 2,353	$ 4,561	$ 4,621	$ 0	$ 5,020	$ 0	$ 3,684
	Average final average salary	$ 9,114	$ 7,797	$ 10,179	$ 9,241	$ 0	$ 10,040	$ 0	$ 9,055
	Number of retirees	1	5	4	4	0	1	0	15
2013	Average monthly benefit	$ 0	$ 2,277	$ 4,234	$ 4,625	$ 5,444	$ 5,452	$ 5,293	$ 4,699
	Average final average salary	$ 0	$ 8,123	$ 8,696	$ 9,251	$ 10,888	$ 10,904	$ 10,585	$ 9,767
	Number of retirees	0	2	6	4	5	4	2	23
2014	Average monthly benefit	$ 0	$ 2,310	$ 4,571	$ 5,151	$ 5,117	$ 4,869	$ 5,293	$ 4,313
	Average final average salary	$ 0	$ 8,259	$ 9,143	$ 10,303	$ 10,233	$ 9,738	$ 10,585	$ 9,435
	Number of retirees	0	4	6	3	3	1	1	18
2015	Average monthly benefit	$ 1,114	$ 3,140	$ 5,572	$ 5,572	$ 5,970	$ 5,572	$ 5,848	$ 5,392
	Average final average salary	$ 11,143	$ 9,419	$ 11,143	$ 11,143	$ 11,940	$ 11,143	$ 11,697	$ 11,253
	Number of retirees	1	3	7	10	7	4	7	39
2016	Average monthly benefit	$ 0	$ 4,193	$ 5,575	$ 5,452	$ 6,166	$ 5,844	$ 0	$ 5,545
	Average final average salary	$ 0	$ 11,688	$ 11,503	$ 10,903	$ 12,332	$ 11,688	$ 0	$ 11,569
	Number of retirees	0	2	3	5	4	2	0	16
2017	Average monthly benefit	$ 602	$ 4,487	$ 5,506	$ 6,054	$ 5,878	$ 6,178	$ 5,931	$ 5,293
	Average final average salary	$ 8,136	$ 11,696	$ 11,367	$ 12,108	$ 11,756	$ 12,355	$ 11,861	$ 11,574
	Number of retirees	2	3	2	4	6	4	2	23
2018	Average monthly benefit	$ 0	$ 4,549	$ 5,525	$ 6,114	$ 5,989	$ 6,238	$ 6,365	$ 5,955
	Average final average salary	$ 0	$ 12,477	$ 11,947	$ 12,227	$ 11,978	$ 12,477	$ 12,730	$ 12,259
	Number of retirees	0	1	4	4	4	4	3	20
Ten Years Ended June 30, 2018									
	Average monthly benefit	$ 699	$ 2,779	$ 4,722	$ 5,076	$ 5,625	$ 5,560	$ 5,457	$ 4,725
	Average final average salary	$ 7,200	$ 8,977	$ 9,766	$ 10,147	$ 11,251	$ 11,120	$ 10,913	$ 10,175
	Number of retirees	10	27	50	53	37	28	24	229

Note: COLA increases are excluded from the above for comparison purposes.

Retirees and Beneficiaries
Tabulated by Fiscal Year of Retirement | As of June 30, 2018

MSEP

Fiscal Year of Retirement	Number	Total Annual Benefit	Average Monthly Benefit
1974	1	$ 4,179	$ 348
1975	1	901	75
1976	1	791	66
1977	5	58,874	981
1978	10	41,850	349
1979	6	42,557	591
1980	10	68,122	568
1981	19	173,143	759
1982	19	162,577	713
1983	11	110,581	838
1984	37	312,670	704
1985	52	476,230	763
1986	76	709,397	778
1987	98	1,161,351	988
1988	128	1,802,806	1,174
1989	161	2,796,719	1,448
1990	167	2,527,715	1,261
1991	247	4,586,776	1,547
1992	296	4,925,474	1,387
1993	403	6,880,280	1,423
1994	391	6,827,675	1,455
1995	547	9,960,233	1,517
1996	602	11,291,528	1,563
1997	611	11,326,652	1,545
1998	749	14,413,001	1,604
1999	890	17,395,824	1,629
2000	980	18,673,344	1,588
2001	2,017	37,804,966	1,562
2002	1,404	22,760,982	1,351
2003	1,545	26,439,246	1,426
2004	2,094	34,025,886	1,354
2005	1,533	22,819,408	1,240
2006	1,697	23,913,193	1,174
2007	2,027	29,456,909	1,211
2008	2,043	29,330,423	1,196
2009	2,139	31,354,527	1,222
2010	2,232	31,544,205	1,178
2011	2,864	42,522,816	1,237
2012	2,671	37,237,628	1,162
2013	2,774	37,675,984	1,132
2014	2,813	38,558,287	1,142
2015	3,109	45,092,684	1,209
2016	3,075	44,432,678	1,204
2017	3,040	47,830,881	1,311
2018	3,189	50,013,334	1,307
	48,784	$ 749,545,288	$ 1,280

