

MISSOURI STATE EMPLOYEES' RETIREMENT SYSTEM
ANNUAL ACTUARIAL VALUATION
JUNE 30, 2016

September 30, 2016

Board of Trustees
Missouri State Employees'
Retirement System
907 Wildwood Drive
Jefferson City, Missouri 65102

Re: Annual Actuarial Valuation as of June 30, 2016

Dear Board Members:

The results of the June 30, 2016 **Annual Actuarial Valuation** of the Missouri State Employees' Retirement System are presented in this report. The purposes of the valuation were to measure the System's funding progress and to determine the level cost employer contribution rate for the fiscal year ending June 30, 2018. Certain disclosures under the Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68 will be issued in separate reports.

Your attention is directed particularly to the Executive Summary and discussion in Section A.

The valuation was based upon data, furnished by the MOSERS' staff, concerning active, inactive and retired members along with pertinent financial information and plan provisions. The complete cooperation of the MOSERS' staff in furnishing materials requested is hereby acknowledged with appreciation. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by MOSERS.

The valuation results summarized in this report involve actuarial calculations that require assumptions about future events. We believe that the assumptions and methods used in this report are reasonable and appropriate for the purpose for which they have been used. However, other assumptions and methods could also be reasonable and could result in materially different results. We have included sensitivity analysis for the assumed rate of investment return. Additional assessment of risks was outside the scope of this assignment. We encourage a review and assessment of investment and other significant risks that may have a material effect on the System's financial condition. Because it is not possible or practical to consider every possible contingency, we may use summary information, estimates or simplifications of calculations to facilitate the modeling of future events. We may also exclude factors or data that are deemed to be immaterial.

To the best of our knowledge, the information contained in this report is accurate and fairly presents the actuarial position of the Missouri State Employees' Retirement System as of the valuation date. All calculations have been made in conformity with generally accepted actuarial principles and practices, Governmental Accounting Standards and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety. GRS is not responsible for unauthorized use of this report. This report should not be relied on for any purpose other than the purpose described. No adjustments have been made for events after June 30, 2016.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as: plan experience differing from that anticipated by the economic and 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 (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. We did not perform an analysis of the potential range of such future measurements under the scope of this assignment.

The actuarial assumptions are adopted by the Board. The financial assumptions used in making the valuations are shown in Section C of this report. Assumptions concerning future experience are needed for computing employer contribution rates. As time passes and actual experience develops, assumed and actual experiences are compared. From time to time one or more of the assumptions about the future may be changed by the Board after consulting with the actuary and the investment consultant.

The actuaries submitting this report, Brad Lee Armstrong and David T. Kausch, are independent of the plan sponsor and are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Respectfully submitted,



Brad Lee Armstrong, ASA, EA, FCA, MAAA
Senior Consultant & Actuary



David T. Kausch, FSA, EA, FCA, MAAA
Consultant & Actuary

BLA/DTK:rmn

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SECTION A
OVERVIEW

Executive Summary

(\$ in Millions)

Valuation Date	June 30, 2016	June 30, 2015
Contribution for Fiscal Year Ending	June 30, 2018	June 30, 2017
Required Employer Contribution		
• Annual Amount (Estimated)	\$ 396.5	\$ 322.9
• Percentage of Covered Payroll	19.45 %	16.34 %
Policy Minimum Employer Contribution		
• Annual Amount (Estimated)	\$ 396.5	\$ 335.3
• Percentage of Covered Payroll	19.45 %	16.97 %
Membership		
Number of		
• Active Members	49,464	49,980
• Retirees and Beneficiaries	44,828	42,964
• Terminated Vested Members	19,512	19,290
• Leave-of-Absence Members	132	195
• Long Term Disability Members	928	948
• Total	114,864	113,377
• Reported Payroll	\$ 1,921.5	\$ 1,918.5
Assets		
• Market Value	\$ 8,109	\$ 8,517
• Actuarial Value	\$ 8,878	\$ 8,792
• Return on Market Value	0.02 %	(2.65)%
• Return on Actuarial Value	5.76 %	6.37 %
• Ratio – Actuarial Value to Market Value	109.48 %	103.24 %
Actuarial Information		
• Actuarial Accrued Liability (AAL)	\$ 12,751	\$ 11,728
• Unfunded Actuarial Accrued Liability (UAAL)	\$ 3,873	\$ 2,935
• Funded Ratio	69.6 %	75.0 %
• Employer Normal Cost %	7.19 %	6.67 %
• UAAL as % of Reported Payroll*	12.26 %	9.67 %
• Amortization Period	28 years	29 years
• Ratio of Assets to Payroll	4.6	4.6
• Ratio of Liability to Payroll	6.6	6.1

Highlights/Changes for the June 30, 2016 Valuation Date

- Assumption & Method Changes based on the 2010-2015 Experience Study and adopted by the Board.
- Losses on assets and liabilities.
- The aggregate experience loss was \$382 million.

The executive summary provides an overview of the valuation report.
It cannot be used as a substitute for a thorough reading of the full report.

* Based on the Required Employer Contribution.

Discussion

Actuarial Valuation

This is the actuarial valuation of the Missouri State Employees' Retirement System, prepared as of June 30, 2016. Valuations are prepared annually as of June 30, the last day of the Missouri State Employees' Retirement System's plan and fiscal year.

The primary purposes of the valuation report are: to measure the plan's liabilities, to determine the required statutory employer contribution rate based upon the System's funding policy, and to analyze changes in the Missouri State Employees' Retirement System's actuarial position.

Financing Objectives

The Missouri State Employees' Retirement System is supported by member contributions, employer contributions, and net earnings on the investments of the fund. The member contribution rate is set by law at 4.0% of the member's compensation for members hired on or after January 1, 2011, while the employer contribution is determined by the actuarial valuation. The computed employer contribution rate is dependent upon timely receipt of both member and employer contributions.

The combined member and employer contributions are intended to be sufficient to pay the normal cost and to amortize the Unfunded Actuarial Accrued Liability (UAAL) as of June 30, 2016 over a period of 28 years starting with the fiscal year ending June 30, 2018. This will achieve progress towards 100% funded status under the provisions, assumptions and methods described in this report. The Board adopted its current amortization policy on June 30, 2013, which closes the 30-year amortization period beginning in fiscal year 2016 and ending in fiscal year 2045. It is important to note the UAAL is expected to increase in nominal (but not real) dollars until fiscal year 2024 then decrease to 0 by fiscal year 2045 if all assumptions are met. By Board Policy, the employer rate shall not fall below the rate set for fiscal 2015 until the plan is 80% funded.

The amortization rate assumes an investment return of 7.65% on the actuarial value of assets each year in the future.

It is the intent of the Board to review the amortization policy prior to the completion of the June 30, 2030 valuation determining the contribution requirements for the fiscal year ending June 30, 2032.

Employer Contribution Requirement, Experience and Funded Ratio

The computed employer contribution rate for the fiscal year ending June 30, 2018 is 19.45% of covered payroll, estimated to result in a contribution of \$396.5 million. This compares with the computed employer contribution rate for the fiscal year ending June 30, 2017 of 16.34% of covered payroll, estimated to result in a contribution of \$322.9 million. A rate reconciliation is shown on the following page:

	Percent of Payroll
6/30/2015 Computed Rate	16.34%
Asset (Gain)/Loss	1.10%
Liability (Gain)/Loss	0.20%
Assumption & Method Changes	2.06%
Projected Payroll Higher than Expected	(0.01)%
Additional UAAL Contribution*	(0.04)%
Normal Cost	(0.20)%
6/30/2016 Computed Rate	19.45%

* The System is expected to contribute an additional 0.63% of payroll (16.97% - 16.34%) in FY 2017 as a result of the Minimum Funding Policy.

The System experienced an experience loss this year. Areas contributing to the loss were investment losses, salary increases higher than expected, active retirement experience, and service purchases, offset by gains attributable to lower COLAs and higher retiree mortality (by age and gender). Experience impacts both the contribution requirement and the progress of the funded ratio. Section B has more analysis of the actuarial gains and losses.

The funded ratio and market value percent funded amounts are shown below:

Valuation Date	June 30, 2016	June 30, 2015
Actuarial Value of Assets (AVA)	\$8,878	\$8,792
Actuarial Accrued Liabilities (AAL)	\$12,751	\$11,728
AVA / AAL (Funded Ratio)	69.6%	75.0%
Market Value of Assets (MVA)	\$8,109	\$8,517
MVA / AAL	63.6%	72.6%

See Section B for a history of the funded ratios.

Variability of Future Contribution Rates

The Actuarial Cost Method used to determine the contribution rate is intended to produce contribution rates which are generally level as a percent-of-payroll. Even so, when experience differs from the assumptions, as it often does, the employer's contribution rate can vary significantly from year-to-year.

One risk-metric for contribution rate volatility is the ratio of assets to payroll, which is currently 4.6. The impact of this metric on the variability of contribution rates is illustrated in the following table.

Sensitivity of Contribution Rate	50% Confidence	90% Confidence
a. Range of Rate of Return* (above or below 7.65%)	± 9.2 %	± 22.6 %
b. Ratio of Assets to Payroll	4.6	4.6
c. Range of Asset Gain/Loss as Percent of Pay (a x b)	± 42.5 %	± 104.0 %
d. Smoothed and Amortized as Percent of Pay	± 0.5 %	± 1.3 %

*Based on a standard deviation of returns of 13.78% per year.

Over time, if the year-to-year gains and losses offset each other, the unfunded contribution rate would be expected to remain level, but this does not often happen.

Relationship to Market Value

The Actuarial Value of Assets exceeds the Market Value of Assets by \$769 million as of the valuation date (see Section C). This difference will be gradually recognized in the absence of offsetting losses.

If Market Value had been the basis for the valuation, the contribution rate would have been 21.98% and the funded ratio would have been 63.6%. This is an indication that absent future gains, the unrecognized asset losses are expected to increase the contribution rate and decrease the funded ratio over the next few years.

Impact of the 2011 Plan

The employer normal cost for 2011 plan members is lower than for MSEP and MSEP 2000 members due to later retirement eligibility and 4% member contributions. As the 2011 plan members replace MSEP and MSEP 2000 members, the System's employer normal cost is expected to ultimately decline by approximately 3.3% of payroll relative to the June 30, 2016 valuation date.

Benefit Provisions

This valuation reflects benefits promised to members by statute as reported to us by the System's staff. There have been no changes since the prior valuation.

Actuarial Assumptions and Methods (Other than Asset Valuation Method)

In determining costs and liabilities, actuaries use assumptions about the future, such as rates of salary increase, probabilities of retirement, termination, death and disability, and an investment return assumption. The Board of Trustees sets the actuarial assumptions and methods taking into account recommendations made by the plan's actuary and other advisors. These assumptions and procedures were revised in 2016 following an analysis of plan experience for the 5-year period ending June 30, 2015.

Section F summarizes the current assumptions. The most significant assumptions are (i) the assumed investment return, currently set at 7.65%, and (ii) the assumption regarding future payroll increases of 3% per year. This valuation assumes an expected rate of return of 7.65% per year for all future years.

We believe the assumptions are internally consistent and are reasonable, based on the actual experience of MOSERS. These actuarial assumptions and methods comply with current actuarial standards of practice.

The results of the actuarial valuation are dependent on the actuarial assumptions used. Actual results can, and almost certainly will, differ as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated employer contribution rates, and amortization periods.

In addition to the actuarial assumptions, the actuary makes use of an Actuarial Cost Method to allocate costs to particular years. In accordance with Missouri statutes, MOSERS uses the Entry Age Normal method. Theoretically, this method produces a level contribution rate pattern of funding over time, and thereby provides equity between various generations of taxpayers. We continue to believe this method is appropriate for the Missouri State Employees' Retirement System and consistent with the statutory funding objective. The actuarial accrued liability determined by the Entry Age Normal method is compared to the Actuarial Value of Assets. Any difference is amortized as a level percentage of payroll over a period of 28 years as of the June 30, 2016 valuation determining contribution requirements for the fiscal year ending June 30, 2018.

Assets

System assets are held in trust. The Missouri State Employees' Retirement System staff have provided the asset information used in this valuation.

Section C contains several exhibits summarizing the plan's assets, presents a summary of the Market Value of Assets held by the fund, shows the allocation of assets held for investment and shows a reconciliation of the assets from the last valuation date to the current valuation date.

Section C also shows the development of the Actuarial Value of Assets on page 34. The Actuarial Value of Assets is a smoothed Market Value. A smoothed value is used in order to dampen some of the year-to-year fluctuations in valuation results that would occur if the Market Value were used instead. The method used phased-in differences between the actual and expected market returns over five years.

The expected return is determined using the 7.65% assumption and the plan's Actuarial Value of Assets, adjusted for contributions received and benefits and refunds paid. Both the actual and expected returns are computed net of investment expenses.

Market experience during the year ended June 30, 2016 was below expectations. The asset valuation method currently in use by MOSERS smoothes investment gains and losses over an open period of 5 years and, in addition, requires the smoothed value of assets to be within a certain corridor limit of the market value of assets. The corridor limit is currently 80% to 125%.

The Actuarial Value of Assets is currently 109% of the Market Value of Assets. Over any short time period, a disparity between Actuarial Value and Market Value may appear, but in the long-run, we would expect the Actuarial Value and the Market Value to continue to track each other fairly closely.

The investment return rate for fiscal year 2015 on Market Value was 0.03% based on an approximation, while it was 5.76% on Actuarial Value. These figures differ because of the asset valuation procedure described above.

Active Member Data

The number of active members decreased from 49,980 last year to 49,464 this year. Total payroll increased 0.16% from \$1,918.5 million last year to \$1,921.5 million this year. Higher than expected payroll growth decreased the contribution rate by 0.01% of covered payroll. The increase in the number of active members participating under MSEP 2011 decreased the Normal Cost contribution rate by 0.20% of covered payroll.

GASB Disclosures

The GASB 67/68 disclosures will be issued in separate reports due to the expressed intent of GASB to disconnect reporting requirements from funding requirements, and the timelines for meeting reporting requirements.

Conclusion

Based on the results of the June 30, 2016 regular annual actuarial valuation, it is our opinion that the Missouri State Employees' Retirement System continues to be funded in accordance with actuarial principles of level percent-of-payroll financing.

Other Observations

General Implications of Contribution Allocation Procedure or Funding Policy on Future Expected Plan Contributions and Funded Status

Given the plan's contribution allocation procedure, if all actuarial assumptions are met (including the assumption of the plan earning 7.65% on the actuarial value of assets), it is expected that:

- (1) The employer normal cost as a percentage of pay will decrease to the level of the MSEP 2011 Plan members normal cost as time passes as the majority of the active population is comprised of MSEP 2011 Plan members,
- (2) The unfunded actuarial accrued liabilities will be fully amortized after 28 years, and
- (3) The funded status of the plan will increase gradually towards a 100% funded ratio.

When selecting a contribution allocation procedure, the following three items should be considered, including the balance amongst the three items: (1) benefit security, (2) intergenerational equity, and (3) contribution stability and predictability. Generally, given the nature of public employee retirement systems (e.g., level contribution financing objective and perceived ongoing nature of the plan or plan sponsor), intergenerational equity and contribution stability and predictability have received more consideration than benefit security when contribution allocation procedures are selected. However, given the importance of benefit security to any retirement system, we suggest that contributions to the System in excess of those presented in this report be considered.

Limitations of Funded Status Measurements

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the actuarial value of assets. Unless otherwise indicated, with regard to any funded status measurements presented in this report:

- (1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations, in other words, for transferring the obligations to an unrelated third party (e.g., insurance company) in a market value type transaction. In addition, the measurement is inappropriate for assessing benefit security for the membership.
- (2) The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. The amounts of future contributions will most certainly differ from those assumed in this report due to future actual experience differing from assumed experience based upon the actuarial assumptions. A funded status measurement in this report of 100% is not synonymous with no required future contributions. If the funded status were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).

The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets, unless the market value of assets is used in the measurement.

SECTION B

FUNDING RESULTS

Principal Valuation Results
as of June 30
(\$ in Millions)

Valuation Date:	2016	2015
A. Number of Participants		
Active Members	49,464	49,980
Retirees and Beneficiaries	44,828	42,964
Terminated Vested Members	19,512	19,290
Leave-of-Absence Members	132	195
Long Term Disability Members	928	948
Total	114,864	113,377
Covered Annual Payroll	\$ 1,922	\$ 1,919
Development of Contribution Rate		
For Fiscal Year Ending	2018	2017
B. Normal Cost %		
Total	8.60 %	8.18 %
Member	1.41 %	1.51 %
Employer	7.19 %	6.67 %
C. Unfunded Actuarial Accrued Liabilities (UAAL)		
Actuarial Accrued Liability	\$ 12,751	\$ 11,728
Actuarial Value of Assets	8,878	8,792
UAAL	\$ 3,873	\$ 2,935
% of Payroll Required to Amortize UAAL*	12.26 %	9.67 %
D. Total Computed Employer Contribution Rate	19.45%	16.34%
E. Policy Minimum Employer Contribution Rate	16.97%	16.97%
F. Estimated Dollar Contribution#	\$ 396.5	\$ 335.3

* This corresponds to an amortization factor of 15.83596 applied to the unfunded actuarial accrued liability at the beginning of the applicable fiscal year assuming payroll growth of 3% per year.

Illustrative only. Estimated employer contribution amounts (shown in \$ millions) are based on the greater of the Total Computed Employer Contribution Rate and the Policy Minimum Contribution Rate shown and valuation payroll projected two years to the applicable fiscal year using the valuation assumptions of 3% per year.

**Computed Employer Contribution Rate
Expressed as Percents of Active Member Payroll
for the Fiscal Year Ending June 30, 2018
Actuarial Valuation Results as of June 30, 2016**

	Contribution Expressed as Percents of Payroll for the Fiscal Year		
	2017/18		
	MSEP & MSEP 2000	MSEP 2011	Weighted Average
A. Normal Cost			
(1) Service retirement benefits	5.90 %	4.26 %	5.32 %
(2) Vested termination benefits	1.74	0.81	1.41
(3) Survivor benefits	0.11	0.14	0.12
(4) Disability benefits	0.81	0.92	0.85
(5) Refunds	0.00	1.30	0.46
(6) Administrative expenses	0.44	0.44	0.44
(7) Total [(1) + (2) + (3) + (4) + (5) + (6)]	9.00	7.87	8.60
B. Less Member Contributions	0.00	4.00	1.41
C. Employer Normal Cost [A(7) - B]	9.00	3.87	7.19
D. Unfunded Actuarial Accrued Liabilities (UAAL) (28-year level percent-of-payroll amortization*)			12.26
E. TOTAL COMPUTED EMPLOYER CONTRIBUTION RATE [C. + D.]			19.45 %
F. POLICY MINIMUM EMPLOYER CONTRIBUTION RATE			16.97 %
G. ESTIMATED EMPLOYER CONTRIBUTION (\$Millions)#			\$396.5

The amortization period is a 30-year closed period beginning with the June 30, 2014 valuation determining the contribution rate for the fiscal year ending June 30, 2016 as described in the Funding Policy adopted by the Board June 30, 2013. As of the June 30, 2016 valuation, 28 years remain starting with the fiscal year ending June 30, 2018 and concluding with the fiscal year ending June 30, 2045.

At the September 18, 2014 meeting, the Board adopted a policy minimum contribution rate so that the employer rate shall not fall below the fiscal 2015 rate (16.97% of payroll) until the plan is 80% funded.

* This corresponds to an amortization factor of 15.83596 applied to the unfunded actuarial accrued liability at the beginning of the applicable fiscal year assuming payroll growth of 3% per year. See page 11.

Illustrative only. Estimated employer contribution amounts (shown in \$ millions) are based on the greater of the Total Computed Employer Contribution Rate and the Policy Minimum Contribution Rate shown and valuation payroll projected two years to the applicable fiscal year using the valuation assumptions of 3% per year. The comparable estimated employer contribution amount from last year's valuation is \$335.3 million.

