



STATE OF ILLINOIS

OFFICE OF THE AUDITOR GENERAL

STATE ACTUARY'S REPORT

**THE ACTUARIAL ASSUMPTIONS AND
VALUATIONS OF THE STATE-FUNDED
RETIREMENT SYSTEMS**

DECEMBER 2017

FRANK J. MAUTINO

AUDITOR GENERAL

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OFFICE OF THE AUDITOR GENERAL
FRANK J. MAUTINO

To the Speaker and Minority Leader of the House of Representatives, the President and Minority Leader of the Senate, the members of the General Assembly, and the Governor:

This is our 2017 report on the actuarial assumptions and valuations of the State-funded retirement systems.

This report was conducted pursuant to Public Act 097-0694 which amended the Illinois State Auditing Act by adding a requirement for the Auditor General to annually review assumptions and valuations prepared by the actuaries of the five State-funded retirement systems. In addition, Public Act 100-0465 added a similar requirement to review the Public School Teachers' Pension and Retirement Fund of Chicago. The report is based on reports prepared by Cheiron, the State Actuary, on each of the State-funded retirement systems.

The report is transmitted in conformance with Section 5/2-8.1(c) of the Illinois State Auditing Act.

SIGNED ORIGINAL ON FILE

FRANK J. MAUTINO
Auditor General

Springfield, Illinois
December 2017

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GLOSSARY OF TERMS

Actuarial Assumptions – Estimates of future experience with respect to rates of mortality, disability, turnover, retirement, interest rate (also called the investment return or discount rate) and inflation. Demographic assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (interest rate and inflation) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

Actuarial 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, as determined in accordance with a particular actuarial funding method.

Actuarial Liability – The Actuarial Liability is the present value of all benefits accrued as of the valuation date using the methods and assumptions of the valuation. It is also referred to by some actuaries as the “accrued liability” or “actuarial accrued liability.”

Actuarial Present Value – The amount of funds currently required to provide a payment or series of payments in the future. It is determined by discounting future payments at predetermined rates of interest and by probabilities of payment.

Actuarial Value of Assets – The Actuarial Value of Assets equals the Market Value of Assets adjusted according to the smoothing method in accordance with Illinois Law. The smoothing method is intended to smooth out the short-term volatility of investment returns in order to stabilize contribution rates and the Funded Status.

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. This is sometimes referred to as the “actuarial funding method.”

Asset Smoothing Method – A method of asset valuation where the annual fluctuation in the Market Value of Assets is averaged over a period of years. See Actuarial Value of Assets above.

Entry Age Normal (EAN) – A method under which the Present Value of Future Benefits of each individual included in an actuarial valuation is allocated on a level basis over the earnings or service of the individual between entry age and assumed exit age(s). The portion of this Present Value of Future Benefits allocated to a valuation year is called the Normal Cost. The portion of this Present Value of Future Benefits not provided for at a valuation date by the Present Value of Future Normal Costs is called the Actuarial Liability.

GLOSSARY OF TERMS

Funded Status – The Actuarial Value of Assets divided by the Actuarial Liability. The Funded Status represents the percentage of assets in the Plan compared to the Actuarial Liability. The Funded Status can also be calculated using the Market Value of Assets.

Governmental Accounting Standards Board – The Governmental Accounting Standards Board (GASB) defines the accounting and financial reporting requirements for governmental entities. GASB Statement No. 67 defines the plan accounting and financial reporting for governmental pension plans, and GASB Statement No. 68 defines the employer accounting and financial reporting for participating in a governmental pension plan.

Market Value of Assets – The fair value of the Plan’s assets assuming that all holdings are liquidated on the measurement date.

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

Present Value of Future Benefits – The Actuarial Present Value of all benefits promised in the future to current members of the Plan assuming all Actuarial Assumptions are met.

Present Value of Future Normal Costs – The Actuarial Present Value of retirement system benefits allocated to future years of service.

Projected Unit Credit (PUC) – A method under which the benefits of each individual included in an actuarial valuation are allocated by a consistent formula to the years in which they are earned. The Actuarial Present Value of benefits allocated to a valuation year is called the Normal Cost. The Actuarial Present Value of benefits allocated to all periods prior to a valuation year is called the Actuarial Liability.