Retirees and Beneficiaries
Tabulated by Fiscal Year of Retirement | As of June 30, 2018

Judicial Plan

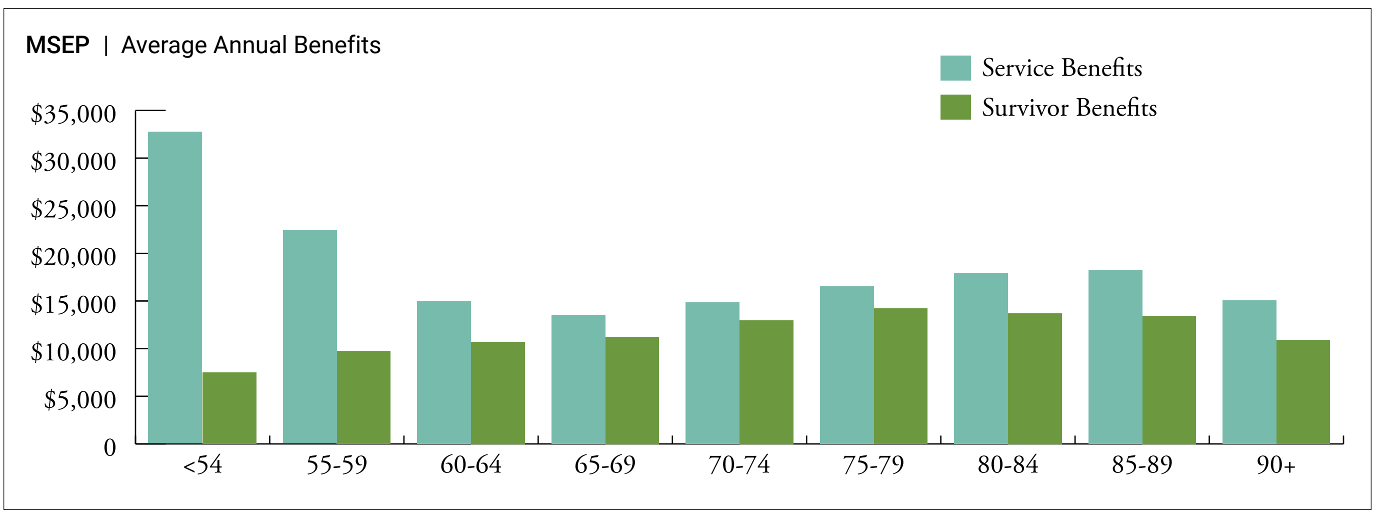
Fiscal Year of Retirement	Number	Total Annual Benefit	Average Monthly Benefit
1976 & prior	1	$ 11,225	$ 935
1977	0	0	0
1978	1	16,106	1,342
1979	0	0	0
1980	1	21,963	1,830
1981	0	0	0
1982	0	0	0
1983	1	21,573	1,798
1984	1	22,929	1,911
1985	0	0	0
1986	0	0	0
1987	5	220,641	3,677
1988	2	109,694	4,571
1989	4	213,327	4,444
1990	4	217,325	4,528
1991	9	415,470	3,847
1992	4	220,800	4,600
1993	6	270,652	3,759
1994	3	123,480	3,430
1995	12	875,781	6,082
1996	7	330,706	3,937
1997	4	244,900	5,102
1998	17	1,081,423	5,301
1999	14	904,821	5,386
2000	13	881,049	5,648
2001	15	1,307,026	7,261
2002	14	1,018,608	6,063
2003	19	1,262,667	5,538
2004	15	1,008,477	5,603
2005	15	1,203,934	6,689
2006	12	456,877	3,173
2007	50	3,202,208	5,337
2008	27	1,638,845	5,058
2009	33	1,840,098	4,647
2010	14	819,753	4,879
2011	36	2,149,499	4,976
2012	20	995,294	4,147
2013	29	1,970,550	5,662
2014	24	1,427,272	4,956
2015	54	3,800,439	5,865
2016	26	1,635,967	5,243
2017	36	2,243,433	5,193
2018	29	2,114,837	6,077
	577	$ 36,299,650	$ 5,243

Total Benefits Payable
Tabulated by Attained Ages of Benefit Recipients | As of June 30, 2018