Sensitivity Analysis

There are several actuarial assumptions used in the valuation. Differences between expected and actual experience result in gains and losses from year to year. The most significant assumption in regards to gains and losses is the rate of return assumption. This illustration shows sensitivity of the valuation results to the investment return assumption by reproducing the valuation at investment return assumptions 6.65%, 7.15%, 8.15% and 8.65%.

(All figures are in \$millions)

Interest Rate Assumption	6.65%	7.15%	7.65%	8.15%	8.65%
Contributions					
Total Normal Cost	10.79%	9.63%	8.60%	7.71%	6.96%
Member Contributions	1.41%	1.41%	1.41%	1.41%	1.41%
Employer Normal Cost	9.38%	8.22%	7.19%	6.30%	5.55%
Unfunded Actuarial Accrued Liability	15.27%	13.80%	12.26%	10.69%	9.10%
Total Employer Contribution	24.65%	22.02%	19.45%	16.99%	14.65%
Total Employer Contribution (\$ in millions)	\$502.5	\$448.8	\$396.5	\$346.4	\$298.6
Actuarial Value of Assets (\$ in millions)	\$ 8,878.1	\$ 8,878.1	\$ 8,878.1	\$ 8,878.1	\$ 8,878.1
Actuarial Accrued Liability (\$ in millions)	\$14,221.6	\$13,456.7	\$12,751.2	\$12,105.1	\$11,518.4
Funded Ratio	62.4%	66.0%	69.6%	73.3%	77.1%

Actuarial Liabilities June 30, 2016

Actuarial Present Value, June 30, for	(1) Actuarial Present Value	(2) Portion Covered By Future Normal Cost Contributions	(3) Actuarial Accrued Liabilities (1) - (2)
Active Members			
Service retirement benefits based on service rendered before and likely to be rendered after valuation date	\$5,058,251,210	\$650,835,032	\$4,407,416,178
Disability benefits likely to be paid to present active members who become totally and permanently disabled	167,686,558	103,681,884	64,004,674
Survivor benefits likely to be paid to widows and children of present active members who die before retiring	58,052,028	14,107,063	43,944,965
Separation benefits likely to be paid to present active members	396,014,751	181,973,237	214,041,514
Refunds likely to be paid to present active members	<u>54,369,551</u>	<u>52,593,418</u>	<u>1,776,133</u>
Active Member Totals	\$5,734,374,098	\$1,003,190,634	\$ 4,731,183,464
Members on Leave of Absence & LTD			
Service retirement benefits based on service rendered before the valuation date			121,521,161
Terminated Vested Members			
Service retirement benefits based on service rendered before the valuation date			592,562,844
Retired Lives			7,293,973,373
Pending Refunds			11,405,729
BackDROP Installment Payments Incurred, but not yet paid			<u>516,182</u>
TOTAL ACTUARIAL ACCRUED LIABILITY			\$12,751,162,753
ACTUARIAL VALUE OF ASSETS			<u>8,878,057,191</u>
UNFUNDED ACTUARIAL ACCRUED LIABILITY			<u>\$ 3,873,105,562</u>
FUNDED RATIO			69.6%

**Determination of the
Unfunded Actuarial Accrued Liability (UAAL)
Amortization
(\$ in Millions)**

(1) Total Contribution Rate as a Percent-of-Payroll for the Year after the Valuation Date (as determined by the prior valuation)	
(a) Total Normal Cost Rate Beginning of Year	8.18%
(b) UAAL Beginning of Year	<u>10.30%</u>
(c) Total Contribution Rate Beginning of Year [@]	18.48%
(2) UAAL on Valuation Date	\$ 3,873.1
(3) Expected Interest on UAAL [(2) * 7.65%]	\$ 296.3
(4) Projected Payroll for the Year After the Valuation Date	\$ 1,979.2
(5) Total Normal Cost [(1)(a) x (4)]	\$ 161.9
(6) 1/2 Year Interest on Normal Cost [(5) / 2 * 7.65%]	\$ 6.2
(7) Total Expected Contributions [(1)(c) x (4)]	\$ 365.8
(8) 1/2 Year Interest on Contributions [(7) / 2 * 7.65%]	\$ 14.0
(9) Projected UAAL [(2) + (3) + (5) + (6) - (7) - (8)]	\$ 3,957.7
(10) Amortization Factor (28 years)	15.83596
(11) Projected Payroll for Second Year after Valuation Date	\$ 2,038.6
(12) UAAL Contribution Rate [(9) / (10) / (11)]	12.26%

[@] The Total Contribution Rate was the adopted employer rate of 16.97% plus the weighted average member rate of 1.51% of payroll.

**Financing Unfunded Actuarial Accrued Liabilities Calculated Using a
Wage Inflation Assumption of 3.0% and an Investment Return
Assumption of 7.65% Compounded Annually**

Level % of Payroll Amortization

Fiscal Year Ending June 30	Projected Active Member Payroll	Unfunded Actuarial Accrued Liability (BOY)	UAAL Adjusted for Wage Inflation (BOY)	Amortization Years Remaining	Annual Contributions		UAAL as % of Payroll	BOY Funded Ratio [#]
-----\$ in millions-----								
2017	\$1,979	\$3,873	\$3,873	29	\$204	10.30 %	195.69 %	69.6 %
2018	2,039	3,958	3,843	28	250	12.26	194.15	69.8
2019	2,100	4,001	3,772	27	257	12.26	190.56	70.3
2020	2,163	4,040	3,697	26	265	12.26	186.81	70.6
2021	2,228	4,074	3,620	25	273	12.26	182.89	71.0
2022	2,294	4,102	3,539	24	281	12.26	178.80	71.3
2023	2,363	4,124	3,454	23	290	12.26	174.52	71.6
2024	2,434	4,139	3,365	22	298	12.26	170.04	71.9
2025	2,507	4,146	3,273	21	307	12.26	165.37	72.3
2026	2,582	4,144	3,176	20	317	12.26	160.48	72.6
2027	2,660	4,133	3,075	19	326	12.26	155.37	73.0
2028	2,740	4,110	2,969	18	336	12.26	150.03	73.3
2029	2,822	4,076	2,859	17	346	12.26	144.45	73.8
2030	2,906	4,029	2,744	16	356	12.26	138.62	74.2
2031	2,994	3,968	2,623	15	367	12.26	132.53	74.8
2032	3,083	3,890	2,497	14	378	12.26	126.16	75.4
2033	3,176	3,795	2,365	13	389	12.26	119.50	76.1
2034	3,271	3,682	2,227	12	401	12.26	112.55	76.9
2035	3,369	3,547	2,084	11	413	12.26	105.27	77.8
2036	3,470	3,390	1,933	10	425	12.26	97.67	78.9
2037	3,575	3,207	1,776	9	438	12.26	89.73	80.1
2038	3,682	2,998	1,612	8	451	12.26	81.43	81.4
2039	3,792	2,759	1,440	7	465	12.26	72.75	83.0
2040	3,906	2,488	1,260	6	479	12.26	63.68	84.8
2041	4,023	2,181	1,073	5	493	12.26	54.21	86.7
2042	4,144	1,836	877	4	508	12.26	44.30	88.9
2043	4,268	1,449	672	3	523	12.26	33.95	91.3
2044	4,396	1,017	458	2	539	12.26	23.13	94.0
2045	4,528	535	234	1	555	12.26	11.82	96.9
2046	4,664	0	0	0	0	0.00	0.00	100.0

[#] The Funded Ratio measure is appropriate for assessing the need for or the amount of future contributions above the amounts needed to fund the normal cost and administrative expenses. The Funded Ratio is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the System's benefit obligation.

Actuarial Balance Sheet as of June 30, 2016

Assets and Present Value of Expected Future Contributions

A. Actuarial Value of Assets	
1. Net Assets from System Financial Statements	\$ 8,109,161,214
2. Adjustment for Valuation Assets	768,895,977
3. Actuarial Value of Assets	<u>8,878,057,191</u>
B. Actuarial Present Value of Expected Future Employer Contributions	
1. For Normal Costs	840,558,134
2. For Unfunded Actuarial Accrued Liability	3,873,105,562
3. Total	<u>4,713,663,696</u>
C. Actuarial Present Value of Expected Future Member Contributions	<u>162,632,500</u>
D. Total Present and Expected Future Resources	<u><u>\$ 13,754,353,387</u></u>

Present Value of Expected Future Benefit Payments

A. To Retirees and Beneficiaries	
1. Annual Pensions	\$ 7,293,973,373
2. Pending Refunds	11,405,729
3. BackDROP Installment Payments Incurred, but not yet paid	516,182
4. Total	<u>7,305,895,284</u>
B. To Vested Terminated, LOA, & LTD Members	714,084,005
C. To Present Active Members	
1. Allocated to Service Rendered Prior to Valuation Date – Actuarial Accrued Liability	4,731,183,464
2. Allocated to Service likely to be Rendered after Valuation Date	1,003,190,634
3. Total	<u>5,734,374,098</u>
D. Total Actuarial Present Value of Expected Future Benefit Payments	<u><u>\$ 13,754,353,387</u></u>

Comparative Schedule

Valuation Date June 30	Active Members				Retired Lives				Accrued Liability	Actuarial			Percent Funded*	Ratio of AAL to Payroll	Ratio of AVA to Payroll*
	Number	Payroll \$ Millions	Average Salary		Number		Annual Benefits			Value of Assets*	UAAL*				
			\$	% Incr.	Retired	Active/ Retired	\$ Million	% of Payroll							
-----million-----															
1997 (1)(2)(3)	52,737	\$1,360	\$25,782	4.6 %	15,609	3.4	\$ 130.4	9.6 %	\$4,484	\$3,581	\$ 903	79.9 %	3.30	2.63	
1998	54,544	1,460	26,762	3.8	16,251	3.4	142.4	9.8	4,919	4,211	708	85.6	3.37	2.88	
1999 (2)	56,158	1,565	27,860	4.1	17,117	3.3	161.3	10.3	5,506	4,909	597	89.2	3.52	3.14	
2000 (1)	57,774	1,684	29,143	4.6	18,196	3.2	177.0	10.5	5,921	5,217	704	88.1	3.52	3.10	
2001 (1)	58,431	1,758	30,090	3.3	20,237	2.9	227.4	12.9	6,065	5,881	184	97.0	3.45	3.35	
2002 (3)	58,616	1,773	30,253	0.5	21,502	2.7	256.6	14.5	6,294	6,033	261	95.9	3.55	3.40	
2003 (2) (3)	57,558	1,740	30,229	(0.1)	22,872	2.5	287.1	16.5	6,662	6,057	605	90.9	3.83	3.48	
2004 (1)	55,914	1,737	31,074	2.8	24,757	2.3	324.6	18.7	7,230	6,118	1,112	84.6	4.16	3.52	
2005 (3)(4)	55,944	1,807	32,293	3.9	25,780	2.2	348.1	19.3	7,578	6,435	1,143	84.9	4.19	3.56	
2006	54,493	1,777	32,615	1.0	27,052	2.0	373.6	21.0	8,013	6,837	1,176	85.3	4.51	3.85	
2007	54,363	1,847	33,969	4.2	28,692	1.9	406.4	22.0	8,500	7,377	1,123	86.8	4.60	3.99	
2008 (1)	54,542	1,917	35,139	3.4	30,132	1.8	434.6	22.7	9,128	7,838	1,290	85.9	4.76	4.09	
2009 (1) (3)	55,057	2,002	36,370	3.5	31,637	1.7	465.4	23.2	9,495	7,876	1,619	83.0	4.74	3.93	
2010 (1)	53,478	1,945	36,372	0.0	33,251	1.6	493.7	25.4	9,853	7,923	1,930	80.4	5.07	4.07	
2011 (1)	51,660	1,876	36,306	(0.2)	35,315	1.5	525.6	28.0	10,124	8,022	2,102	79.2	5.40	4.28	
2012 (1)	51,332	1,864	36,314	0.0	37,308	1.4	558.6	30.0	10,794	7,897	2,897	73.2	5.79	4.24	
2013 (3)	50,833	1,880	36,988	1.9	39,139	1.3	589.9	31.4	11,135	8,096	3,039	72.7	5.92	4.31	
2014	50,621	1,903	37,588	1.6	41,000	1.2	618.7	32.5	11,495	8,638	2,857	75.1	6.04	4.54	
2015	49,980	1,919	38,386	2.1	42,964	1.2	650.9	33.9	11,728	8,792	2,936	75.0	6.11	4.58	
2016	49,464	1,922	38,847	1.2	44,828	1.1	680.8	35.4	12,094	8,750	3,344	72.3	6.29	4.55	
2016 (1) (3)	49,464	1,922	38,847	1.2	44,828	1.1	680.8	35.4	12,751	8,878	3,873	69.6	6.64	4.62	

(1) After changes in assumptions.

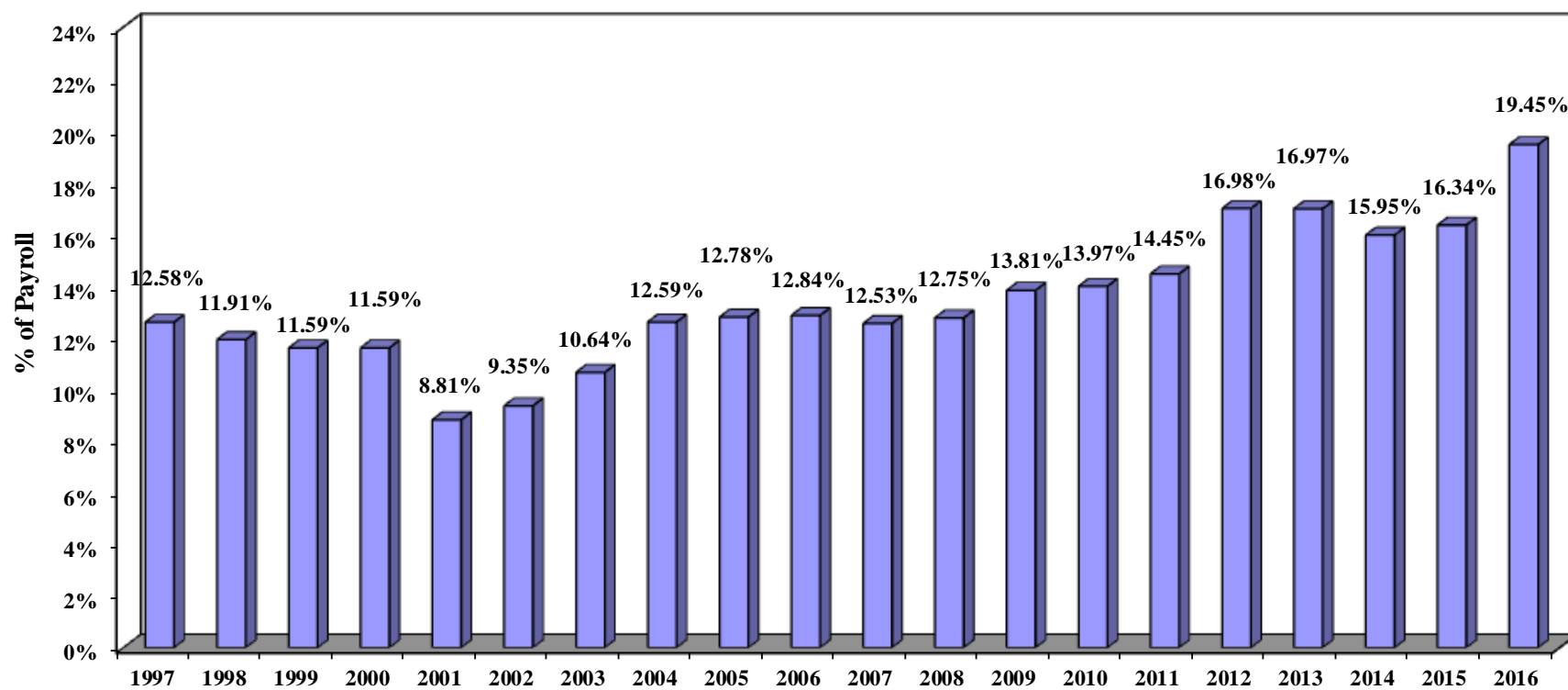
(2) After changes in benefit provisions.

(3) After changes in methods.

(4) Reflects the addition of the assets, liabilities, and members of the Administrative Law Judges Retirement System.

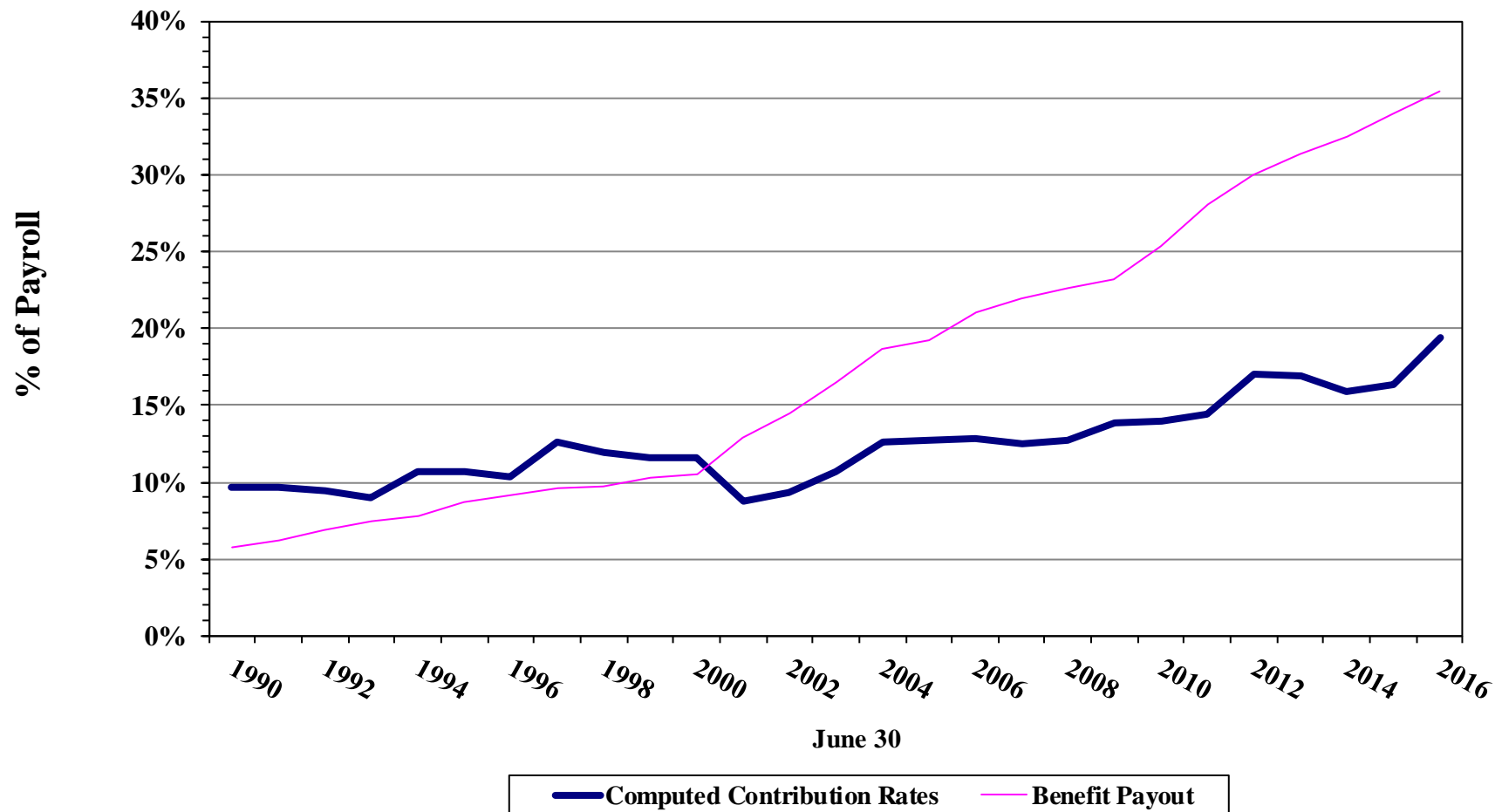
* These figures would be different if based on the market value of assets instead of the actuarial value of assets.