Unfunded Actuarial Liability (UAL) – The UAL represents the difference between the Actuarial Liability and Actuarial Value of Assets. This is sometimes referred to as “unfunded accrued liability.”

Chapter One

AUDITOR GENERAL'S SUMMARY

REPORT CONCLUSIONS

On June 18, 2012, Public Act 097-0694 was signed into law, which directed the Auditor General to contract with or hire an actuary to serve as the State Actuary. Cheiron was selected as the State Actuary. The Public Act directed the State Actuary to:

- Review assumptions and valuations prepared by actuaries retained by the boards of trustees of the State-funded retirement systems;
- Issue preliminary reports to the boards of trustees of the State-funded retirement systems concerning proposed certifications of required State contributions submitted to the State Actuary by those boards; and
- Identify recommended changes to actuarial assumptions that the boards must consider before finalizing their certifications of the required State contributions.

On August 31, 2017, Public Act 100-0465 was signed into law, which added a sixth retirement system to be reviewed by the State Actuary. The Illinois Pension Code was revised to require the Chicago Teachers' Pension Fund (CTPF) submit information to the State Actuary similar to the requirement for the other State-funded retirement systems.

Review of Actuarial Assumptions

Cheiron reviewed the actuarial assumptions used in each of the six systems' actuarial valuations for the year ended June 30, 2017, and **concluded that they generally were reasonable with two exceptions, both of which applied to the Chicago Teachers' Pension Fund.** Cheiron recommended:

- For the Chicago Teachers' Pension Fund, the interest rate assumption should be lowered to a rate no higher than 7.25% for the June 30, 2017 valuation.
- For the Chicago Teachers' Pension Fund, the wage inflation assumption should be lowered from 3.50% to 3.25% for the June 30, 2017 valuation.

After receiving the draft report from the State Actuary, the CTPF Board accepted the recommendations and adopted an interest rate assumption of 7.25% and a wage inflation assumption of 3.25% at its December 14, 2017 Board meeting.

The combined total of the required State contribution for the six retirement systems was \$8,678,855,109. Cheiron verified the arithmetic calculations made by the systems' actuaries to develop the required State contribution and reviewed the assumptions on which the calculations were based.

Public Act 100-0023 Statutory Funding Changes

Public Act 100-0023, effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes be phased-in over a 5-year period. This Act applied to five of the systems but did not apply to CTPF. The actuaries for the retirement systems interpreted the new requirement in two different ways leading Cheiron to recommend that four of the systems review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act.

Public Act 100-0023 also required each of the five systems to recertify the amount of the State contributions for fiscal year 2018 taking into account the phasing-in of assumption changes that may have occurred beginning in fiscal year 2014. After taking into account the phasing-in of assumption changes, the total fiscal year 2018 required State contribution decreased by over \$900 million.

Additional Disclosures and Changes for Future Valuations

Cheiron also made recommendations for additional disclosures for the 2017 valuations and recommended changes for future valuations. Recommendations included the following:

- The Boards of SERS, JRS, and GARS should periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary.
- Cheiron continues to recommend the Boards annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.

State Mandated Funding Method

For five of the retirement systems (TRS, SURS, SERS, JRS, and GARS), the Illinois Pension Code requires the systems' actuaries to calculate the required State contribution using a prescribed funding method that achieves 90 percent funding in the year 2045. Cheiron concluded that **this funding method does not meet** generally accepted actuarial principles because the systems are never targeted to be funded to 100 percent and the funding of the systems is significantly deferred into the future. Cheiron recommended that the funding method be changed to at least fully fund future plan benefit accruals to avoid continued systematic underfunding of the systems.

According to the systems' 2017 actuarial valuation reports, the funded ratio of the retirement systems ranged from 51.3% (CTPF) to 14.9% (GARS), based on the actuarial value of assets as a ratio to the actuarial liability. Cheiron has concerns about the solvency of the systems if there is a significant market downturn and recommended the systems include stress testing within the valuation reports.

INTRODUCTION AND BACKGROUND

On June 18, 2012, Public Act 097-0694 was signed into law, which directed the Auditor General to contract with or hire an actuary to serve as the State Actuary. The Public Act amended the Illinois State Auditing Act as well as sections of the Illinois Pension Code for each of the following State-funded retirement systems:

- The Teachers’ Retirement System (TRS);
- The State Universities Retirement System (SURS);
- The State Employees’ Retirement System (SERS);
- The Judges’ Retirement System (JRS); and
- The General Assembly Retirement System (GARS).