MSEP

	Service Retirement		Survivors and Beneficiaries		Totals	
Attained Ages	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
<54	487	$ 15,946,164	595	$ 4,461,948	1,082	$ 20,408,112
55-59	3,317	74,459,640	332	3,238,872	3,649	77,698,512
60-64	8,355	125,863,572	529	5,669,448	8,884	131,533,020
65-69	11,480	155,671,008	750	8,425,944	12,230	164,096,952
70-74	8,741	130,159,536	756	9,816,060	9,497	139,975,596
75-79	5,102	84,500,004	785	11,161,920	5,887	95,661,924
80-84	2,921	52,596,156	731	10,028,400	3,652	62,624,556
85-89	1,577	28,840,056	541	7,278,696	2,118	36,118,752
90+	857	12,930,060	351	3,824,364	1,208	16,754,424
Totals	42,837	$ 680,966,196	5,370	$ 63,905,652	48,207	$ 744,871,848

Average age at retirement: 60.3 years • Average age now: 70.3 years



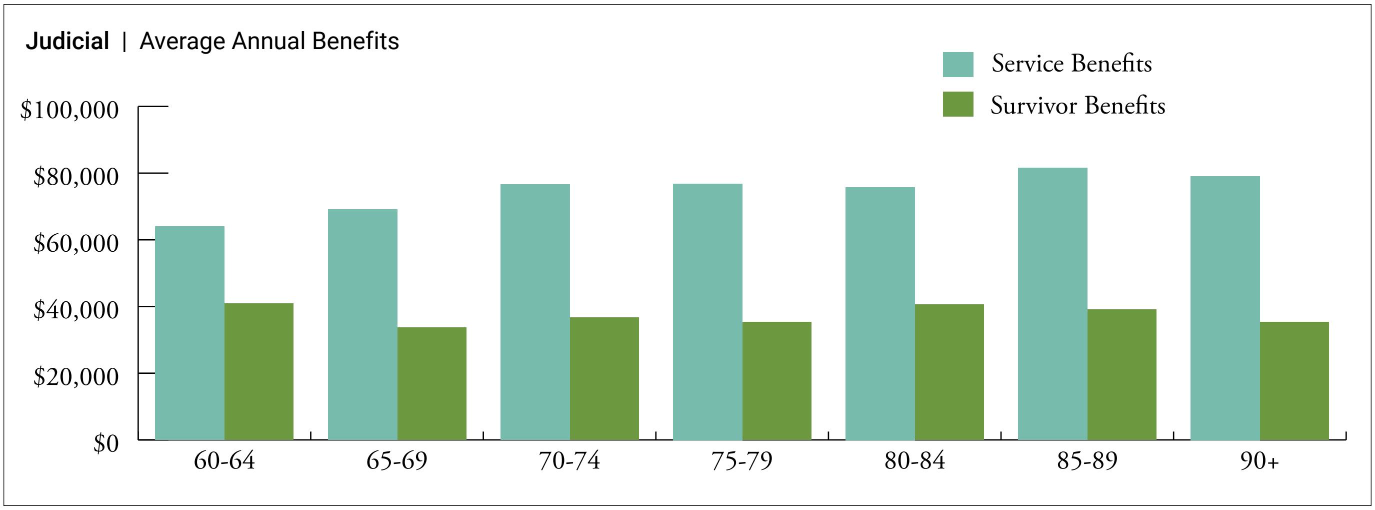
Average benefit paid: $15,897 service benefits • $11,900 survivor benefits

Total Benefits Payable
Tabulated by Attained Ages of Benefit Recipients | As of June 30, 2018

Judicial Plan

	Service Retirement		Survivors and Beneficiaries		Totals	
Attained Ages	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
60-64	23	$ 1,471,584	12	$ 491,316	35	$ 1,962,900
65-69	91	6,288,132	13	437,928	104	6,726,060
70-74	131	10,034,496	24	880,956	155	10,915,452
75-79	71	5,451,564	19	672,708	90	6,124,272
80-84	43	3,254,532	20	812,892	63	4,067,424
85-89	32	2,609,868	38	1,484,400	70	4,094,268
90+	14	1,106,316	38	1,340,544	52	2,446,860
Totals	405	$ 30,216,492	164	$ 6,120,744	569	$ 36,337,236

Average age at retirement: 65.6 years • Average age now: 76.5 years



Average benefit paid: $74,609 service benefits • $37,322 survivor benefits

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Missouri State Employees' Retirement System
Mailing Address: PO Box 209 • Jefferson City, MO 65102-0209
Visit us at 907 Wildwood Drive

Phone: (573) 632-6100 • (800) 827-1063 | Fax: (573) 632-6103
Email: *mosers@mosers.org* | Web Address: *www.mosers.org*
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