Computed Employer Contribution Rates

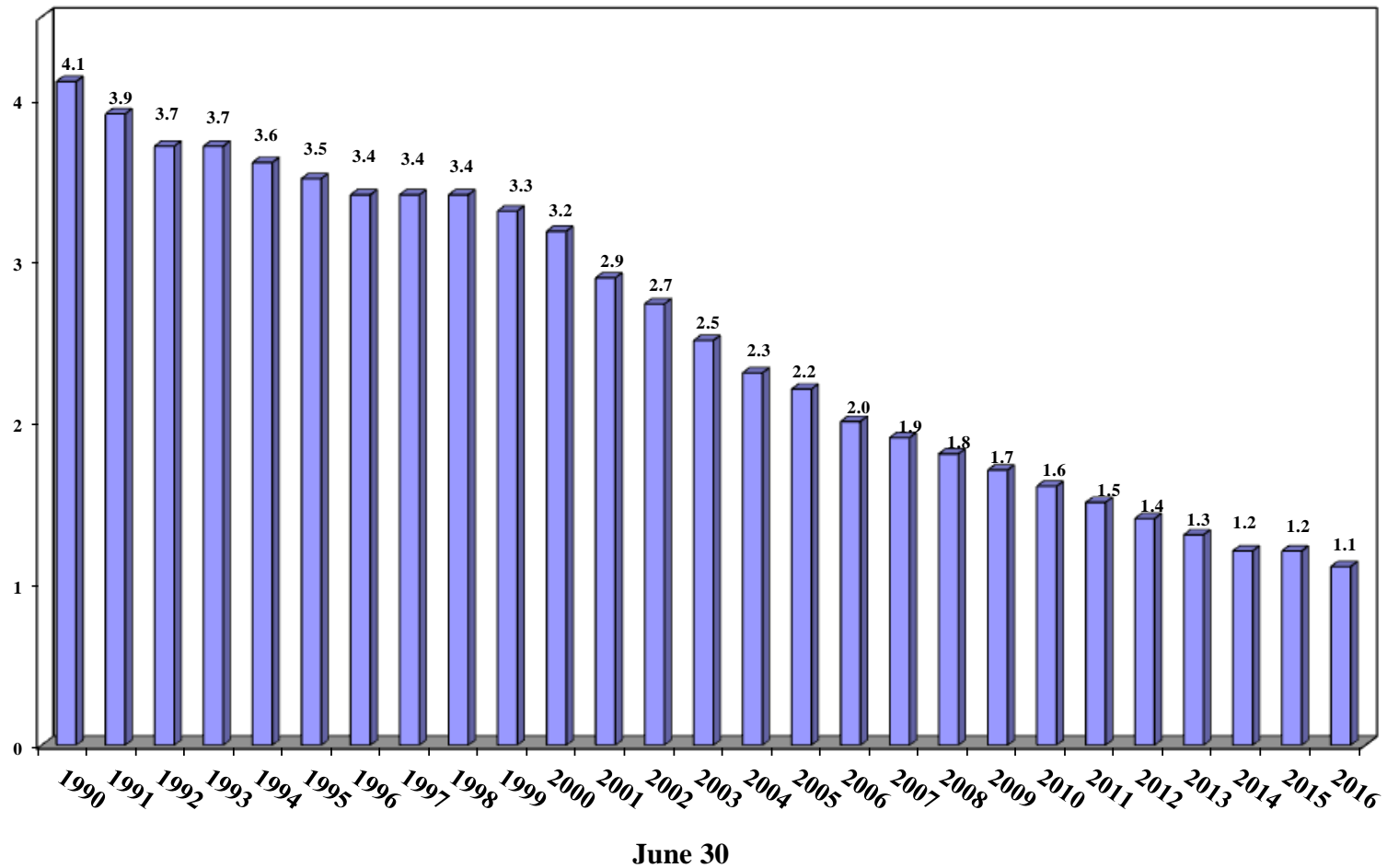


June 30

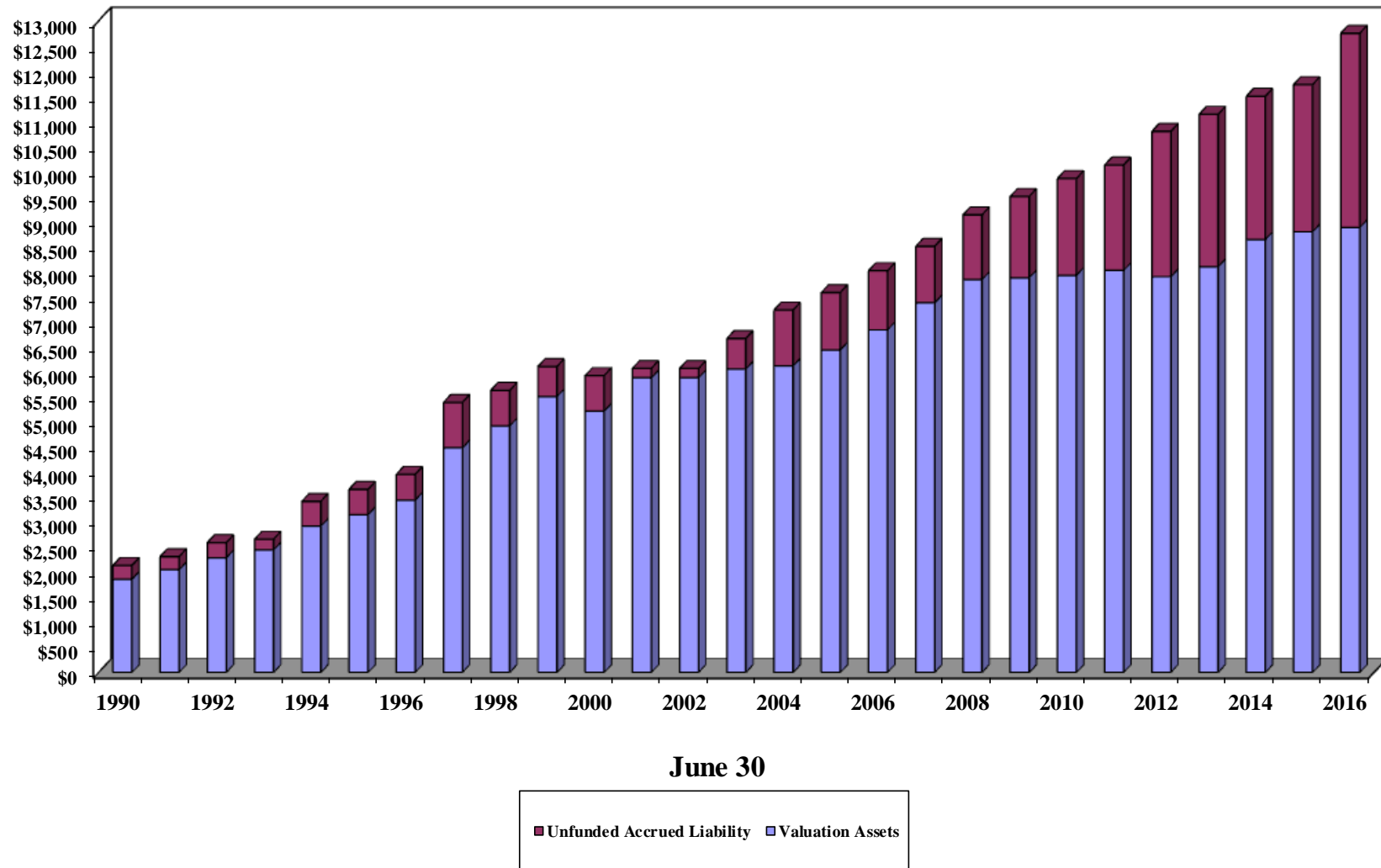
Contribution Rates vs. Benefit Payout



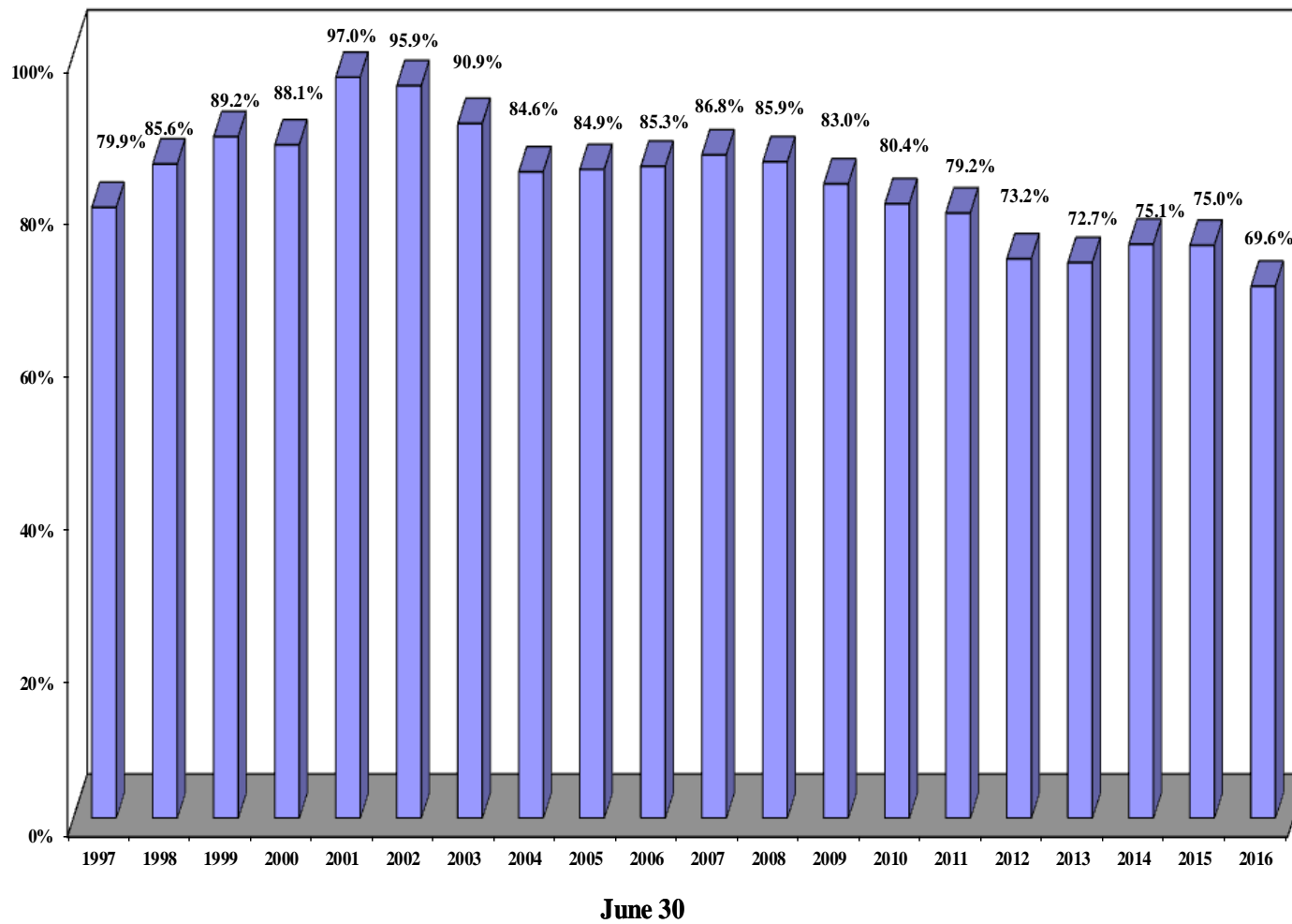
Number of Active Members Per Benefit Recipient



Actuarial Value of Assets and Actuarial Accrued Liabilities (\$ in millions)



**Actuarial Value of Assets as
Percents of Accrued Liabilities
(Funded Ratio)**



Gain/Loss Analysis of Experience During Last Year

Comments

Purpose of Gain/Loss Analysis. Regular actuarial valuations provide valuable information about the composite change in unfunded actuarial accrued liabilities – whether or not the liabilities are increasing or decreasing, and by how much. However, valuations do not show the portion of the change attributable to each risk area within the retirement system financial mechanism: the rate of investment income on plan assets; the rates of withdrawal of active members who leave covered employment; the rates of mortality; the rates of disability; the rates of salary increases; and the assumed ages at actual retirement. In an actuarial valuation, assumptions are made as to what these rates will be for the next year and for decades in the future.

The objective of a gain and loss analysis is to determine the portion of the change in unfunded actuarial accrued liabilities attributable to each risk area.

The fact that actual experience differs from assumed experience is to be expected – the future cannot be predicted with precision. Changes in the valuation assumed experience for a risk area should be made when the differences between assumed and actual experience have been observed to be sizeable and persistent. One year's gain/loss analysis may or may not be indicative of ***long-term trends, which are the basis of financial assumptions.***

2015 and 2016 Data. For the 2015 and 2016 valuations, active and retired member data was reported as of May 31. It was brought forward to June 30 by adding one month of service for all active members, adding the June COLA for certain retirees, and otherwise making no other adjustments. It was assumed for valuation purposes that there was no turnover among members and no new entrants during the month of June. Financial information was reported as of June 30. It is believed that this procedure resulted in a slight overstatement of total liabilities as of June 30, 2015 and June 30, 2016.

The expected and actual numbers of retirements, deaths, and terminations found on pages 28 through 33 reflect experience over the 12-month period from May 31, 2015 through May 31, 2016.

Results from 2016 Plan Year. There was a net experience loss this year, with the largest single identifiable source being investment losses. The table below summarizes historical MOSERS economic experience:

Period	Inflation as Measured by		Approximate Market Return	Real Rate of Return	
	CPI	Increase in Average Salary@		Relative to CPI	Relative to Salaries
July 1, 2007 - June 30, 2008	5.0 %	5.3 %	1.4 %	(3.6) %	(3.9) %
July 1, 2008 - June 30, 2009	(1.4)	5.1	(19.3)	(17.9)	(24.5)
July 1, 2009 - June 30, 2010	1.1	0.7	14.3	13.2	13.6
July 1, 2010 - June 30, 2011	3.5	1.0	21.3	17.8	20.4
July 1, 2011 - June 30, 2012	1.7	1.8	2.1	0.4	0.3
July 1, 2012 - June 30, 2013	1.7	3.2	10.5	8.8	7.3
July 1, 2013 - June 30, 2014	2.1	3.0	19.0	16.9	16.0
July 1, 2014 - June 30, 2015	0.1	3.5	(2.7)	(2.8)	(6.2)
July 1, 2015 - June 30, 2016	1.0	2.9	0.0	(1.0)	(2.9)

@ For members active both at beginning and end of year.

The dollar amount of Unfunded Actuarial Accrued Liabilities (UAAL) is large in absolute dollars. However, the size should be viewed in the light of MOSERS' overall financial program. ***The ratio of unfunded actuarial accrued liabilities divided by active member payroll is significant.*** UAAL represents plan debt, while active member payroll is indicative of the state's capacity to amortize the UAAL – ***the ratio thus provides an index of relative condition.*** The smaller the ratio, the stronger the financial condition.

Valuation Date	UAAL/Active Member Payroll
June 30, 2007	.61
June 30, 2008	.67
June 30, 2009	.81
June 30, 2010	.99
June 30, 2011	1.12
June 30, 2012	1.55
June 30, 2013	1.62
June 30, 2014	1.50
June 30, 2015	1.53
June 30, 2016	2.02

Derivation of Experience Gain (Loss) Year Ended June 30, 2016

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 sizeable year-to-year variations from assumed experience are common. Detail on the derivation of the experience gain (loss) is shown below.

	(A) Actuarial Accrued Liability	(B) Valuation Assets	(C) = (A) - (B) UAAL*
(1) Value at start of year	\$11,727,618,410	\$ 8,792,485,658	\$ 2,935,132,752
(2) Total normal cost from last valuation	157,511,130	0	157,511,130
(3) Actual contributions (Employer and Member)	0	356,565,911	(356,565,911)
(4) Benefit payments & administrative expenses	(765,799,878)	(765,799,878)	0
(5) Interest accrual: (1) x .0800 + [(2) + (3) + (4)] x .0400	913,877,923	687,029,494	226,848,429
(6) Expected value before changes: (1) + (2) + (3) + (4) + (5)	\$12,033,207,585	\$ 9,070,281,185	\$ 2,962,926,400
(7) Change from benefit changes	0	0	0
(8) Change from revised actuarial assumptions/methods	656,805,085	128,149,330	528,655,755
(9) Expected value after changes: (6) + (7) + (8)	\$12,690,012,670	\$ 9,198,430,515	\$ 3,491,582,155
(10) Actual value at end of year	12,751,162,753	8,878,057,191	3,873,105,562
	Gain / (Loss)	(Gain) / Loss	Gain / (Loss)
(11) Gain / Loss: (9) - (10)	\$ (61,150,083)	\$ 320,373,324	\$ (381,523,407)
(12) Gain / Loss as percent of actuarial accrued liabilities at start of year	\$ 11,727,618,410	(0.5%)	2.7%
			(3.3%)

* *Unfunded Actuarial Accrued Liabilities.*

Valuation Date June 30	Actuarial Gain (Loss) as a % of Beginning Accrued Liabilities
2006	(0.1) %
2007	1.0
2008	0.1
2009	(5.2)
2010	(4.0)
2011	(2.4)
2012	(4.7)
2013	(2.8)
2014	2.1
2015	(0.9)
2016	(3.3)

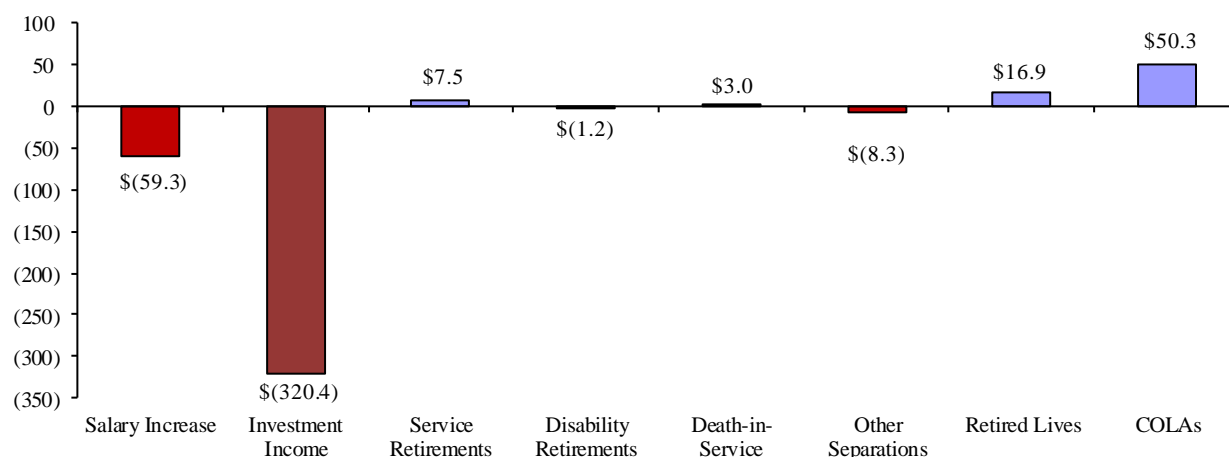
Gains & (Losses) in Actuarial Accrued Liabilities During Plan Year 2015 - 2016

Type of Activity	Gain or (Loss) for Year Ended 6/30/2016	
Age & Service Retirements. If members retire at older ages or with lower final average pay than assumed, there is a gain. If younger ages or higher average pays, a loss.	\$ 7,484,281	0.1%
Death-in-Service Benefits. If survivor claims are less than assumed, there is a gain. If more claims, there is a loss.	3,024,152	0.0%
Withdrawal From Employment. If more liabilities are released by withdrawals than assumed, there is a gain. If smaller releases, a loss.	(8,315,995)	(0.1)%
Long Term Disability. The occurrence of a gain or loss depends upon the age at disability and the incidence of disability.	(1,152,103)	(0.0)%
Pay Increases. If there are smaller pay increases than assumed, there is a gain. If greater increases, a loss.	(59,322,689)	(0.5)%
Investment Income. If there is greater investment return on assets than assumed, there is a gain. If less return, a loss.	(320,373,324)	(2.7)%
Retiree Mortality. If more deaths than assumed, there is a gain. If fewer deaths, a loss.	16,865,560	0.1%
COLAs. If Cost of Living Adjustments are less than expected, a gain, if more a loss.	50,294,963	0.4%
Service Changes. Service credit reinstatements, service transfers, service purchases, and inactive members returning to work.	(20,616,783)	(0.2)%
Other. Miscellaneous gains and losses resulting from data adjustments, timing of financial transactions, valuation methods, etc.	(49,411,468)	(0.4)%
Gain (or Loss) During Year From Experience	\$ (381,523,407)	(3.3)%

* Beginning of year accrued liabilities totaled \$11,728 million.