Requirements of Public Act 097-0694

Public Act 097-0694 requires the State Actuary to conduct an annual review of the valuations prepared by the actuaries of the State-funded retirement systems. Specifically the Act requires the State Actuary to:

- Review assumptions and valuations prepared by actuaries retained by the boards of trustees of the State-funded retirement systems;
- Issue preliminary reports to the boards of trustees of the State-funded retirement systems concerning proposed certifications of required State contributions submitted to the State Actuary by those boards; and
- Identify recommended changes to actuarial assumptions that the boards must consider before finalizing their certifications of the required State contributions.

On or before November 1 of each year, beginning November 1, 2012, the boards of each of the systems must submit to the State Actuary a proposed certification of the amount of the required State contribution to the system for the next fiscal year, along with all of the actuarial assumptions, calculations, and data upon which that proposed certification is based.

On or before January 1, 2013, and each January 1 thereafter, the Auditor General shall submit a written report to the General Assembly and Governor documenting the initial assumptions and valuations prepared by actuaries retained by the boards of trustees of the State-funded retirement systems, any changes recommended by the State Actuary in the actuarial assumptions, and the responses of each Board to the State Actuary's recommendations.

On or before January 15, 2013, and every January 15 thereafter, each Board shall certify to the Governor and the General Assembly the amount of the required State contribution for the next fiscal year. The Board's certification must note any deviations from the State Actuary's

recommended changes, the reason or reasons for not following the State Actuary's recommended changes, and the fiscal impact of not following the State Actuary's recommended changes on the required State contribution.

Requirements of Public Act 100-0465

On August 31, 2017, Public Act 100-0465 was signed into law, which added a sixth retirement system to be reviewed by the State Actuary. The Illinois Pension Code was revised to require the Chicago Teachers' Pension Fund (CTPF) submit information to the State Actuary similar to the requirement for the other State-funded retirement systems. Public Act 100-0465 specified the following regarding the Chicago Teachers' Pension Fund:

- For State fiscal year 2018, the State shall contribute \$221,300,000 for the employer normal cost.
- Beginning in State fiscal year 2019, the State shall contribute an amount equal to the employer normal cost for that fiscal year.
- On or before November 1 of each year, beginning November 1, 2017, the Board shall submit to the State Actuary, the Governor, and the General Assembly a proposed certification of the amount of the required State contribution to the Fund for the next fiscal year, along with all of the actuarial assumptions, calculations, and data upon which that proposed certification is based.
- On or before January 1 of each year, beginning January 1, 2018, the State Actuary shall issue a preliminary report concerning the proposed certification and identifying, if necessary, recommended changes in actuarial assumptions that the Board must consider before finalizing its certification of the required State contributions.
- On or before January 15, 2018, and each January 15 thereafter, the Board shall certify to the Governor and the General Assembly the amount of the required State contribution for the next fiscal year. The Board's certification must note any deviations from the State Actuary's recommended changes, the reason or reasons for not following the State Actuary's recommended changes, and the fiscal impact of not following the State Actuary's recommended changes on the required State contribution.

Contracting with the State Actuary

On July 12, 2012, the Office of the Auditor General issued a Request for Proposals for the services of a State Actuary. On August 24, 2012, the contract was awarded to Cheiron. Cheiron is a full-service actuarial and consulting firm with offices in nine locations throughout the United States. Cheiron has experience working with multiple public pension plans around the country.

REVIEW OF THE ACTUARIAL ASSUMPTIONS

Cheiron reviewed the actuarial assumptions used in each of the six systems’ actuarial valuations for the year ended June 30, 2017, and **concluded that they generally were reasonable with two exceptions:**

- For the Chicago Teachers’ Pension Fund, the interest rate assumption should be lowered to a rate no higher than 7.25%.
- For the Chicago Teachers’ Pension Fund, the wage inflation assumption should be lowered from 3.50% to 3.25%.

After receiving the draft report from the State Actuary, the CTPF Board accepted the recommendations and adopted an interest rate assumption of 7.25% and a wage inflation assumption of 3.25% at its December 14, 2017 Board meeting.

Cheiron did not recommend any additional changes to the assumptions used in the June 30, 2017 actuarial valuations. Cheiron did recommend additional disclosures for the 2017 valuations and also recommended changes for future valuations. The systems’ responses to Cheiron’s preliminary reports can be found in Appendix C of this report.

Exhibit 1-1 summarizes the recommendations made to the retirement systems. At the end of each of the reports located in Chapters Two through Six is a chart summarizing the status of recommendations made by the State Actuary in the 2016 report. This chart is not included in the report to CTPF in Chapter Seven as this is the first year the system was reviewed. This year’s report contains 33 recommendations compared to 25 recommendations made in last year’s report. The increased number of recommendations is the result of the funding changes required in Public Act 100-0023 and the addition of CTPF to the systems being reviewed.

Exhibit 1-1 RECOMMENDATIONS TO THE RETIREMENT SYSTEMS						
Recommendations	TRS	SURS	SERS	JRS	GARS	CTPF
Recommended Changes to Actuarial Assumptions used in the 2017 Actuarial Valuations:						
• Lower the interest rate assumption to a rate no higher than 7.25%						X
• Since the general inflation assumption was lowered to 2.50%, lower the wage inflation assumption from 3.50% to 3.25%						X
Other than these two exceptions, Cheiron reviewed the actuarial assumptions and concluded that they were reasonable.						
Recommended Additional Disclosures for the 2017 Actuarial Valuations:						
• Expand/include stress testing of the System within the valuation report	X	X	X	X	X	
• Disclose why it relied on different capital market forecasts than used in similar reviews of other Illinois systems						X
Recommended Changes for Future Actuarial Valuations:						
• Annually review the economic assumptions (interest rate and inflation rate) and adjust assumptions accordingly	X	X	X	X	X	X
• Evaluate the implications of the one year delay in data used for the valuation to substantiate if it is immaterial	X					
Conformance to Statutory Funding Changes of Public Act 100-0023:						
• Review the method used to phase-in prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result		X	X	X	X	
• Include an exhibit in the recertification document demonstrating how the new amounts were determined	X		X	X	X	
• Reflect the hybrid plan in the June 30, 2017 valuation	X					
• Include additional disclosures demonstrating that Tier 3 benefits will have an immaterial impact on funding			X			
Other Recommendations:						
• Periodically retain the services of an independent actuary to conduct a full scope actuarial audit in which the results of the valuation are fully replicated			X	X	X	
• Change the funding method to fully fund plan benefits and discontinue the systematic underfunding of the system	X	X	X	X	X	
Source: OAG summary of Cheiron's preliminary reports to the six retirement systems.						

The following sections discuss some of the key assumptions and recommendations. Further details on the assumptions and recommendations, including those not discussed in this summary chapter, are contained in the State Actuary's preliminary reports for each of the retirement systems, found in Chapters Two through Seven of this report.

Economic Assumptions

Cheiron reviewed the economic assumptions utilized in the actuarial valuations for each of the six retirement systems. The following sections discuss two of those assumptions – the interest rate assumption and the inflation assumption.

Interest Rate Assumption

The interest rate assumption (also called the investment return or discount rate) is **the most impactful assumption affecting the required State contribution amount**. This assumption is used to value liabilities for funding purposes. The retirement systems use varying interest rate assumptions. Exhibit 1-2 shows the interest rate assumptions for each of the six retirement systems. As can be seen in the exhibit, the interest rate assumption was lowered by four of the systems for the 2016 actuarial valuations.

Exhibit 1-2 INTEREST RATE ASSUMPTIONS June 30, 2017 Valuation		
System	Interest Rate	Notes
Teachers' Retirement System	7.00%	Lowered from 7.50% for the June 30, 2016 actuarial valuation
State Universities Retirement System	7.25%	Lowered from 7.75% for the June 30, 2014 actuarial valuation
State Employees' Retirement System	7.00%	Lowered from 7.25% for the June 30, 2016 actuarial valuation
Judges' Retirement System	6.75%	Lowered from 7.00% for the June 30, 2016 actuarial valuation
General Assembly Retirement System	6.75%	Lowered from 7.00% for the June 30, 2016 actuarial valuation
Chicago Teachers' Pension Fund	7.50% ¹	Lowered from 7.75% for the June 30, 2017 actuarial valuation
¹ After receiving the draft report from the State Actuary, the CTPF Board lowered its interest rate assumption to 7.25%		
Source: Retirement system actuarial reports.		