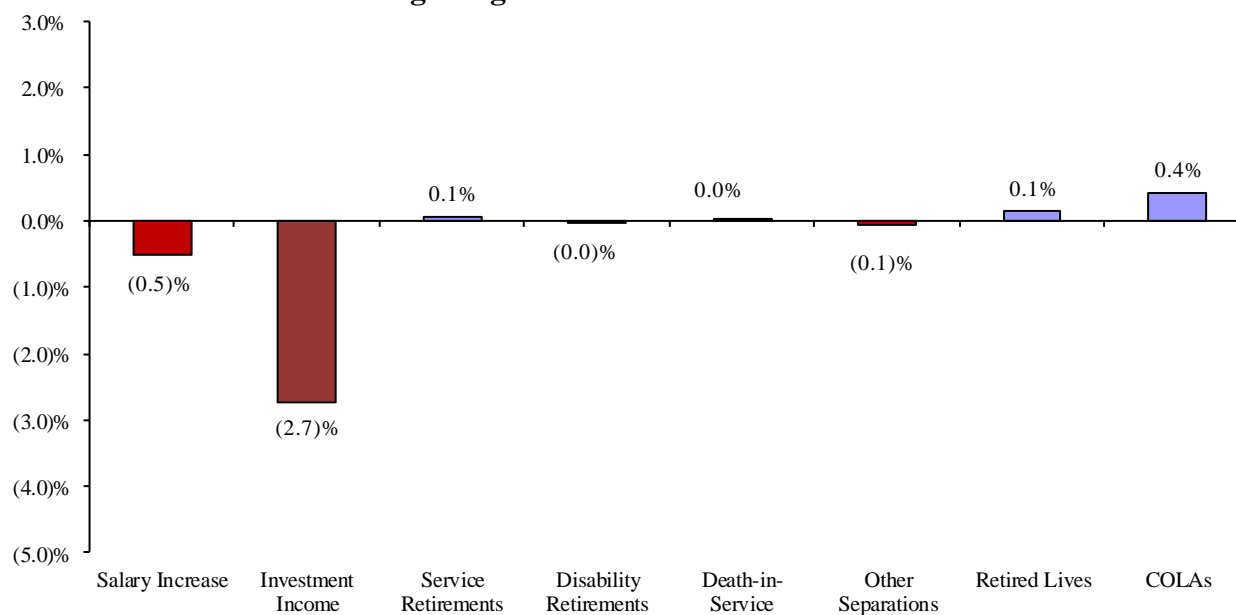
Gain (Loss) Analysis 2015-2016 Experience

Amount in \$ Millions



Type of Risk Area

% of Beginning of Year Actuarial Accrued Liabilities



Type of Risk Area

Experience Gains & Losses by Risk Area
Comparative Statement
-----\$ in Millions-----

Year Ending June 30	Gain (Loss) By Risk Area									Total Exper. Gain (Loss)	Exper. Gain (Loss) as % of AAL	Accrued Liability Beginning of Year
	Salary Increases	Investments	Age & Service Retirement	Disability	Death- In- Service	Withdrawal	Retired Lives &	COLAs	Other			
1997 *	\$ (26.3)	\$ 260.3	\$ (3.1)	\$0.5	\$ 2.6	\$ (7.1)	14.5		\$ (50.6)	\$ 190.8	5.5	\$ 3,440
1998	(56.9)	325.9	9.6	0.2	(0.3)	(1.7)	16.3		(48.3)	244.8	5.5	4,484
1999	(21.9)	299.8	(1.3)	(0.3)	(0.9)	1.7	10.5		(58.1)	229.5	4.7	4,919
2000 *	(6.4)	162.0	1.7	(0.5)	(0.7)	8.9	18.5		(34.7)	148.8	2.7	5,506
2001 *	(23.2)	(67.9)	(59.8)	(1.0)	(0.2)	(28.2)	(13.1)		(66.1)	(259.5)	(4.4)	5,921
2002	115.0	(284.6)	(14.4)	(0.5)	(1.3)	(21.4)	37.1		(62.6)	(232.8)	(3.8)	6,065
2003	7.7	(314.1)	(27.2)	(0.6)	(2.6)	(14.6)	9.6		(63.1)	(404.9)	(6.5)	6,294
2004 *	(40.0)	(240.1)	(51.5)	(1.4)	(1.3)	(6.7)	(4.3)		(53.8)	(399.1)	(6.0)	6,662
2005	(3.4)	(196.6)	3.1	(2.0)	(1.7)	(0.9)	(11.7)		(35.5)	(248.7)	(3.4)	7,230
2006	(29.5)	38.0	(1.7)	(2.3)	(2.4)	15.5	(21.1)		(3.6)	(7.1)	(0.1)	7,578
2007	(11.5)	179.4	(17.3)	(2.1)	(2.4)	3.8	(29.7)		(43.0)	77.2	1.0	8,013
2008 *	(10.5)	78.3	(22.9)	(2.0)	(3.4)	6.6	8.7		(49.8)	5.0	0.1	8,500
2009 *	(15.9)	(354.3)	8.8	(1.5)	0.0	(31.3)	(39.8)		(37.6)	(471.6)	(5.2)	9,128
2010	23.2	(313.6)	(19.0)	8.4	8.0	(30.6)	4.7		(56.9)	(375.8)	(3.9)	9,495
2011	49.6	(204.0)	(52.8)	10.8	7.5	(21.0)	32.7		(60.4)	(237.6)	(2.4)	9,853
2012 *	12.3	(447.2)	(24.3)	8.3	8.9	8.1	10.3		(53.6)	(477.2)	(4.7)	10,124
2013 **	60.4	(313.7)	6.7	11.1	7.4	2.0	(7.7)	(3.1)	(70.4)	(307.3)	(2.8)	10,794
2014	52.6	249.5	(6.9)	(4.2)	(2.5)	(12.7)	6.3	18.0	(68.3)	231.8	2.1	11,135
2015	51.4	(137.9)	(29.1)	(1.6)	(0.5)	15.6	18.9	30.0	(54.0)	(107.2)	(0.9)	11,495
2016 ***	(59.3)	(320.4)	7.5	(1.2)	3.0	(8.3)	16.9	50.3	(70.0)	(381.5)	(3.3)	11,728

* Revision in assumptions.

** Revision in asset valuation method.

*** Revision in assumptions & asset valuation method.

& Prior to the 2013 valuation, this amount included COLAs.

**Development of Gain (Loss)
from Investment Income
During Plan Year 2015 - 2016**

	Market Value ----- \$ in millions -----	Actuarial Value (Before Revised Asset Valuation Method)
1. Assets at June 30, 2015	\$ 8,516.7	\$ 8,792.5
2. Contributions and Transfers In	356.5	356.5
3. Investment Income	1.7	366.7
4. Benefit Payments	757.3	757.3
5. Administrative Expenses	8.5	8.5
6. Assets at June 30, 2016 = (1) + (2) + (3) – (4) – (5)	8,109.1	8,749.9
7. Actual Investment Increment/Mean Assets*	0.02 %	4.27 %
8. Expected Investment Increment		8.0 %
9. Investment Gain (Loss):		
a. As a % of mean assets: (7) – (8)		(3.73) %
b. \$ in millions		\$ (320.4)

* Based on the approximation formula: $I / [.5 \times (A+B-I)]$, where

I = Investment increment

A = Beginning of year asset value

B = End of year asset value

**Salary Increases
to Members Active Both at Beginning & End of Year
During Plan Year 2015 - 2016**

Age Groups		Salary Increases	
		Actual*	Expected
Below 20			
20- 24	906	6.8%	3.2%
25- 29	3,288	5.6%	2.6%
30- 34	4,106	4.3%	1.9%
35- 39	4,717	3.9%	1.4%
40- 44	5,122	3.0%	1.1%
45- 49	6,172	2.7%	0.8%
50- 54	6,946	2.3%	0.6%
55- 59	6,234	1.9%	0.5%
60-64	4,205	1.9%	0.4%
65 & Over	1,657	1.3%	0.2%
Total	43,353		
Average		2.9%	1.0%

* Excludes new entrants and terminations.

	Payroll Growth		
	2016	2015	2014
Actual	0.2%	0.8%	1.2%
Assumed	0.0%	3.0%	3.0%

**Active Members Who Retired With
SERVICE OR REDUCED SERVICE RETIREMENT BENEFITS
During Plan Year 2015 - 2016**

Ages	Men		Women		Total	
	Actual	Expected	Actual	Expected	Actual	Expected
Under 50	1	0.7	3	2.9	4	3.5
50	3	1.8	9	7.7	12	9.5
51	5	5.9	18	12.2	23	18.1
52	7	14.1	26	24.9	33	39.0
53	19	16.8	15	26.5	34	43.3
54	17	22.4	35	39.7	52	62.1
55	26	31.4	46	47.3	72	78.7
56	22	32.4	30	46.5	52	78.9
57	26	40.0	51	61.7	77	101.7
58	35	38.8	67	66.8	102	105.6
59	40	46.6	70	62.0	110	108.6
60	39	48.4	83	76.2	122	124.6
61	42	49.7	61	64.3	103	114.1
62	73	80.5	107	118.5	180	199.1
63	51	61.1	59	83.3	110	144.3
64	41	49.7	61	68.1	102	117.8
65	54	60.0	94	91.2	148	151.3
66	51	50.0	79	62.5	130	112.6
67	30	29.4	36	28.8	66	58.2
68	17	20.6	30	26.4	47	47.0
69	21	20.1	23	19.2	44	39.2
70 & Over	46	59.1	58	60.5	104	119.6
	666	779.4	1,061	1097.4	1,727	1,876.8

	Men	Women	Total
Average age at retirement	62.2 years	61.5 years	61.7 years
Average service at retirement	22.4 years	22.8 years	22.7 years

**Active Members Who Retired with DISABILITY BENEFITS
During Plan Year 2015 - 2016**

Ages	Men		Women		Total	
	Actual	Expected	Actual	Expected	Actual	Expected
Under 25	1	1.0		2.3	1	3.3
25- 29	3	3.0	3	7.4	6	10.4
30- 34	2	3.9	4	8.6	6	12.5
35- 39		4.7	7	9.8	7	14.6
40- 44	7	6.4	15	12.2	22	18.5
45- 49	9	9.7	10	19.2	19	28.8
50- 54	16	16.8	23	28.1	39	44.9
55- 59	18	23.3	21	33.5	39	56.8
60 & Over	8	12.8	8	18.0	16	30.8
	64	81.5	91	139.0	155	220.5

	Men	Women	Total
Average age at disability	50.6 years	49.0 years	49.7 years
Average service at disability	11.6 years	11.3 years	11.4 years

Active Members Who Died During Plan Year 2015 - 2016

Ages	Men		Women		Total	
	Actual	Expected	Actual	Expected	Actual	Expected
Under 30	0	0.1	0	0.1	0	0.1
30- 34	2	0.4	1	0.3	3	0.7
35- 39	2	0.8	0	0.6	2	1.4
40- 44	1	1.2	0	1.0	1	2.2
45- 49	1	1.9	6	1.9	7	3.8
50- 54	7	3.3	5	3.7	12	7.0
55- 59	8	5.9	5	6.6	13	12.5
60- 64	11	8.5	5	8.7	16	17.3
65 & Over	2	9.1	6	7.4	8	16.4
Totals	34	31.2	28	30.2	62	61.3

	Men	Women	Total
Average age at death	54.7 years	55.9 years	55.3 years
Average service at death	13.9 years	17.7 years	15.7 years

Of the 62 active members who died in service during plan year 2015-2016, 23 members had a benefit payable to a survivor.

Active Members Who Left Active Status with a DEFERRED BENEFIT
(Retirement with Monthly Payments Beginning at Later Age)
During Plan Year 2015 - 2016

Ages	Men		Women		Total	
	Actual	Expected	Actual	Expected	Actual	Expected
Under 30	35	21.8	60	36.5	95	58.3
30- 34	105	88.1	168	123.5	273	211.6
35- 39	122	92.6	168	155.5	290	248.1
40- 44	80	82.5	161	137.3	241	219.8
45- 49	64	72.3	141	125.2	205	197.6
50- 54	75	58.6	114	94.4	189	153.0
55- 59	30	43.3	76	72.2	106	115.5
60 & Over	5	13.3	23	20.6	28	33.8
Totals	516	472.6	911	765.2	1,427	1,237.8

	Men	Women	Total
Average age at termination	41.0 years	42.0 years	41.6 years
Average service at termination	10.0 years	10.4 years	10.3 years

Active Members Who Left Active Status with NO BENEFIT PAYABLE
(Other than Deaths)
During Plan Year 2015 - 2016

Ages	Men		Women		Total	
	Actual	Expected	Actual	Expected	Actual	Expected
Under 20						
20- 24	190	112.9	283	163.3	473	276.2
25- 29	378	271.7	538	381.7	916	653.4
30- 34	242	179.3	340	261.6	582	440.9
35- 39	145	121.4	219	191.8	364	313.2
40- 44	99	83.5	187	152.0	286	235.5
45- 49	75	73.7	154	148.9	229	222.7
50- 54	76	72.7	111	136.4	187	209.1
55- 59	40	58.2	82	110.9	122	169.1
60- 64	30	46.7	37	58.8	67	105.5
65- 69	10	13.1	16	14.8	26	27.9
70 & Over	3	4.5	1	3.2	4	7.8
	1,288	1,037.8	1,968	1,623.5	3,256	2,661.2

Service	Men		Women		Total	
	Actual	Expected	Actual	Expected	Actual	Expected
0	481	385.4	784	669.3	1,265	1,054.7
1	337	274.5	468	424.0	805	698.5
2	244	193.9	345	274.3	589	468.2
3	153	127.4	237	194.0	390	321.4
4	73	57	134	62	207	118.5
5 & Over						
	1,288	1,037.8	1,968	1,623.5	3,256	2,661.2

	Men	Women	Total
Average age at termination	34.2 years	34.9 years	34.6 years
Average service at termination	2.3 years	2.2 years	2.2 years

**Comparison of Actual to Expected Deaths
Among Retired Lives
(Service Retirement Only)
As of June 30, 2016**

Age	Male Deaths			Female Deaths			Total Deaths		
	Actual	Expected	Exposure	Actual	Expected	Exposure	Actual	Expected	Exposure
45-49	0	0	0	0	0	1	0	0	1
50-54	1	0	100	2	1	277	3	1	377
55-59	16	4	1,042	12	7	2,039	28	11	3,081
60-64	36	22	2,960	42	32	4,911	78	54	7,871
65-69	78	55	4,221	65	70	6,231	143	125	10,452
70-74	74	60	2,816	62	74	3,982	136	134	6,798
75-79	61	65	1,724	102	79	2,608	163	144	4,332
80-84	60	72	1,031	98	82	1,657	158	154	2,688
85-89	66	64	530	81	93	1,040	147	157	1,570
90-94	42	41	210	83	69	478	125	110	688
95-99	10	12	42	27	25	124	37	37	166
100 & Up	3	2	4	7	6	23	10	8	27
Totals	447	397	14,680	581	538	23,371	1,028	935	38,051

Average

Ages	77.1	79.1	70.1	79.9	79.9	70.1	78.7	79.6	70.1
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SECTION C
FUND ASSETS

Development of Actuarial Value of Assets

Valuation Date: June 30	2013	2014	2015	2016
A. Actuarial value at beginning of year	\$ 7,897,167,203	\$ 8,096,436,929	\$ 8,637,758,955	\$ 8,792,485,658
B. Market value at end of year	7,993,837,570	9,136,781,826	8,516,654,912	8,109,161,214
C. Market value at beginning of year	7,581,882,309	7,993,837,570	9,136,781,826	8,516,654,912
D. Cash flow				
D1. Contributions	290,275,917	345,557,293	353,287,107	356,565,911
D2. Benefit payments	(649,242,314)	(680,436,106)	(728,265,800)	(757,310,503)
D3. Administrative expenses	(7,575,883)	(7,336,922)	(8,077,692)	(8,489,375)
D4. Net	(366,542,280)	(342,215,735)	(383,056,385)	(409,233,967)
E. Investment income				
E1. Market total (B-C-D4)	778,497,541	1,485,159,991	(237,070,529)	1,740,269
E2. Assumed rate	8.00%	8.00%	8.00%	8.00%
E3. Amount for immediate recognition (A + .5 * D4) * E2	617,111,685	634,026,325	675,698,461	687,029,494
E4. Amount for phased-in recognition (E1 - E3)	161,385,856	851,133,666	(912,768,990)	(685,289,225)
F. Unrecognized gains/(losses) from prior years	(315,284,894)	(102,599,359)	499,022,871	(275,830,746)
G. Phased-in recognition of investment income (E4 + F) / 5*	(51,299,679)	249,511,436	(137,915,373)	(192,223,994)
H. End of year adjustment	-	-	-	-
I. Actuarial value at end of year				
I1. Preliminary Value (A + D4 + E3 + G + H)	8,096,436,929	8,637,758,955	8,792,485,658	8,878,057,191
I2. Upper Corridor Limit: 125% x B	9,992,296,963	11,420,977,283	10,645,818,640	10,136,451,518
I3. Lower Corridor Limit: 80% x B	6,395,070,056	7,309,425,461	6,813,323,930	6,487,328,971
I4. Corridor Adjustment	-	-	-	-
I5. Funding Value End of Year: I1 + I4	8,096,436,929	8,637,758,955	8,792,485,658	8,878,057,191
J. Difference between market and actuarial values (B - I5)	(102,599,359)	499,022,871	(275,830,746)	(768,895,977)
K. Recognized rate of return	7.33%	11.15%	6.37%	5.76%
L. Market value rate of return	10.52%	18.99%	(2.65)%	0.02%
M. Actuarial value as a % of market value: I5 / B	101%	95%	103%	109%
	(4.5)%	(4.0)%	(4.4)%	(4.6)%
	(102,599,359)	499,022,871	(275,830,746)	(768,895,977)

* Phased-in over 3 years prior to 2016.

The actuarial value of assets recognizes assumed investment income (line E3) fully each year. Differences between actual and assumed investment income (line E4) are phased-in over an open 5-year period. During periods when investment performance exceeds the assumed rate, the actuarial value of assets will tend to be less than market value. During periods when investment performance is less than assumed, the actuarial value will tend to be greater than market value.