Also as shown in Exhibit 1-2, the Chicago Teachers' Pension Fund lowered its interest rate assumption from 7.75% to 7.25% for the 2017 actuarial valuation. The actuary for CTPF performed a review of the economic assumptions and presented the results to the Board at the Board's September 21, 2017 meeting. The CTPF actuary recommended the Board lower the interest rate assumption from 7.75% to 7.25%. However, initially the Board did not adopt that recommendation and instead adopted an interest rate assumption of 7.50%. CTPF officials indicated that, as reflected in the Board's records of the October meeting, the CTPF Board supported a reduction in the interest rate assumption but noted its belief that a one-step 0.5% reduction in the year before the Fund's scheduled 2018 experience study and economic review was premature. Officials noted, after consideration of various economic, investment return, and actuarial factors, the Board accepted its actuary's recommendation, in part, reducing the interest rate assumption from 7.75% to 7.50% but pledged to make an additional reduction in 2019.

Cheiron concluded that the use of 7.50% was overly aggressive and recommended lowering the interest rate assumption to a rate no higher than 7.25% for the 2017 valuation. On December 14, 2017, after receiving the draft report from the State Actuary, the Board of trustees for the Chicago Teachers' Pension Fund adopted the recommended change and lowered the interest rate assumption to 7.25%.

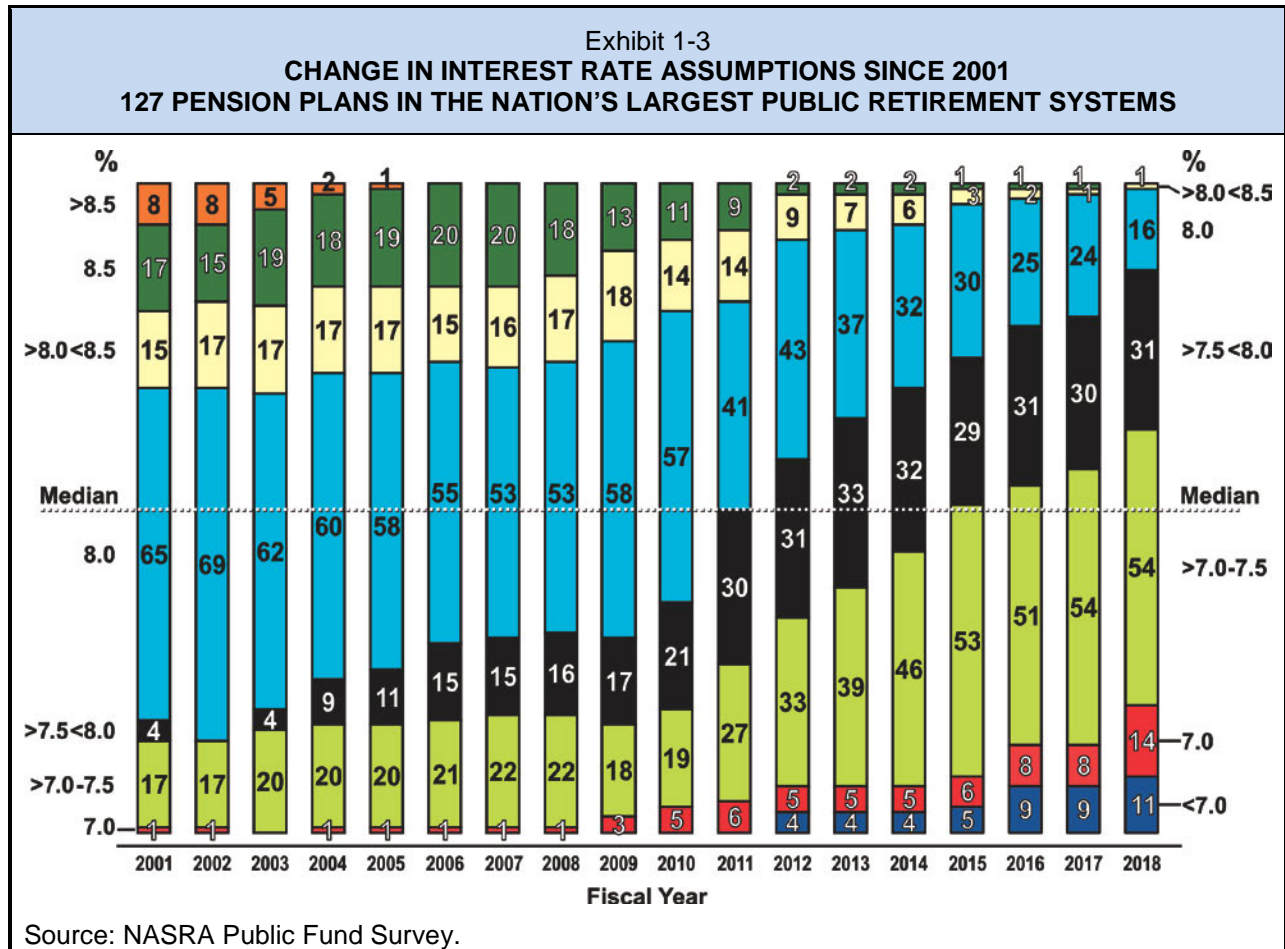
Cheiron concluded that the interest rate assumptions for the other five systems were reasonable. As it did in last year's report, Cheiron again recommended that the Boards annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly. All of the systems complied with this recommendation prior to conducting the 2017 actuarial valuations.

Cheiron noted that the systems are, or will be, experiencing negative cash flows which may impact the interest rate returns that are realized. Negative cash flow is measured as contributions less benefits and expenses. TRS, SURS, and CTPF are experiencing negative cash flows while SERS, JRS, and GARS are projected to begin having negative cash flows in the near future. Negative cash flows result in actuarial returns (i.e., "dollar weighted" returns) being less than "time weighted" returns.

Cheiron also noted that there has been emerging actuarial practice throughout the country to reduce the discount rates even below the level that the investment consultants believe is achievable. This is because of the very low interest rate environment we are currently experiencing. The lower the interest rate environment, the greater the investment risk that must be taken to achieve an assumed rate of return.

Cheiron discussed the nationwide movement among pension plans to lower the interest rate assumption. The National Association of State Retirement Administrators (NASRA) conducts the Public Fund Survey, which is an online compendium of key characteristics covering 127 public pension plans. Exhibit 1-3 shows the change in the interest rate assumptions, since the inception of the Public Fund Survey in 2001, for 127 public pension plans.

The exhibit shows the shift to lower interest rate assumptions. In 2001, 105 of the 127 plans (83%) used an interest rate assumption of 8.0% or higher. The most recent data, which includes results collected through November 2017, shows that this number has dropped to only 17 of 127 plans (13%) that use an interest rate of 8.0% or higher. The median assumption has fallen to 7.5%. Since Fiscal Year 2011, 105 of the 127 plans have reduced the interest rate assumption with an average reduction of 0.49%. In addition, 25 plans have adopted a rate of 7.0% or lower.



Inflation Assumption

The six retirement systems use inflation assumptions ranging from 2.50% to 2.75%. Exhibit 1-4 shows the inflation assumptions for each of the systems. As with the interest rate assumption, four of the systems lowered the inflation assumption for the 2016 valuations and one system, CTPF, lowered the inflation assumption for the current valuation.

Cheiron concluded that the inflation assumptions used by the six retirement systems were reasonable. Cheiron’s rationale for concurring with the inflation assumptions included:

- The July 2017 Old-Age, Survivors, and Disability Insurance Trustees Report projects that over the long-term (next 75 years) inflation will average somewhere between 2.0% and 3.2%. Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.6%.
- The National Conference on Public Employee Retirement Systems (NCPERS) compared public sector retirement systems’ inflation assumptions in a study published in December 2016. The study shows that the 2.50% assumption used by TRS and CTPF, and the 2.75% assumption used by the remaining four systems, is lower than the average rate of 3.0% for the 159 systems who responded to the study.