Asset Summary

June 30, 2016

	Market Value	Actuarial Value
1. Assets at June 30, 2015	8,516,654,912	\$8,792,485,658
2. Contributions		
State Contributions	329,957,369	329,957,369
Employee Contributions	21,684,920	21,684,920
Member Purchases of Service Credit	2,815,749	2,815,749
Service Transfer Contributions	<u>2,107,873</u>	<u>2,107,873</u>
Total	356,565,911	356,565,911
3. Investment Increment*	1,740,269	494,805,500
4. Benefit Payments and Transfers Out	757,310,503	757,310,503
5. Administrative and Misc. Expenses	8,489,375	8,489,375
6. Assets at June 30, 2016		
(1) + (2) + (3) - (4) - (5)	8,109,161,214	8,878,057,191
7. Investment Increment/Mean Assets**	0.02%	5.76%

* Net of investment expenses.

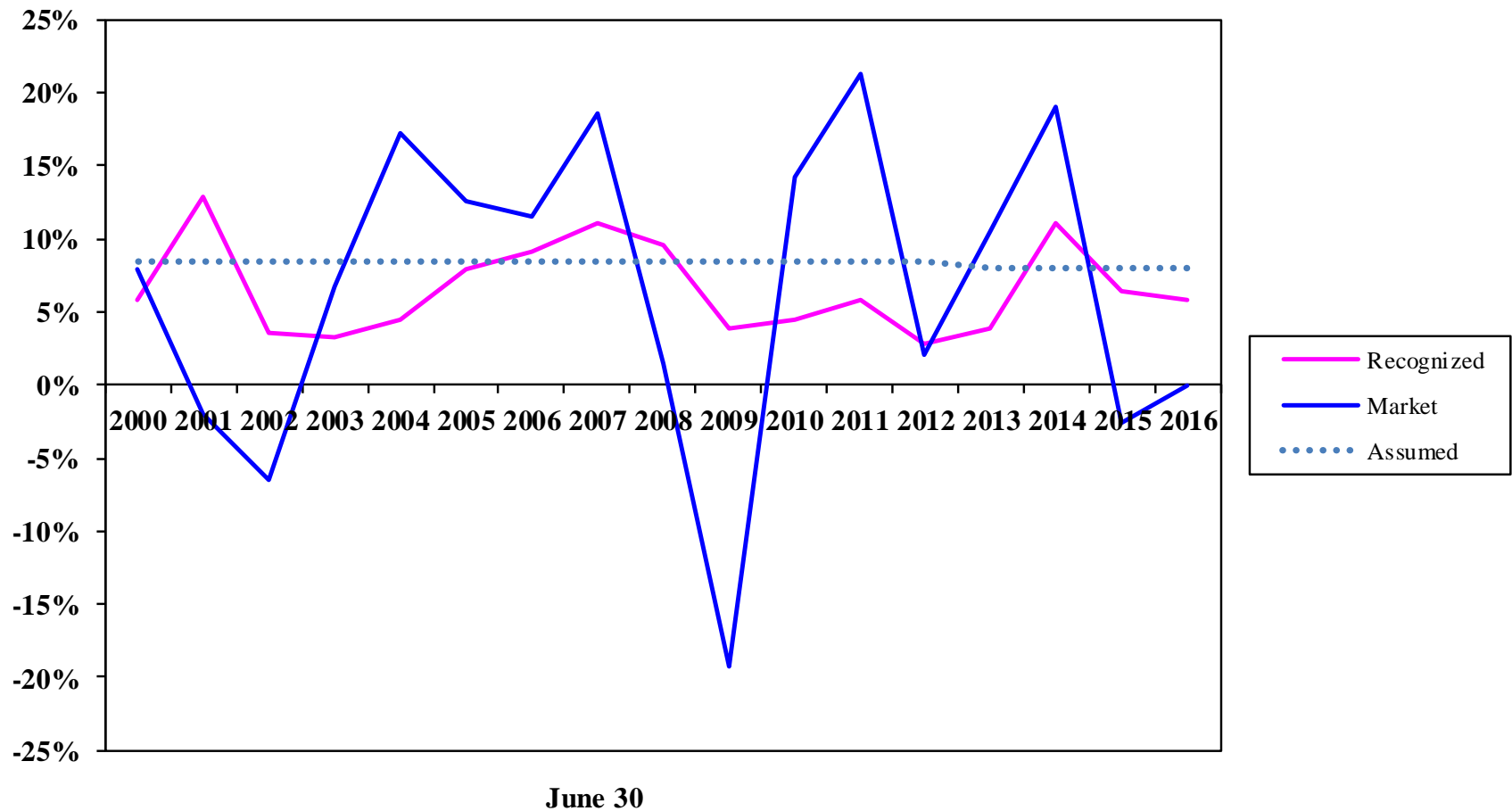
** Based on the approximation formula: $I / [.5 \times (A+B-I)]$, where

I = Investment Increment

A = Beginning of year asset value

B = End of year asset value

Recognized vs. Market Returns



The period of asset smoothing was changed from 3 to 5 years effective June 30, 2001.

The asset smoothing method was changed from 5-year smoothing to 3-year rolling smoothing effective June 30, 2013.

The asset smoothing method was changed from 3-year rolling smoothing to 5-year rolling smoothing effective June 30, 2016.

SECTION D
PROJECTIONS

The Nature of Actuarial Projections

Regular actuarial valuations measure the Retirement System's present financial position and contributions adequacy by calculating and financing the liabilities created by the present benefit program. This process involves discounting to present values the future benefit payments on behalf of present active and retired members and their survivors. However, valuations do not produce information regarding future changes in the makeup of the covered group or the amounts of benefits to be paid or investment income to be received-actuarial projections do.

Whereas valuations provide a snapshot of the Retirement System as of a given date, projections provide a moving picture. Projected active and retired groups are developed from year to year by the application of assumptions regarding pre-retirement withdrawal from service, retirements, deaths, disabilities, and the addition of new members. Projected information regarding the retired life group leads to assumed future benefit payout. Combining future benefit payments with assumed contributions and expected investment earnings produces the net cash flow of the System each year, and thus end of year asset levels.

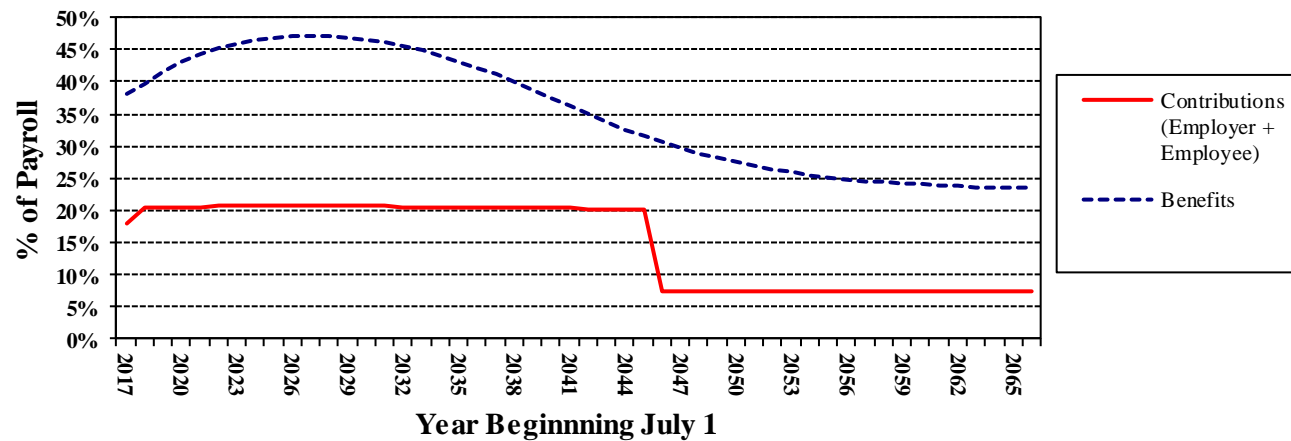
Projections are used for many purposes. Among them are (i) developing cash flow patterns for investment policy and asset mix consideration, (ii) exploring the effect of alternative assumptions about future experience, (iii) analyzing the impact on System funding progress of changes in the workforce, and (iv) examining the potential effect of changes in benefits on system financial activity.

Projection results are useful in demonstrating changing relationships among key elements affecting system financial activity. For example: how benefits payable and System assets will grow in future decades. Projections are not predictions of specific future events and do not provide numeric precision in absolute terms. For instance, cash flow projected to occur 10 years in the future will not be exact (except by coincidence), but understanding the changed relationships between future benefit payout and future investment income can be very useful.

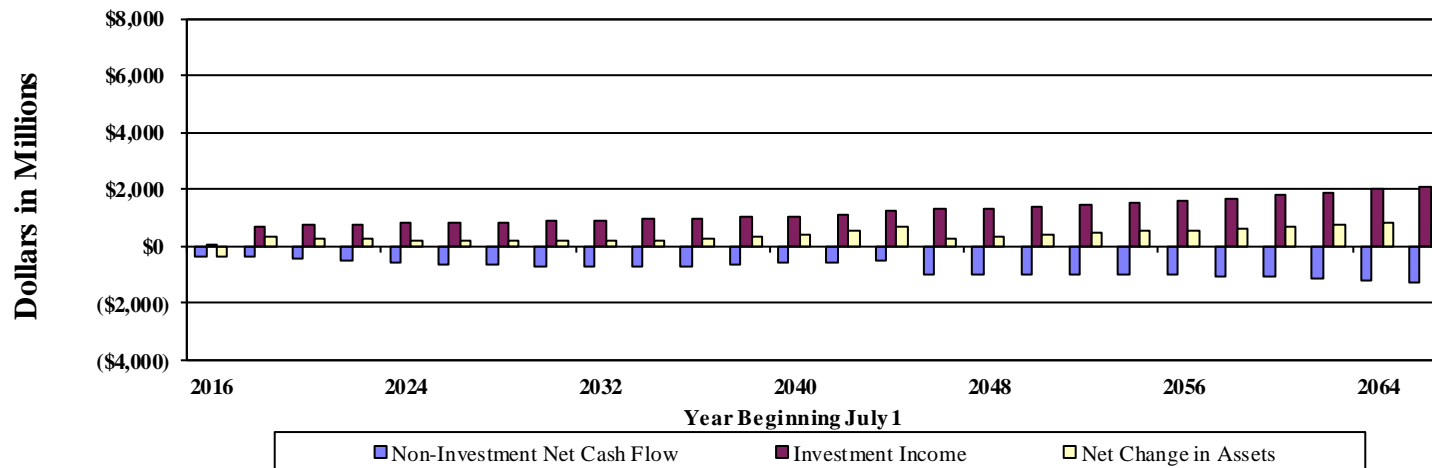
It is important to note that a projection is different than an amortization schedule and therefore the projected dollar contributions may differ from those shown on page 12.

50-Year Cash Flow Projection Based on Valuation Assumptions

Projected Contributions* and Benefits Expressed as Percents of Active Member Payroll



Net Change in Asset Values



* Does not include contributions for administrative expenses. Includes member contributions.

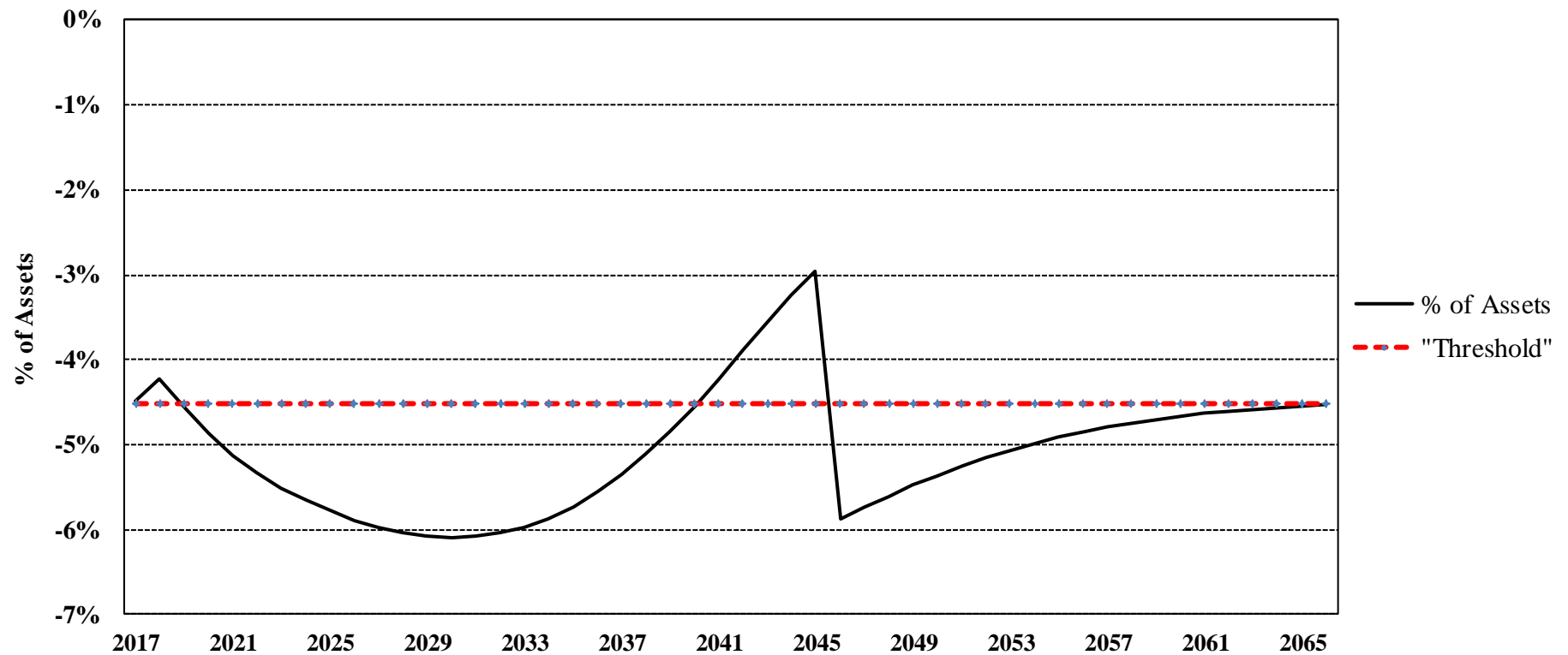
50-Year Cash Flow Projection (in Thousands)

Year Ended June 30	Assets BOY	Contributions*			Benefits	Investment Income	Assets EOY	
		Normal	UAAL ⁺	Total			Inflated	2017 \$
2017	\$ 8,878,057	\$ 153,584	\$ 203,855	\$ 357,439	\$ 756,055	\$ 664,112	\$ 9,143,553	\$9,143,553
2018	9,143,553	164,801	247,302	412,103	797,771	684,911	9,442,796	9,167,763
2019	9,442,796	166,636	255,824	422,460	853,322	706,096	9,718,030	9,160,175
2020	9,718,030	169,109	263,667	432,776	906,475	725,533	9,969,864	9,123,838
2021	9,969,864	171,752	271,743	443,495	955,842	743,338	10,200,855	9,063,328
2022	10,200,855	174,761	280,015	454,776	999,518	759,785	10,415,898	8,984,845
2023	10,415,898	177,924	288,477	466,401	1,039,682	775,158	10,617,775	8,892,219
2024	10,617,775	181,267	297,167	478,434	1,078,320	789,596	10,807,485	8,787,474
2025	10,807,485	185,026	306,078	491,104	1,115,776	803,174	10,985,987	8,672,440
2026	10,985,987	188,960	315,422	504,382	1,151,149	815,993	11,155,213	8,549,542
2027	11,155,213	193,086	324,736	517,822	1,183,662	828,219	11,317,592	8,421,351
2028	11,317,592	197,666	334,511	532,177	1,215,035	839,997	11,474,731	8,289,590
2029	11,474,731	202,424	344,439	546,863	1,243,729	851,488	11,629,353	8,156,594
2030	11,629,353	207,369	354,789	562,158	1,270,417	862,888	11,783,982	8,024,318
2031	11,783,982	212,508	365,300	577,808	1,293,982	874,417	11,942,225	7,895,218
2032	11,942,225	218,130	375,957	594,087	1,315,368	886,330	12,107,274	7,771,198
2033	12,107,274	223,653	387,012	610,665	1,333,619	898,893	12,283,213	7,654,492
2034	12,283,213	229,669	398,480	628,149	1,348,566	912,447	12,475,243	7,547,727
2035	12,475,243	235,892	410,056	645,948	1,360,608	927,357	12,687,940	7,452,828
2036	12,687,940	242,326	422,043	664,369	1,369,736	943,979	12,926,552	7,371,832
2037	12,926,552	249,321	434,474	683,795	1,376,392	962,716	13,196,671	7,306,677
2038	13,196,671	256,209	446,989	703,198	1,378,743	984,023	13,505,149	7,259,683
2039	13,505,149	263,691	459,950	723,641	1,377,873	1,008,426	13,859,343	7,233,087
2040	13,859,343	271,399	472,936	744,335	1,374,105	1,036,446	14,266,019	7,228,474
2041	14,266,019	278,955	486,286	765,241	1,367,819	1,068,586	14,732,027	7,247,181
2042	14,732,027	287,119	500,030	787,149	1,360,493	1,105,338	15,264,021	7,290,181
2043	15,264,021	295,512	513,743	809,255	1,352,890	1,147,159	15,867,545	7,357,697
2044	15,867,545	304,132	526,557	830,689	1,345,924	1,194,402	16,546,712	7,449,149
2045	16,546,712	313,402	538,355	851,757	1,341,160	1,247,334	17,304,643	7,563,457
2046	17,304,643	322,479	0	322,479	1,339,238	1,285,392	17,573,276	7,457,156
2047	17,573,276	332,243	0	332,243	1,339,848	1,306,288	17,871,959	7,363,010
2048	17,871,959	341,814	0	341,814	1,343,179	1,329,374	18,199,968	7,279,753
2049	18,199,968	352,120	0	352,120	1,349,050	1,354,633	18,557,671	7,206,631
2050	18,557,671	362,716	0	362,716	1,357,688	1,382,072	18,944,771	7,142,676
2051	18,944,771	373,609	0	373,609	1,369,035	1,411,668	19,361,013	7,087,000
2052	19,361,013	384,807	0	384,807	1,383,028	1,443,405	19,806,197	7,038,794
2053	19,806,197	396,326	0	396,326	1,399,634	1,477,269	20,280,158	6,997,312
2054	20,280,158	408,182	0	408,182	1,418,975	1,513,244	20,782,609	6,961,819
2055	20,782,609	420,390	0	420,390	1,441,165	1,551,305	21,313,139	6,931,590
2056	21,313,139	432,961	0	432,961	1,466,057	1,591,425	21,871,468	6,905,994
2057	21,871,468	445,908	0	445,908	1,493,691	1,633,582	22,457,267	6,884,429
2058	22,457,267	459,245	0	459,245	1,524,159	1,677,747	23,070,100	6,866,308
2059	23,070,100	472,983	0	472,983	1,557,182	1,723,901	23,709,802	6,851,166
2060	23,709,802	487,136	0	487,136	1,592,698	1,772,032	24,376,272	6,838,591
2061	24,376,272	502,400	0	502,400	1,630,759	1,822,155	25,070,068	6,828,379
2062	25,070,068	517,443	0	517,443	1,671,234	1,874,270	25,790,547	6,820,017
2063	25,790,547	532,942	0	532,942	1,714,023	1,928,356	26,537,822	6,813,228
2064	26,537,822	548,911	0	548,911	1,758,981	1,984,427	27,312,179	6,807,800
2065	27,312,179	565,364	0	565,364	1,806,049	2,042,509	28,114,003	6,803,555
2066	28,114,003	582,315	0	582,315	1,855,205	2,102,631	28,943,744	6,800,341

* Does not include contributions for administrative expenses. Includes member contributions.

+The projection of the UAAL is based on dynamic payroll and may not coincide exactly with an amortization schedule.

50-Year Cash Flow Projection
Projected Net External Cash Flow Expressed as a Percent of Assets



Net External Cash Flow equals: i) Contributions to the plan, less ii) Benefits paid by the plan. A negative Net External Cash Flow means that benefits are being partly funded by investment income --- a natural consequence of advance funding.