Exhibit 1-4 INFLATION ASSUMPTIONS June 30, 2017 Valuation		
System	Inflation Rate	Notes
Teachers' Retirement System	2.50%	Lowered from 3.00% for the June 30, 2016 actuarial valuation
State Universities Retirement System	2.75%	Lowered from 3.75% for the June 30, 2011 actuarial valuation
State Employees' Retirement System	2.75%	Lowered from 3.00% for the June 30, 2016 actuarial valuation
Judges' Retirement System	2.75%	Lowered from 3.00% for the June 30, 2016 actuarial valuation
General Assembly Retirement System	2.75%	Lowered from 3.00% for the June 30, 2016 actuarial valuation
Chicago Teachers' Pension Fund	2.50%	Lowered from 2.75% for the June 30, 2017 actuarial valuation
Source: Retirement system actuarial reports and experience studies.		

The inflation assumption primarily impacts the salary increase assumption. The salary increase assumption is generally comprised of the inflation assumption and a productivity, or real wage growth assumption. As shown in Exhibit 1-4, CTPF lowered its inflation assumption from 2.75% to 2.50% for its 2017 actuarial valuation. However, CTPF did not lower its 3.50% salary increase assumption to correspond with the lowering of its inflation assumption. This implies that the productivity component had been increased from 0.75% to 1.00%. Cheiron found that to be unreasonable. **Cheiron recommended that CTPF lower its salary increase assumption from 3.50% to 3.25% for the 2017 actuarial valuation.** On December 14, 2017, after receiving the draft report from the State Actuary, the Board of trustees for the Chicago Teachers' Pension Fund adopted the recommended change and lowered the salary increase assumption to 3.25%.

Demographic Assumptions

The retirement systems utilize a number of demographic assumptions such as mortality rates, disability rates, and termination rates. Cheiron reviewed the demographic assumptions and concluded that they were reasonable. As it did last year, Cheiron included additional analysis in its reports on each of the systems. Cheiron collected data from past valuation reports dating back to 2011 and presented a historical review of past demographic and salary increase experience gains and losses. Results were presented in a chart which showed the pattern of annual gains and losses attributable to different sources. These charts can be found in Chapters Two through Seven. Different measures were used for each system depending on the information available but sources used included:

- Active and retiree mortality;
- Disability;
- New entrants;
- Benefit recipients;
- Salary increases;

- Retirement; and
- Terminations.

An examination of these trends can be used to determine if adjustments need to be made to assumptions or if additional disclosures need to be made in the actuarial valuation reports. Additional details on the demographic assumptions examined can be found in the chapters for each of the six retirement systems.

PROPOSED CERTIFICATION OF REQUIRED STATE CONTRIBUTION

Each of the six retirement systems submitted to the State Actuary a proposed certification of the amount of the required State contribution for that system. **Cheiron verified the arithmetic calculations made by the systems’ actuaries to develop the required State contribution and reviewed the assumptions on which the calculations were based.** Exhibit 1-5 shows the amounts of proposed State contributions submitted by the systems for Fiscal Year 2019.

Exhibit 1-5 AMOUNTS OF STATUTORILY REQUIRED STATE CONTRIBUTIONS	
System	State Contribution (for Fiscal Year 2019)
Teachers’ Retirement System	\$4,466,178,109
State Universities Retirement System	1,655,154,000
State Employees’ Retirement System	2,165,841,000
Judges’ Retirement System	140,469,000
General Assembly Retirement System	23,221,000
Chicago Teachers’ Pension Fund ¹	227,992,000
Total	\$8,678,855,109
¹ The State contribution for CTPF is limited to the employer normal cost for that fiscal year. Source: 2017 Retirement system actuarial valuation reports.	

Cheiron noted that, in accordance with 30 ILCS 5/2-8.1, its review does not include a replication of the actuarial valuation results. Beginning with the December 2014 State Actuary Report, Cheiron recommended that the Boards periodically undertake a full scope actuarial audit, utilizing the services of a reviewing actuary. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the Systems’ actuaries. Two of the systems (TRS and SURS) complied with this recommendation but SERS, JRS, and GARS have not. Given the size of SERS, the Plans’ low funded ratios, the recent changes in legal requirements, and guidance issued by the Government Finance Officers Association, **Cheiron continues to recommend that the Boards at SERS, JRS, and GARS periodically undertake a full scope actuarial audit**, utilizing the services of a reviewing actuary.