50-Year Cash Flow Projection Analysis of Projected Net Cash Flow (In Thousands)

Year Ended June 30	External Cash Flow		Net External Cash Flow		Year Ended June 30	External Cash Flow		Net External Cash Flow	
	Inflow*	Outflow	\$	% of Assets		Inflow*	Outflow	\$	% of Assets
2017	\$ 357,439	\$ 756,055	\$ (398,616)	(4.49)%	2042	\$ 787,149	\$ 1,360,493	\$ (573,344)	(3.89)%
2018	412,103	797,771	(385,668)	(4.22)%	2043	809,255	1,352,890	(543,635)	(3.56)%
2019	422,460	853,322	(430,862)	(4.56)%	2044	830,689	1,345,924	(515,235)	(3.25)%
2020	432,776	906,475	(473,699)	(4.87)%	2045	851,757	1,341,160	(489,403)	(2.96)%
2021	443,495	955,842	(512,347)	(5.14)%	2046	322,479	1,339,238	(1,016,759)	(5.88)%
2022	454,776	999,518	(544,742)	(5.34)%	2047	332,243	1,339,848	(1,007,605)	(5.73)%
2023	466,401	1,039,682	(573,281)	(5.50)%	2048	341,814	1,343,179	(1,001,365)	(5.60)%
2024	478,434	1,078,320	(599,886)	(5.65)%	2049	352,120	1,349,050	(996,930)	(5.48)%
2025	491,104	1,115,776	(624,672)	(5.78)%	2050	362,716	1,357,688	(994,972)	(5.36)%
2026	504,382	1,151,149	(646,767)	(5.89)%	2051	373,609	1,369,035	(995,426)	(5.25)%
2027	517,822	1,183,662	(665,840)	(5.97)%	2052	384,807	1,383,028	(998,221)	(5.16)%
2028	532,177	1,215,035	(682,858)	(6.03)%	2053	396,326	1,399,634	(1,003,308)	(5.07)%
2029	546,863	1,243,729	(696,866)	(6.07)%	2054	408,182	1,418,975	(1,010,793)	(4.98)%
2030	562,158	1,270,417	(708,259)	(6.09)%	2055	420,390	1,441,165	(1,020,775)	(4.91)%
2031	577,808	1,293,982	(716,174)	(6.08)%	2056	432,961	1,466,057	(1,033,096)	(4.85)%
2032	594,087	1,315,368	(721,281)	(6.04)%	2057	445,908	1,493,691	(1,047,783)	(4.79)%
2033	610,665	1,333,619	(722,954)	(5.97)%	2058	459,245	1,524,159	(1,064,914)	(4.74)%
2034	628,149	1,348,566	(720,417)	(5.87)%	2059	472,983	1,557,182	(1,084,199)	(4.70)%
2035	645,948	1,360,608	(714,660)	(5.73)%	2060	487,136	1,592,698	(1,105,562)	(4.66)%
2036	664,369	1,369,736	(705,367)	(5.56)%	2061	502,400	1,630,759	(1,128,359)	(4.63)%
2037	683,795	1,376,392	(692,597)	(5.36)%	2062	517,443	1,671,234	(1,153,791)	(4.60)%
2038	703,198	1,378,743	(675,545)	(5.12)%	2063	532,942	1,714,023	(1,181,081)	(4.58)%
2039	723,641	1,377,873	(654,232)	(4.84)%	2064	548,911	1,758,981	(1,210,070)	(4.56)%
2040	744,335	1,374,105	(629,770)	(4.54)%	2065	565,364	1,806,049	(1,240,685)	(4.54)%
2041	765,241	1,367,819	(602,578)	(4.22)%	2066	582,315	1,855,205	(1,272,890)	(4.53)%

* Does not include contributions for administrative expenses.

The portion of investment income needed to pay benefits (the negative external cash flow) increases gradually and begins to level off at the end of the amortization of the unfunded accrued liabilities. After this period, it then approaches the assumed rate of 4.51% (1.0765 / 1.03 - 1). The remainder of the expected investment income is needed to preserve the purchasing power of the trust fund.

SECTION E
PARTICIPANT DATA

Retired Lives as of June 30, 2016
Tabulated by Plan Year of Retirement

Calendar Year of Retirement	No.	Total Annual Benefits	Average Monthly Benefits
2016*	1,320	\$ 19,386,757	\$ 1,224
2015	3,206	46,655,226	1,213
2014	2,969	41,063,621	1,153
2013	2,872	39,308,500	1,141
2012	2,867	39,654,322	1,153
2011	2,676	37,489,300	1,167
2010	2,786	41,596,187	1,244
2009	2,228	32,080,021	1,200
2008	2,184	31,635,975	1,207
2007	2,057	29,305,359	1,187
2006	1,978	28,589,974	1,204
2005	1,762	25,953,619	1,227
2004	1,274	18,438,904	1,206
2003	2,421	39,856,618	1,372
2002	1,709	28,106,800	1,371
2001	1,446	25,284,799	1,457
2000	1,905	35,003,911	1,531
1999	998	17,869,962	1,492
1998	935	18,107,669	1,614
1997	788	14,583,623	1,542
1996	673	11,582,010	1,434
1995	694	12,695,515	1,524
1994	482	7,737,115	1,338
1993	507	8,817,198	1,449
1992	401	6,499,754	1,351
1991	368	6,107,013	1,383
1990	246	4,012,828	1,359
1989	243	3,702,959	1,270
1988	222	3,443,106	1,292
1987	144	1,718,184	994
1986	135	1,453,212	897
1985	89	826,377	774
1984	61	675,169	922
1983	43	403,452	782
1982	39	415,215	887
1981	29	217,443	625
1980	21	227,861	904
1979	16	93,938	489
1978	9	47,020	435
1977	13	117,060	750
1976	4	19,524	407
1975	5	20,484	341
1974	2	7,296	304
1973	1	4,128	344
TOTAL	44,828	\$ 680,815,008	\$ 1,266

* Five months ended May 31, 2016.

**Retired Lives Benefits Payable as of June 30, 2016
Tabulated by Option and Type of Benefit**

MSEP Benefits

Type of Benefit	No.	Annual Benefits
Service Retirement		
Life Annuity	5,673	\$ 79,297,703
50% Joint and Survivor	5,278	95,672,250
100% Joint and Survivor	2,935	61,173,130
5- Year Certain and Life	144	1,584,272
10- Year Certain and Life	160	1,773,398
Survivor Beneficiary	2,501	31,904,311
Total	16,691	271,405,064
Disability Retirement	4	14,640
Death-in-Service	1,458	16,765,144
Total	18,153	\$ 288,184,848

MSEP 2000 Benefits

Type of Benefit	No.	Annual Benefits
Service Retirement		
Life Annuity	15,975	\$ 224,376,119
50% Joint and Survivor	3,855	76,033,837
100% Joint and Survivor	4,424	70,439,754
5- Year Certain and Life	26	378,402
10- Year Certain and Life	736	7,436,891
15- Year Certain and Life	593	4,974,231
Survivor Beneficiary	866	8,175,375
Total	26,475	391,814,610
Death-in-Service	199	799,746
Total	26,674	\$ 392,614,356

There is one MSEP 2011 Death-In-Service Benefit of \$15,804 payable annually.

Retired Lives Benefits Payable as of June 30, 2016
Tabulated by Attained Ages of Benefit Recipients

Attained Ages	Service Retirement		Disability Retirement		Survivors and Beneficiaries		Totals	
	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
Under 20					73	\$ 247,204	73	\$ 247,204
20-24					14	80,398	14	80,398
25-29					9	88,128	9	88,128
30-34					21	131,055	21	131,055
35-39					40	290,137	40	290,137
40-44					73	516,535	73	516,535
45-49	5	\$ 150,012			146	1,186,130	151	1,336,142
50-54	477	15,106,270			213	1,825,386	690	16,931,656
55-59	3,491	74,397,774	1	\$ 2,184	346	3,495,483	3,838	77,895,441
60-64	8,500	128,027,998	3	12,456	496	5,361,433	8,999	133,401,887
65-69	10,929	145,196,729			733	8,299,051	11,662	153,495,780
70-74	7,030	102,823,394			668	8,685,888	7,698	111,509,282
75-79	4,393	75,781,927			708	9,846,185	5,101	85,628,112
80-84	2,664	46,120,440			721	8,959,210	3,385	55,079,651
85-89	1,498	24,111,937			494	5,763,461	1,992	29,875,398
90-94	640	9,344,076			221	2,356,798	861	11,700,874
95	56	615,580			16	190,392	72	805,972
96	38	451,125			13	97,522	51	548,647
97	36	451,168			5	97,901	41	549,070
98	12	224,904			7	90,864	19	315,768
99	8	107,292			1	19,260	9	126,552
100	8	97,526			4	10,524	12	108,050
101	4	59,904			2	17,760	6	77,664
102	5	45,984					5	45,984
103	3	11,560			1	3,672	4	15,232
104	2	14,388					2	14,388
105								
Totals	39,799	\$ 623,139,988	4	\$ 14,640	5,025	\$ 57,660,379	44,828	\$ 680,815,008

Average Age at Retirement: 60.0 years

Average Age on Valuation: 69.9 years

Summary of Member Data Included in Valuation June 30, 2016

Active Members

Valuation Group	Number	Payroll	Group Averages		
			Salary	Age(yrs.)	Service(yrs.)
Regular State Employees	46,652	\$ 1,760,954,416	\$ 37,747	45.2	10.8
Elected Officials	6	659,977	109,996	47.7	8.7
Legislative Clerks	17	637,809	37,518	62.4	23.0
Legislators	194	6,978,820	35,973	52.7	5.1
Uniformed Water Patrol	11	721,310	65,574	40.7	15.1
Conservation Department	1,371	59,149,578	43,143	44.5	14.2
School-Term Salaried Employees	1,186	89,282,632	75,280	57.4	21.6
Administrative Law Judges	27	3,144,394	116,459	58.8	21.9
Total MOSERS*	49,464	\$ 1,921,528,936	\$ 38,847	45.5	11.2
Judges*	408	\$ 57,421,016	\$ 140,738	56.7	12.0

The total number of MOSERS active members includes 14,551 MSEP members, 17,975 MSEP 2000 members and 16,938 MSEP 2011 members.

Retired Lives

Type of Benefit Payment	No.	Annual Benefit	Group Averages	
			Benefit	Age(yrs.)
Retirement	39,799	\$ 623,139,988	\$ 15,657	69.7
Disability	4	14,640	3,660	63.0
Survivor of Active Member	1,658	17,580,693	10,604	62.4
Survivor of Retired Member	3,367	40,079,686	11,904	75.3
Total MOSERS*	44,828	\$ 680,815,008	\$ 15,187	69.9
Judges*	540	\$ 33,189,832	\$ 61,463	75.8

This valuation also includes 19,512 terminated vested members, 132 members on leave and 928 members on long-term disability.

** Total covered by MOSERS excluding Judges. Judges assets, liabilities, contribution rates and other valuation results are included in a separate report covering only Judges.*

Active Members as of June 30, 2016

By Age and Years of Service**

Attained Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 plus	No.	Valuation Payroll
15-19	94							94	\$ 2,396,533
20-24	2,049	6						2,055	57,822,351
25-29	4,035	546	14					4,595	148,984,633
30-34	2,742	1,647	498	17				4,904	174,216,818
35-39	2,027	1,409	1,374	543	16			5,369	202,764,305
40-44	1,562	1,127	1,108	1,446	425	20		5,688	221,426,491
45-49	1,523	1,052	990	1,402	1,210	476	58	6,711	269,296,848
50-54	1,409	1,060	1,070	1,320	1,080	998	473	7,410	304,709,083
55-59	1,119	956	950	1,302	934	732	596	6,589	272,173,222
60	194	181	197	237	144	107	101	1,161	48,331,660
61	148	144	181	207	148	107	72	1,007	43,851,427
62	113	152	128	181	98	82	67	821	35,480,883
63	94	113	111	156	94	75	57	700	30,390,857
64	75	93	117	145	85	55	84	654	29,129,971
65	41	72	83	92	72	37	72	469	21,052,309
66	39	67	66	66	36	29	41	344	16,170,991
67	22	47	36	44	26	22	26	223	10,418,013
68	14	36	43	37	20	14	23	187	9,127,311
69	18	33	26	34	12	15	19	157	7,861,704
70 & Over	35	51	59	55	52	24	50	326	15,923,526
Totals	17,353	8,792	7,051	7,284	4,452	2,793	1,739	49,464	\$ 1,921,528,936

While not used in financial computations, the following group averages are computed and shown because of their general interest.

Age: 45.5 years
Service: 11.2 years
Annual Pay: \$ 38,847

Includes 27 ALJ members.

* A breakdown by gender is included on pages 47 and 48.

Active Members as of June 30, 2016

By Age and Years of Service

Male

Near Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 plus	No.	Valuation Payroll
15-19	36							36	\$ 953,277
20-24	914	3						917	26,825,685
25-29	1,756	215	5					1,976	66,080,590
30-34	1,114	720	211	5				2,050	76,019,039
35-39	776	550	556	156	3			2,041	80,388,170
40-44	558	436	458	537	146	1		2,136	89,070,385
45-49	513	401	388	540	451	145	9	2,447	105,854,897
50-54	479	414	404	485	406	427	136	2,751	124,781,066
55-59	401	371	361	491	363	341	221	2,549	116,992,039
60	78	73	68	94	55	48	38	454	21,248,537
61	61	67	72	83	56	54	36	429	20,931,271
62	48	63	52	60	40	38	34	335	16,072,394
63	49	53	42	60	32	42	21	299	14,602,569
64	35	41	52	52	25	33	42	280	14,207,831
65	20	32	37	36	18	16	36	195	9,828,151
66	20	33	31	27	17	14	22	164	8,848,277
67	7	31	17	18	15	7	16	111	5,993,618
68	10	20	20	14	10	5	13	92	5,059,528
69	10	21	13	17	5	7	11	84	4,893,415
70 & Over	22	28	30	27	26	7	32	172	10,013,286
Totals	6,907	3,572	2,817	2,702	1,668	1,185	667	19,518	\$ 818,664,025

While not used in financial computations, the following group averages are computed and shown because of their general interest.

Age: 45.4 years
 Service: 11.1 years
 Annual Pay: \$ 41,944

Active Members as of June 30, 2016
By Age and Years of Service

Female

Near Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 plus	No.	Valuation Payroll
15-19	58							58	\$ 1,443,256
20-24	1,135	3						1,138	30,996,666
25-29	2,279	331	9					2,619	82,904,043
30-34	1,628	927	287	12				2,854	98,197,779
35-39	1,251	859	818	387	13			3,328	122,376,135
40-44	1,004	691	650	909	279	19		3,552	132,356,106
45-49	1,010	651	602	862	759	331	49	4,264	163,441,951
50-54	930	646	666	835	674	571	337	4,659	179,928,017
55-59	718	585	589	811	571	391	375	4,040	155,181,183
60	116	108	129	143	89	59	63	707	27,083,123
61	87	77	109	124	92	53	36	578	22,920,156
62	65	89	76	121	58	44	33	486	19,408,489
63	45	60	69	96	62	33	36	401	15,788,288
64	40	52	65	93	60	22	42	374	14,922,140
65	21	40	46	56	54	21	36	274	11,224,158
66	19	34	35	39	19	15	19	180	7,322,714
67	15	16	19	26	11	15	10	112	4,424,395
68	4	16	23	23	10	9	10	95	4,067,783
69	8	12	13	17	7	8	8	73	2,968,289
70 & Over	13	23	29	28	26	17	18	154	5,910,240
Totals	10,446	5,220	4,234	4,582	2,784	1,608	1,072	29,946	\$ 1,102,864,911

While not used in financial computations, the following group averages are computed and shown because of their general interest.

Age: 45.6 years
Service: 11.2 years
Annual Pay: \$ 36,828

SECTION F

METHODS & ASSUMPTIONS

The Actuarial Valuation Process

An *actuarial valuation* is the mathematical process by which actuarial present values and contribution rates are determined. The flow of activity constituting the valuation may be summarized as follows:

- A. ***Census Data***, furnished by the system administrative staff, including:
 - Retired lives now receiving benefits
 - Former members with vested benefits not yet payable
 - Active members
- + B. ***Benefit Provisions*** governing future payments from the retirement system.
- + C. ***Asset data*** (cash & investments), furnished by the system administrative staff.
- + D. ***Assumptions concerning future experiences*** in various risk areas, which assumptions are established by the Board of Trustees after consulting with the actuary.
- + E. ***The funding method*** for employer contributions (the long-term planned pattern for employer contributions).
- + F. ***Mathematically combining the assumptions, the funding method, and the data.***
- = G. ***Determination of:***
 - Plan financial position and*
 - The employer contribution rate.*

Meaning of "Unfunded Actuarial Accrued Liabilities"

"Actuarial accrued liabilities" are *the portion of the present value of plan promises to pay benefits in the future which are not covered by future normal cost contributions* --- a liability has been established ("accrued") because the service has been rendered but the resulting monthly cash benefit may not be payable until years in the future. Actuarial accrued liabilities are the result of complex mathematical calculations, which are made annually by the plan's actuary.

If "actuarial accrued liabilities" at any time exceed the actuarial value of the plan's accrued assets, the difference is *"unfunded actuarial accrued liabilities."* This is the common condition. If the plan's assets equaled the plan's "actuarial accrued liabilities," the plan would be termed "fully funded."

Each time a plan adds a new benefit which applies to service already rendered, an "actuarial accrued liability" is created, which is also an "unfunded actuarial accrued liability" because the plan can't print instant cash to cover the value of the new benefit promises. Payment for such unfunded actuarial accrued liabilities is spread over a period of years.

Unfunded actuarial accrued liabilities can occur in another way: If actual financial experience is less favorable than assumed financial experience, the difference is added to unfunded actuarial accrued liabilities. In plans where benefits are directly related to an employee's pay near time of retirement, unfunded actuarial accrued liabilities increase when unexpected rates of pay increase create additional actuarial accrued liabilities which are not offset by favorable experience in other areas.

The existence of unfunded actuarial accrued liabilities is not bad, but the changes from year to year in the amount of unfunded actuarial accrued liabilities are important and should be monitored.

Unfunded actuarial accrued liabilities are not a bill payable immediately but it is important that policy-makers prevent the amount from becoming unreasonably high and *it is vital for plans to have a sound method for making payments toward them* so that the System will achieve progress towards 100% funded status.

Summary of Assumptions Used for the June 30, 2016 Actuarial Valuation

All actuarial assumptions are expectations of future experience, not market measures. The rationale for the actuarial assumption is based on the System's investment policy, capital market expectations, and demographic experience as described in the experience study reports. Actuarial assumptions were last reviewed in conjunction with the July 1, 2010 through June 30, 2015 5-Year Experience Study dated March 28, 2016 and subsequent presentation.

-----*Economic Assumptions*-----

The economic assumptions were adopted by the Board on July 16, 2016 to be first effective for the June 30, 2016 valuation.

The investment return rate used in the valuations was 7.65% per year, compounded annually (net after investment expenses). This assumption is used to account for the fact that equal amounts of money payable at different points in time in the future do not have the same value presently.

Pay increase assumptions for individual active members are shown for sample ages on page 57. Part of the assumption for each age is for merit and/or seniority increase, and the other 3.0% recognizes wage inflation. This assumption is used to project a member's current salary to the salaries upon which benefits will be based.

Price inflation is assumed to be 2.5% per year.

The active member payroll is assumed to increase 3.0% annually, which is the portion of the individual pay increase assumptions attributable to wage inflation.

The annual Cost-of-Living Adjustment (COLA) is assumed to be 4.00%, on a compounded basis, when a minimum COLA of 4% is in effect (4.0% for 12 years, 3.06% the next year to reach a cumulative 65% followed by 2.0%). When no minimum COLA is in effect, price inflation is assumed to be 2.5% and the annual COLA is assumed to be 2.0% (80% of 2.5%), on a compounded basis.

Summary of Assumptions Used for the June 30, 2016 Actuarial Valuation

- - - - - Non-Economic Assumptions - - - - -

The demographic assumptions were adopted by the Board on June 16, 2016 to be first effective for the June 30, 2016 valuation.

The mortality table, for post-retirement mortality, used in evaluating allowances to be paid was the RP-2014 Healthy Annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 120%. Related values are shown on page 54. This assumption is used to measure the probabilities of each benefit payment being made after retirement.

The pre-retirement 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. The pre-retirement mortality table used for Long-Term Disability (LTD) members was the RP-2014 Disabled mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 95% for males and 90% for females.

The probabilities of age and service retirement are shown on page 56. It was assumed that each member will be granted 4 months (5 months for 2011 plan members) of service credit for unused leave upon retirement and 4 months of military service purchases (0 months for 2011 plan members).

The probabilities of withdrawal from service, disability and death-in-service are shown for sample ages on page 54. For disability retirement, impaired longevity was recognized by use of special mortality tables.

The entry age normal actuarial cost method of valuation was used in determining liabilities and normal cost. Each member's normal cost was based on the benefit provisions applicable to that member. The normal cost is projected to the applicable fiscal year. Differences in the past between assumed experience and actuarial experience ("actuarial gains and losses") become part of actuarial accrued liabilities. Unfunded actuarial accrued liabilities are amortized to produce payments, (principal & interest) which are level percents of payroll contributions.

The amortization of the unfunded actuarial accrued liability is based on a closed 30-year amortization period, level percent-of-payroll amortization as adopted by the Board. This method was first effective with the June 30, 2014 valuation. As of June 30, 2016 valuation, 28 years remain. The amortization is based on the projected unfunded actuarial accrued liability to the beginning of the fiscal year during which the contributions are expected to be made.

Summary of Assumptions Used for the June 30, 2016 Actuarial Valuation

----- *Non-Economic Assumptions (concluded)* -----

Employer contribution dollars were assumed to be *paid in equal installments* throughout the employer's fiscal year.

Actuarial value of assets. Valuation assets recognize assumed investment return fully each year. Differences between actual and assumed investment return are phased-in over an open five-year period. Valuation assets are not permitted to deviate from the market value by less than 80% or more than 125%.

The data about persons now covered and about present assets were furnished by the System's administrative staff. Although examined for general reasonableness, the data was not audited by the Actuary.

The liabilities for active members hired on or after January 1, 2011 were based on MSEP 2011 benefits. The liabilities for active members hired on or after July 1, 2000 (April 26, 2005 for Administrative Law Judges) were based on MSEP 2000 benefits. The liabilities for active members hired before July 1, 2000 for Elected Officials, General Assembly, and Uniformed Water Patrol were based on MSEP benefits. The liabilities for all other active members hired before July 1, 2000 were based on the assumption that members would elect MSEP 2000 prior to age 62 and MSEP on or after age 62.

For members on long-term disability, the actuarial accrued liability is the present value of benefit under active assumptions and projecting salary by 3.0% (wage inflation assumption) per year from the year of disability to the current year to reflect indexing of pay in ultimate retirement benefits.

The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (M.A.A.A.).

Separations From Active Employment Before Service Retirement June 30, 2016

Sample Ages	Years of Service	Percent of Active Members ----- Separating within the Next Year -----					
		Withdrawal **		Death*		Disability	
		Men	Women	Men	Women	Men	Women
	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	0.03 %	0.01 %	0.10 %	0.10 %
30		10.6	11.0	0.03	0.02	0.10	0.10
35		8.2	8.5	0.04	0.03	0.10	0.10
40		5.8	6.0	0.05	0.03	0.36	0.36
45		4.3	4.5	0.07	0.05	0.41	0.41
50		2.9	3.0	0.13	0.08	0.57	0.57
55		2.9	3.0	0.22	0.14	0.77	0.77
60		2.9	3.0	0.40	0.20	1.02	1.02
65		2.9	3.0	0.70	0.30	1.23	1.23
70		2.9	3.0	1.17	0.50	1.23	1.23

* The pre-retirement 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. 2% of the deaths in active service are assumed to be duty related.

** Does not apply to Elected Officials and Legislators.

Elected Officials and Legislators

Years of Service	Percent of Active Members Separating within the Next Year
	Withdrawal
	Male/Female
1	8.0 %
2	8.0
3	8.0
4	8.0
5	12.0
6	12.0
7	12.0
8+	35.0

Post-Retirement and Pre-Retirement Long Term Disability Mortality Rates

The mortality table for post-retirement mortality was the RP-2014 Healthy Annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 120%. The pre-retirement mortality table used for Long-Term Disability (LTD) members was the RP-2014 Disabled mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 95% for males and 90% for females.

Age	Post-Retirement		Pre-Retirement LTD	
	Men	Women	Men	Women
45	0.0025	0.0021	0.0121	0.0069
50	0.0038	0.0028	0.0152	0.0090
55	0.0058	0.0040	0.0187	0.0121
60	0.0083	0.0058	0.0225	0.0142
65	0.0118	0.0086	0.0268	0.0167
70	0.0179	0.0136	0.0341	0.0223
75	0.0288	0.0223	0.0462	0.0327
80	0.0485	0.0382	0.0658	0.0502
85	0.0848	0.0679	0.0982	0.0761

Sample Attained Ages	Future Life Expectancy (Years)			
	Post-Retirement		Pre-Retirement LTD	
	Men	Women	Men	Women
40	40.95	43.52	31.67	37.37
45	36.33	38.90	28.24	33.43
50	31.84	34.33	25.02	29.63
55	27.52	29.85	21.99	26.06
60	23.38	25.49	19.08	22.66
65	19.40	21.29	16.23	19.25
70	15.62	17.28	13.44	15.89
75	12.13	13.56	10.80	12.77
80	9.03	10.22	8.40	10.01
85	6.42	7.37	6.33	7.71

Retirement Values - June 30, 2016

Sample Attained Ages	Present Value of \$1/Month the First Year Increasing 4.0% / 2.0% Yearly (50% J & S)		Present Value of \$1/Month the First Year Increasing 2.0% Yearly	
	Old Plan COLA		New Plan COLA	
	Men	Women	Men	Women
40	\$232.55	\$233.39	\$188.71	\$192.71
45	224.67	225.75	180.96	186.10
50	215.04	216.17	171.72	177.90
55	203.45	204.34	160.97	167.90
60	189.59	189.93	148.53	155.96
65	172.99	172.53	133.99	141.77
70	153.41	152.07	117.23	125.31
75	131.21	128.92	98.73	106.89
80	107.27	104.17	79.34	87.21
85	83.33	79.90	60.48	67.65

Percent of Eligible Active Members Retiring Next Year

Normal Retirement Pattern					Early Retirement Pattern		
Retirement Age	MSEP and MSEP 2000*			MSEP 2011**	Retirement Age	MSEP and MSEP 2000	MSEP 2011
	Percent Eligible			Percent Eligible		Percent Eligible	Percent Eligible
	1 st Year	2 nd Year	3 rd Year				
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%	57	2.4%	
58	20%	10%	21%	35%	58	2.4%	
59	20%	10%	21%	30%	59	2.4%	
60	20%	10%	21%	35%	60	2.4%	
61	19%	10%	21%	25%	61	2.4%	
62	18%	22%	29%	40%	62	2.4%	10%
63	16%	18%	24%	30%	63	2.4%	10
64	15%	17%	17%	20%	64	2.4%	10
65	19%	19%	27%	30%	65	3.1%	50
66	24%	25%	28%	25%	66	3.0%	50
67	10%	25%	23%	20%	67	5.1%	
68	20%	25%	23%	20%	68	6.0%	
69	20%	25%	23%	20%	69	6.0%	
70	20%	25%	23%	20%	70	6.0%	
71	20%	25%	23%	20%	71	6.0%	
72	20%	25%	23%	20%	72	6.0%	
73	20%	25%	23%	20%	73	6.0%	
74	20%	25%	23%	20%	74	6.0%	
75	50%	50%	23%	50%	75	6.0%	
76	50%	50%	23%	50%	76	6.0%	
77	75%	75%	23%	75%	77	6.0%	
78	100%	100%	100%	100%	78	100.0	

* For members hired prior to January 1, 2011.

** For members hired on or after January 1, 2011.

Individual Pay Increase Assumptions June 30, 2016

Service Index	Merit & Seniority*	Base (Economy)	Increase Next Year
1	5.75%	3.00%	8.75%
2	2.50%	3.00%	5.50%
3	1.50%	3.00%	4.50%
4	1.25%	3.00%	4.25%
5	1.00%	3.00%	4.00%
6	1.00%	3.00%	4.00%
7	1.00%	3.00%	4.00%
8	1.00%	3.00%	4.00%
9	0.75%	3.00%	3.75%
10	0.50%	3.00%	3.50%
15	0.50%	3.00%	3.50%
20	0.50%	3.00%	3.50%
25	0.25%	3.00%	3.25%
30	0.25%	3.00%	3.25%

* Does not apply to members of the General Assembly.

Summary of Assumptions Used June 30, 2016 Miscellaneous and Technical Assumptions

Pay Increase Timing:	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.										
Normal Form of Benefit:	The assumed normal form of benefit is the straight life form for MSEP 2000 with 50% continuing to an eligible surviving spouse for MSEP. No adjustment has been made for post-retirement option election changes.										
Other Liability Adjustments:	<p><i>Pre-Retirement Survivor Benefits for Spouse of Terminated Vested Member</i></p> <table> <tr> <th><u>Age</u></th><th><u>Male/Female</u></th></tr> <tr> <td><30</td><td>1.57/1.31</td></tr> <tr> <td>30-39</td><td>1.24/1.13</td></tr> <tr> <td>40-49</td><td>1.09/1.05</td></tr> <tr> <td>>50</td><td>1.02/1.01</td></tr> </table> <p>These factors are used to estimate the cost of immediate unreduced survivor annuities upon the death of a vested member.</p>	<u>Age</u>	<u>Male/Female</u>	<30	1.57/1.31	30-39	1.24/1.13	40-49	1.09/1.05	>50	1.02/1.01
<u>Age</u>	<u>Male/Female</u>										
<30	1.57/1.31										
30-39	1.24/1.13										
40-49	1.09/1.05										
>50	1.02/1.01										

Summary of Assumptions Used
June 30, 2016
Miscellaneous and Technical Assumptions
(Continued)

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.
MSEP 2000 Election:	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 and Administrative Law Judges hired before April 26, 2005 are assumed to elect MSEP at retirement.
Service Adjustment:	It is assumed that each member will be granted 8 months of service credit, 4 months for unused leave upon retirement and 4 months for military service purchases. For members hired on or after January 1, 2011 it is assumed that each member will be granted 5 months for unused leave.
Marriage Assumption:	It is assumed that among active members 70% are married at retirement, 60% of those dying in active service are married, and men are three years older than their spouses.
Forfeitures:	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.
Salary and Benefit Limits:	For purposes of the valuation, no limits were applied to member compensation or benefits.

The number of active members is assumed to remain constant although certain new hires on or after July 1, 2002 will participate in the Colleges and Universities Retirement Plan. Active and retired member data is reported as of May 31. It is assumed for valuation purposes that there is no turnover among members and no new entrants during the month of June. New entrant assumed demographic patterns are based on the demographics of active members hired within the last three to eight years.

**Summary of Assumptions Used
June 30, 2016
Miscellaneous and Technical Assumptions
(Concluded)**

Data Adjustments:

Active and retired member data was reported as of May 31, 2016. It was brought forward to June 30, 2016 by adding one month of service for all active members and the June COLA for certain retired members. It is expected that this procedure resulted in a slight overstatement of total liabilities as of June 30, 2016. Financial information continues to be reported 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 October 1 statutory deadline.

Active members reported with less than a \$100 annualized salary were assumed to receive the average active member pay, which is \$38,805 (\$116,459 for Administrative Law Judges) as of June 30, 2016. There were 25 Regular State Employee members affected by this assumption.

When the option of choosing plans is available, terminated vested members are reported with two records, one with benefits under the MSEP plan and one with benefits under the MSEP 2000 plan. 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 3 years younger for male retirees and 3 years older for female retirees.

For the terminated vested members, GRS staff found one member less than what was initially reported. This was confirmed with MOSERS Staff.

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.

SECTION G
PLAN PROVISIONS

Summary of Benefit Provisions Evaluated June 30, 2016 Actuarial Valuation

MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>PARTICIPATION</p> <p>Participants include:</p> <p>All MOSERS members, vested former members, retirees and survivors who first became members prior to July 1, 2000 and who do not elect to transfer to the MSEP 2000 plan. Election is made at the time benefits commence.</p>	<p>PARTICIPATION</p> <p>Participants include:</p> <ol style="list-style-type: none"> (1) All new employees who first become members on or after July 1, 2000, except full-time teaching and senior administrative personnel of the regional colleges and universities hired on or after July 1, 2002 who will be participants in the Colleges and Universities Retirement Plan (CURP). (2) MSEP active members and vested former members who elect to transfer to the MSEP 2000 plan prior to retirement. (3) MSEP retirees who elect to transfer to the MSEP 2000 plan during the election window from July 1, 2000 through June 30, 2001, and their survivors. (4) MSEP non-vested terminations rehired on or after July 1, 2000. (5) Members hired prior to January 1, 2011 participating in the CURP for six years may elect to change to MOSERS. Transferred service is for vesting purposes only. 	<p>PARTICIPATION</p> <p>Participants include:</p> <ol style="list-style-type: none"> (1) All new employees who first become employees on or after January 1, 2011, except full-time teaching and senior administrative personnel of the regional colleges and universities hired on or after July 1, 2002 who will be participants in the Colleges and Universities Retirement Plan (CURP). (2) Members hired on or after January 1, 2011 participating in the CURP for six years may elect to change to MOSERS. Transferred service is for vesting purposes only.
<p>AVERAGE COMPENSATION USED FOR BENEFIT DETERMINATION</p> <p>The average annual compensation of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining Average Compensation). Non-recurring lump sum payments are excluded. Unused sick leave may be converted to additional credited service (usable only for benefit computation, not eligibility).</p>	<p>The average annual compensation of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining Average compensation). Non-recurring lump sum payments are excluded. Unused sick leave may be converted to additional credited service (usable only for benefit computation, not eligibility).</p>	<p>The average annual compensation of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining Average compensation). Non-recurring lump sum payments are excluded. Unused sick leave may be converted to additional credited service (usable only for benefit computation, not eligibility).</p>

MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>NORMAL RETIREMENT ELIGIBILITY (UNREDUCED BENEFITS)</p> <p><i>Members of the General Assembly:</i> Age 55 with completion of at least 3 full biennial assemblies.</p> <p><i>Statewide Elected Officials:</i> The earliest of attaining:</p> <ul style="list-style-type: none"> (1) Age 65 with at least 4 years of credited service. (2) Age 60 with at least 15 years of credited service. (3) Age 50 with age plus credited service equal to 80 or more. <p><i>General Employees:</i> The earliest of attaining:</p> <ul style="list-style-type: none"> (1) Age 65 and active with at least 4 years of credited service. (2) Age 65 with at least 5 years of credited service. (3) Age 60 with at least 15 years of credited service. (4) Age 48 with age plus credited service equal to 80 or more. <p><i>Uniformed Water Patrol Employees:</i> The earliest of attaining:</p> <ul style="list-style-type: none"> (1) Age 55 and active with at least 4 years of credited service. (2) Age 55 with at least 5 years of credited service. (3) Age 48 with age plus credited service equal to 80 or more. <p><i>Administrative Law Judges:</i> The earliest of attaining:</p> <ul style="list-style-type: none"> (1) Age 62 and active with at least 12 years of credited service. (2) Age 60 with at least 15 years of credited service. (3) Age 55 with at least 20 years of credited service. 	<p><i>Members of the General Assembly:</i> The earliest of attaining:</p> <ul style="list-style-type: none"> (1) Age 55 with completion of at least 3 full biennial assemblies. (2) Age 50 with completion of at least 3 full biennial assemblies and with age plus credited service equal to 80 or more. <p><i>Statewide Elected Officials:</i> The earliest of attaining:</p> <ul style="list-style-type: none"> (1) Age 55 with at least 4 years of credited service as a statewide elected official. (2) Age 50 with age plus credited service equal to 80 or more. <p><i>General Employees:</i> The earliest of attaining:</p> <ul style="list-style-type: none"> (1) Age 62 with at least 5 years of credited service. (2) Age 48 with age plus credited service equal to 80 or more. 	<p><i>Members of the General Assembly:</i> The earliest of attaining:</p> <ul style="list-style-type: none"> (1) Age 62 with completion of at least 3 full biennial assemblies. (2) Age 55 with completion of at least 3 full biennial assemblies and with age plus credited service equal to 90 or more. <p><i>Statewide Elected Officials:</i> The earliest of attaining:</p> <ul style="list-style-type: none"> (1) Age 62 with at least 4 years of credited service as a statewide elected official. (2) Age 55 with age plus credited service equal to 90 or more. <p><i>General Employees:</i> The earliest of attaining:</p> <ul style="list-style-type: none"> (1) Age 67 with at least 10 years of credited service. (2) Age 55 with age plus credited service equal to 90 or more.

MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>BENEFIT AMOUNT</p> <p><i>Members of the General Assembly:</i> \$150 per month per biennial assembly served.</p> <p><i>Statewide Elected Officials:</i></p> <ol style="list-style-type: none"> 1) Less than 12 years of credited service: 1.6% of Average Compensation times years of credited service. 2) 12 or more years of credited service: 50% of pay of the highest elected position held prior to retirement. <p><i>General Employees:</i> 1.6% of Average Compensation times years of credited service.</p> <p>2.1% of Average Compensation times years of credited service for any period of non-social security covered employment transferred from the Public School Retirement System.</p> <p><i>Uniformed Water Patrol:</i> 2.13% of Average Compensation times years of credited service.</p> <p><i>Administrative Law Judges:</i> 50% of Compensation.</p>	<p><i>Members of the General Assembly:</i> 1/24 of pay times first 24 years of credited service as a member of the General Assembly.</p> <p><i>Statewide Elected Officials:</i> 1/24 of pay (of the highest elected position held prior to retirement) times the first 12 years of credited service as a statewide elected official.</p> <p><i>General Employees:</i> 1.7% of Average Compensation times years of credited service.</p> <p>Temporary Benefit: If member retires between ages 48 and 62 with age plus credited service equal to 80 or more, a temporary benefit is payable until the attainment of the minimum age at which reduced social security benefits are payable, in the amount of 0.8% of Average Compensation times years of credited service.</p> <p>Non-Social Security Covered Service: 2.5% of Average Compensation times years of credited service for any period of non-social security covered employment transferred from the Public School Retirement System.</p>	<p><i>Members of the General Assembly:</i> 1/24 of pay times first 24 years of credited service as a member of the General Assembly.</p> <p><i>Statewide Elected Officials:</i> 1/24 of pay (of the highest elected position held prior to retirement) times the first 12 years of credited service as a statewide elected official.</p> <p><i>General Employees:</i> 1.7% of Average Compensation times years of credited service.</p> <p>Temporary Benefit: If member retires between ages 55 and 62 with age plus credited service equal to 90 or more, a temporary benefit is payable until the attainment of the minimum age at which reduced social security benefits are payable, in the amount of 0.8% of Average Compensation times years of credited service.</p> <p>Non-Social Security Covered Service: 2.5% of Average Compensation times years of credited service for any period of non-social security covered employment transferred from the Public School Retirement System.</p>

MSEP (Missouri State Employees’ Plan)	MSEP 2000 (Missouri State Employees’ Plan 2000)	MSEP 2011 (Missouri State Employees’ Plan 2011)																																																								
<p>EARLY RETIREMENT FOR GENERAL EMPLOYEES</p> <p><i>Eligibility:</i> Age 55 with at least 10 years of credited service.</p> <p><i>Amount:</i> Normal retirement amount reduced by ½% for each month that retirement precedes eligibility for normal retirement.</p> <p>1) Less than 15 years of service: Normal retirement amount actuarially reduced for years younger than age 65.</p> <p>2) 15 years but less than 20 years of service, and less than the number of years of service necessary for age and service to total 80: Normal retirement amount actuarially reduced for years younger than age 60.</p> <p>3) 20 or more years of service, but less than the number of years of service necessary for age and service to total 80: Normal retirement amount reduced for years younger than the 80 and out eligibility date.</p> <p>VESTED DEFERRED BENEFITS</p> <p>Benefits for employees who terminate prior to eligibility for an immediate benefit are considered to be vested in accordance with the following schedule (benefits commence at the age the individual would have been eligible for early or normal retirement, considering years of credited service). Unused sick leave is not converted.</p>	<p><i>Eligibility:</i> Age 57 with at least 5 years of credited service.</p> <p><i>Amount:</i> Normal retirement amount reduced by ½% for each month that retirement precedes eligibility for normal retirement. Normal retirement is age 62.</p> <p>Benefits for employees who terminate prior to eligibility for an immediate benefit are considered to be vested in accordance with the following schedule (benefits commence at age 57 for early retirement or 62 for normal retirement). Unused sick leave is not converted. CURP to MOSERS transfers with 6 years of service are immediately vested.</p>	<p><i>Eligibility:</i> Age 62 with at least 10 years of credited service.</p> <p><i>Amount:</i> Normal retirement amount reduced by ½% for each month that retirement precedes eligibility for normal retirement. Normal retirement is age 67.</p> <p>Benefits for employees who terminate prior to eligibility for an immediate benefit are considered to be vested in accordance with the following schedule (benefits commence at age 67 normal retirement). Unused sick leave is not converted.</p>																																																								
<table><tr><th>Years of Service</th><th>General Assembly</th><th>Elected Officials</th><th>General Employees</th></tr><tr><td>4</td><td></td><td>100%</td><td></td></tr><tr><td>5</td><td></td><td></td><td>100%</td></tr><tr><td>6 (3 Assemblies)</td><td>100%</td><td></td><td></td></tr></table>	Years of Service	General Assembly	Elected Officials	General Employees	4		100%		5			100%	6 (3 Assemblies)	100%			<table><tr><th>Years of Service</th><th>General Assembly</th><th>Elected Officials</th><th>General Employees</th></tr><tr><td>4</td><td></td><td>100%</td><td></td></tr><tr><td>5</td><td></td><td></td><td>100%</td></tr><tr><td>6 (3 Assemblies)</td><td>100%</td><td></td><td></td></tr><tr><td>HB1455 prospectively</td><td></td><td></td><td></td></tr></table>	Years of Service	General Assembly	Elected Officials	General Employees	4		100%		5			100%	6 (3 Assemblies)	100%			HB1455 prospectively				<table><tr><th>Years of Service</th><th>General Assembly</th><th>Elected Officials</th><th>General Employees</th></tr><tr><td>4</td><td></td><td>100%</td><td></td></tr><tr><td>6 (3 Assemblies)</td><td>100%</td><td></td><td></td></tr><tr><td>HB1455 prospectively</td><td></td><td></td><td></td></tr><tr><td>10</td><td></td><td></td><td>100%</td></tr></table>	Years of Service	General Assembly	Elected Officials	General Employees	4		100%		6 (3 Assemblies)	100%			HB1455 prospectively				10			100%
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MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>DEATH PRIOR TO RETIREMENT</p> <p>The surviving spouse benefit is computed as if the member had been normal age on the date of death and elected the joint and 100% survivor optional form of payment, provided the member had at least 5 years of credited service and was married on the date of death. If no eligible spouse survives, 80% of the member's life income annuity is paid to eligible children until age 21. If the death is duty related, the service requirement is waived and the minimum spouse benefit is 50% of Average Compensation (rate of compensation for members of the General Assembly).</p>	<p>The surviving spouse benefit is computed as if the member had been normal age on the date of death and elected the joint and 100% survivor optional form of payment, provided the member had at least 5 years of credited service (3 full assemblies for a member of the General Assembly, 4 years of credited service for a statewide elected official). If no eligible spouse survives, 80% of the member's life income annuity is paid to eligible children until age 21. If the death is duty related, the service requirement is waived and the minimum spouse benefit is 50% of Average Compensation (rate of compensation for members of the General Assembly).</p>	<p>The surviving spouse benefit is computed as if the member had been normal age on the date of death and elected the joint and 100% survivor optional form of payment, provided the member had at least 5 years of credited service (2 full assemblies for a member of the General Assembly, 4 years of credited service for a statewide elected official). If no eligible spouse survives, 80% of the member's life income annuity is paid to eligible children until age 21. If the death is duty related, the service requirement is waived and the minimum spouse benefit is 50% of Average Compensation (rate of compensation for members of the General Assembly).</p>

MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>DEATH AFTER RETIREMENT</p> <p>50% of the benefit the retired member was receiving on the date of death (the normal form of payment), or the benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement and provided the member was married on their date of retirement. Effective July 1, 2000, a member who is not married at retirement but marries thereafter may designate a spouse as beneficiary within one year of marriage. Additionally, a member may designate a new spouse as beneficiary within one year of marriage in the event of the death of the spouse the member was married to at the date of retirement (this provision does not apply to period certain annuities).</p> <p>DISABILITY (RECIPIENTS OF LTD BENEFITS)</p> <p>Normal retirement benefits become payable at the time the member is eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability (if the member retires on or after August 28, 1999, the member's rate of pay is based on the rate of pay at the time of disability indexed to the time of benefit commencement). An exception is Uniformed Water Patrol employees who are eligible for an immediate occupational disability benefit equal to 50% of pay at time of disability.</p>	<p>The benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement. A member who is not married at retirement but marries thereafter may designate a spouse as beneficiary within one year of marriage. Additionally, a member may designate a new spouse as beneficiary within one year of marriage in the event of the death of the spouse the member was married to at the date of retirement (this provision does not apply to period certain annuities).</p> <p>Normal retirement benefits become payable at the time the member is eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability indexed to the time of benefit commencement. The annual percentage increase in the pay used to compute benefits is the lesser of: i) 80% of the CPI increase and ii) 5%.</p>	<p>The benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement. A member who is not married at retirement but marries thereafter may designate a spouse as beneficiary upon completion of one year of marriage. Additionally, a member may designate a new spouse as beneficiary upon completion of one year of marriage in the event of the death of the spouse the member was married to at the date of retirement (this provision does not apply to period certain annuities).</p> <p>Normal retirement benefits become payable at the time the member is eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability indexed to the time of benefit commencement. The annual percentage increase in the pay used to compute benefits is the lesser of: i) 80% of the CPI increase and ii) 5%.</p>

MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)												
<p>POST-RETIREMENT BENEFIT ADJUSTMENTS</p> <p>Benefits are increased to retired members (including survivors) annually in accordance with the following formulas:</p> <table border="1" data-bbox="86 443 672 768"> <thead> <tr> <th>Increase in CPI</th><th>Formula 1 Benefit Increase</th><th>Formula 2 Benefit Increase</th></tr> </thead> <tbody> <tr> <td>5.00% or less</td><td>4%</td><td>80% of CPI increase</td></tr> <tr> <td>5.01% - 6.24%</td><td>80% of CPI increase</td><td>80% of CPI increase</td></tr> <tr> <td>6.25% or more</td><td>5%</td><td>5%</td></tr> </tbody> </table> <p>Members first hired prior to August 28, 1997 receive COLAs based on Formula 1 until an aggregate increase of 65% is reached. At that point subsequent COLAs based on Formula 2 are granted.</p> <p>Members first hired on or after August 28, 1997 receive COLAs based solely on Formula 2.</p> <p>Statewide Elected Officials with 12 or more years of service have their benefit adjusted annually based on the increase in the pay for an active statewide elected official in the member's highest elected position.</p> <p>Members who are fully vested and work beyond age 65 will have their monthly benefit increased upon retirement. The percentage increase in benefit is equal to all COLAs for the years between age 65 and date of retirement, not to exceed 65% and counts toward the Formula 1 65% maximum.</p>	Increase in CPI	Formula 1 Benefit Increase	Formula 2 Benefit Increase	5.00% or less	4%	80% of CPI increase	5.01% - 6.24%	80% of CPI increase	80% of CPI increase	6.25% or more	5%	5%	<p>Benefits are increased to retired members (including survivors) annually in accordance with the following:</p> <p>Members of the General Assembly: Benefit is adjusted annually based on the increase in the pay for an active member of the General Assembly.</p> <p>Statewide Elected Officials: Benefit is adjusted annually based on the increase in the pay for an active statewide elected official in the retired member's highest elected position.</p> <p>General Employees: Annual benefit percentage increase equal to the lesser of: i) 80% of the CPI increase, and 5%.</p> <p>CPI: For the basis of determining CPI, the average monthly reported CPI for the prior calendar year is divided by the average monthly reported CPI for the second prior calendar year to determine the current year increases, if any. If this amount is less than one, benefits are not reduced, nor is there any cumulative effect on future years determination of CPI.</p> <p>Timing of Increase: Benefits are adjusted on the anniversary of the effective date of retirement for most members. Members retiring under the BackDROP provisions have an anniversary based on the retroactive starting date for the BackDROP.</p>	<p>Benefits are increased to retired members (including survivors) annually in accordance with the following:</p> <p>Members of the General Assembly: Benefit is adjusted annually based on the increase in the pay for an active member of the General Assembly.</p> <p>Statewide Elected Officials: Benefit is adjusted annually based on the increase in the pay for an active statewide elected official in the retired member's highest elected position.</p> <p>General Employees: Annual benefit percentage increase equal to the lesser of: i) 80% of the CPI increase, and 5%.</p> <p>CPI: For the basis of determining CPI, the average monthly reported CPI for the prior calendar year is divided by the average monthly reported CPI for the second prior calendar year to determine the current year increases, if any. If this amount is less than one, benefits are not reduced, nor is there any cumulative effect on future years determination of CPI.</p> <p>Timing of Increase: Benefits are adjusted on the anniversary of the effective date of retirement.</p>
Increase in CPI	Formula 1 Benefit Increase	Formula 2 Benefit Increase												
5.00% or less	4%	80% of CPI increase												
5.01% - 6.24%	80% of CPI increase	80% of CPI increase												
6.25% or more	5%	5%												

MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>POP-UP PROVISION</p> <p>Benefits to members who choose a survivor form of payment and whose spouse precedes the member in death, will "pop-up" or revert to the amount the member would have received had he/she not elected a survivor option.</p> <p>PORTABILITY</p> <p>Purchase/Transfer Provisions (in addition to military). Effective August 28, 1999, a member may purchase up to four years of non-federal full-time Missouri public service, provided the member is not vested in another retirement system for that same service.</p> <p>MEMBER CONTRIBUTIONS. None.</p> <p>BACKDROP. See following page.</p>	<p>Same.</p> <p>Purchase/Transfer Provisions (in addition to military). A member may purchase up to four years of non-federal full-time Missouri public service, provided the member is not vested in another retirement system for that same service. Local vested service credit granted after 10 years of state service if the other retirement plan agrees to transfer assets equal to the accrued liability to MOSERS.</p> <p>Same as MSEP.</p> <p>Same as MSEP.</p>	<p>Same.</p> <p>May purchase qualifying public sector service at full actuarial cost.</p> <p>4.0% of salary, with 4.0% interest credited to member contributions.</p> <p>Not eligible for the BackDROP.</p>

MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>BACKDROP</p> <p>To be eligible to participate in the BackDROP, a member must have been eligible to retire under normal age and/or service conditions for at least two years. A retroactive starting date is established for BackDROP purposes which is the later of: 1) the member's normal retirement date or 2) five years prior to the annuity starting date under the retirement plan selected by the member.</p> <p>A member may elect the BackDROP period for the accumulation of the BackDROP account in 12 month increments prior to their actual retirement date or back to the earliest possible date. This results in a BackDROP period of one to five years depending upon the individual situation.</p> <p>A theoretical BackDROP account is accumulated that includes 90% of the value of the benefit payments that would have been paid during the BackDROP period had the member retired at the retroactive starting date with their respective option election. These payments include applicable post-retirement benefit increases.</p> <p>The member is paid the resulting lump sum value of the BackDROP account as of the annuity starting date or as three equal annual installments beginning at the annuity starting date.</p> <p>The annuity benefit payable from the actual retirement date is computed with years of service and average pay as of the retroactive starting date for the BackDROP. Post-retirement benefit increases that occurred during the BackDROP period are applied in the calculation of the monthly annuity.</p>	<p>Same as MSEP.</p>	<p>Not eligible for the BackDROP.</p>

SECTION H

GLOSSARY

June 30, 2016 Actuarial Valuation Glossary

Actuarial Accrued Liability. The difference between (i) the actuarial present value of future plan benefits, and (ii) the actuarial present value of future normal cost. Sometimes referred to as "accrued liability" or "past service liability."

Accrued Service. The service credited under the plan which was rendered before the date of the actuarial valuation.

Actuarial Assumptions. Estimates of future plan experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

Actuarial Cost Method. A mathematical budgeting procedure for allocating the dollar amount of the "actuarial present value of future plan benefits" between the actuarial present value of future normal cost and the actuarial accrued liability. Sometimes referred to as the "actuarial funding method."

Actuarial Equivalent. A series of payments is called an actuarial equivalent of another series of payments if the two series have the same actuarial present value.

Actuarial Present Value. The amount of funds presently required to provide a payment or series of payments in the future. It is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

Actuarial Value of Assets. Also referred to as funding value of assets, smoothed market value of assets, or valuation assets.

The valuation assets are used to determine funding requirements to the System. Valuation assets recognize assumed investment income fully each year along with one-third of cumulative investment gains or losses. Valuation assets are restricted to be no less than 80% and no more than 125% of the market value of assets. The 80% to 125% corridor is symmetric in that when market value of assets is 80% (125%) of the actuarial value of assets, the actuarial value of assets is 125% (80%) of market. This treatment helps remove the timing of investment activities from the valuation process. During periods when investment performance exceeds the assumed rate, valuation assets will tend to be less than market value. During periods when investment performance is less than the assumed rate, valuation assets will tend to be greater than market value.

Amortization. Paying off an interest-bearing liability by means of periodic payments of interest and principal, as opposed to paying it off with a lump sum payment.

Experience Gain (Loss). A measure of the difference between actual experience and that expected based upon a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used.

Normal Cost. The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as "current service cost." Any payment toward the unfunded actuarial accrued liability is not part of the normal cost.

(continued on following page)

June 30, 2016 Actuarial Valuation

Glossary

(concluded)

Plan Termination Liability. The actuarial present value of future plan benefits based on the assumption that there will be no further accruals for future service and salary. The termination liability will generally be less than the liabilities computed on a "going concern" basis and is not normally determined in a routine actuarial valuation.

Reserve Account. An account used to indicate that funds have been set aside for a specific purpose and are not generally available for other uses.

Unfunded Actuarial Accrued Liability. The difference between the actuarial accrued liability and actuarial value of assets. Sometimes referred to as "unfunded accrued liability."

The existence of unfunded actuarial accrued liabilities is not in itself bad, any more than a mortgage on a house is bad. Unfunded actuarial accrued liabilities do not represent a debt that is payable today. What is important is the ability to amortize the unfunded actuarial accrued liabilities and the trend in their amount (after due allowance for devaluation of the dollar).

Valuation Payroll. Active member payroll that is intended to reflect the annual salary considered as covered compensation for Retirement System benefits.

SECTION I

HISTORY OF RESULTS FROM THE INVESTMENT UNIVERSE

Basic Series Year-by-Year Total Returns (1966 - 2015)

Year	Large Company Stocks	Long-Term Corporate Bonds	Long-Term Government Bonds	U.S. Treasury Bills	CPI (Inflation)
1966	-10.06%	0.20%	3.65%	4.76%	3.35%
1967	23.98%	-4.95%	-9.18%	4.21%	3.04%
1968	11.06%	2.57%	-0.26%	5.21%	4.72%
1969	-8.50%	-8.09%	-5.07%	6.58%	6.11%
1970	4.01%	18.37%	12.11%	6.52%	5.49%
1971	14.31%	11.01%	13.23%	4.39%	3.36%
1972	18.98%	7.26%	5.69%	3.84%	3.41%
1973	-14.66%	1.14%	-1.11%	6.93%	8.80%
1974	-26.47%	-3.06%	4.35%	8.00%	12.20%
1975	37.20%	14.64%	9.20%	5.80%	7.01%
1976	23.84%	18.65%	16.75%	5.08%	4.81%
1977	-7.18%	1.71%	-0.69%	5.12%	6.77%
1978	6.56%	-0.07%	-1.18%	7.18%	9.03%
1979	18.44%	-4.18%	-1.23%	10.38%	13.31%
1980	32.42%	-2.62%	-3.95%	11.24%	12.40%
1981	-4.91%	-0.96%	1.86%	14.71%	8.94%
1982	21.41%	43.79%	40.35%	10.54%	3.87%
1983	22.51%	4.70%	0.65%	8.80%	3.80%
1984	6.27%	16.39%	15.48%	9.85%	3.95%
1985	32.16%	30.09%	30.97%	7.72%	3.77%
1986	18.47%	19.85%	24.54%	6.16%	1.13%
1987	5.23%	-0.27%	-2.71%	5.47%	4.41%
1988	16.81%	10.70%	9.67%	6.35%	4.42%
1989	31.49%	16.23%	18.11%	8.37%	4.65%
1990	-3.17%	6.78%	6.18%	7.81%	6.11%
1991	30.55%	19.89%	19.30%	5.60%	3.06%
1992	7.67%	9.39%	8.05%	3.51%	2.90%
1993	9.99%	13.19%	18.24%	2.90%	2.75%
1994	1.31%	-5.76%	-7.77%	3.90%	2.67%
1995	37.43%	27.20%	31.67%	5.60%	2.54%
1996	23.07%	1.40%	-0.93%	5.21%	3.32%
1997	33.36%	12.95%	15.85%	5.26%	1.70%
1998	28.58%	10.76%	13.06%	4.86%	1.61%
1999	21.04%	-7.45%	-8.96%	4.68%	2.68%
2000	-9.11%	12.87%	21.48%	5.89%	3.39%
2001	-11.88%	10.65%	3.70%	3.83%	1.55%
2002	-22.10%	16.33%	17.84%	1.65%	2.38%
2003	28.70%	5.27%	1.45%	1.02%	1.88%
2004	10.87%	8.72%	8.51%	1.20%	3.26%
2005	4.91%	5.87%	7.81%	2.98%	3.42%
2006	15.80%	3.24%	1.19%	4.80%	2.54%
2007	5.49%	2.60%	9.88%	4.66%	4.08%
2008	-37.00%	8.78%	25.87%	1.60%	0.09%
2009	26.46%	3.02%	-14.90%	0.10%	2.72%
2010	15.06%	12.44%	10.14%	0.12%	1.50%
2011	2.11%	17.95%	28.23%	0.04%	2.96%
2012	16.00%	10.68%	3.31%	0.06%	1.74%
2013	32.39%	-7.07%	-11.36%	0.02%	1.50%
2014	13.69%	17.28%	23.87%	0.02%	0.76%
2015	1.38%	-4.77%	-1.26%	0.47%	0.73%

Sources:

Beginning with 2015, SBBI Yearbook is no longer available, which was used in years past.

Large Company Stock returns are based on S&P 500 Total Return Index

Long-Term Corporate Bond returns are based on Vanguard Long-Term Corporate Bond ETF (VCLT)

Long-Term Government Bond returns are based on Vanguard Long-Term Bond ETF (VGLT)

U.S. Treasury Bill returns are based on Vanguard Short-Term Treasury Inv (VFISX)

CPI - All Urban Consumers, not seasonally adjusted, U.S. City Average, All Items, 1982-87 = 100