CONFORMANCE TO STATUTORY FUNDING CHANGES

Public Act 100-0023, effective July 6, 2017, modified the State’s funding policy to require that the contribution impact of all assumption changes be phased-in over a 5-year period. This Act applied to five of the systems but did not apply to CTPF. The Act requires that the impact of assumption changes “*be implemented in equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.*” This amount is then implemented “*at the resulting annual rate in each of the remaining fiscal years in that 5-year period.*”

The actuaries for the retirement systems interpreted this in two different ways:

- The actuary for TRS interpreted this to mean determining the change in the required State contribution, and phasing in the change over five years in **equal dollar amounts**.
- The actuaries for SURS, SERS, JRS, and GARS interpreted this to mean determining the cost impact of the change, converting it to a **percentage of payroll**, and reflecting one-fifth of that percentage change over five years.

Cheiron believes the second method may not match the adjustment as described in the Act. Because payroll changes each year, using a percentage of payroll will result in different dollar amounts each of the five years and thus not the “*equal annual amounts*” required by the Act. **Cheiron recommended the actuaries review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act.**

Fiscal Year 2018 State Contribution Recertification

Public Act 100-0023 also required each of the five systems recertify the amount of the State contributions for fiscal year 2018 taking into account the phasing-in of assumption changes that may have occurred beginning in fiscal year 2014. Exhibit 1-6 shows both the original State contribution amounts submitted last year and the recertified amounts submitted this year. After taking into account the phasing-in of assumption changes, the total fiscal year 2018 required State contribution decreased by over \$900 million.

Exhibit 1-6 RECERTIFICATION OF FISCAL YEAR 2018 STATE CONTRIBUTIONS		
System	Original Amount	Recertified Amount
Teachers’ Retirement System	\$4,564,952,674	\$4,095,316,146
State Universities Retirement System	1,753,685,000	1,629,307,606
State Employees’ Retirement System	2,327,649,000	2,029,583,000
Judges’ Retirement System	146,766,000	135,622,000
General Assembly Retirement System	26,679,000	21,155,000
Total	\$8,819,731,674	\$7,910,983,752

Source: Retirement system funding recertification documents.

For four of the systems, Cheiron recommended that the actuaries include additional information in the recertification documents to support the revised amounts. This should include an exhibit demonstrating how the new amounts were determined. Otherwise, the recertification may not be considered a complete actuarial communication as the information in the document as a stand-alone communication was insufficient.

ACTUARIAL METHODS

Actuarial methods consist of three components: (1) the funding method, which is the attribution of total costs to past, current, and future years; (2) the method of calculating the actuarial value of assets (i.e., asset smoothing); and (3) the amortization basis of the Unfunded Actuarial Liability (UAL). The amortization basis is discussed under the State Mandated Funding Method in the next section on page 14.

Funding Method

All of the retirement systems use the Projected Unit Credit (PUC) cost method to assign costs to years of service. This method is required under the Illinois Pension Code. Cheiron had no objection to using the PUC cost method as it is an acceptable method that is used by other public sector pension funds. However, Cheiron would prefer the Entry Age Normal (EAN) funding method as it is more consistent with the Pension Code’s requirement for level percent of pay funding.

Under the PUC method, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date but not beyond) is taken into account in calculating these benefits. The cost of providing benefits based on past service and future compensation is the actuarial accrued liability for a given active participant. Under the PUC cost method, the value of an active participant’s benefits tends to increase more sharply over their later years of service than over their earlier ones.

As a result of this pattern of benefit values increasing, while the PUC method is not an unreasonable method, more plans use the EAN funding method to mitigate this effect. It should also be noted that the EAN method is the required method to calculate liability for the Governmental Accounting Standards Board Statements 67 and 68.

Asset Smoothing Method

The actuarial value of assets for the systems is a smoothed market value. Unanticipated changes in market value are recognized over five years for all of the systems except CTPF, which smooths over four years. The primary purpose for smoothing out gains and losses over multiple years is that the fluctuations in the actuarial value of assets will be less volatile over time than fluctuations in the market value of assets. Cheiron concurred with the use of the asset smoothing method noting that smoothing the market gains and losses over a period of years to determine the actuarial value of assets is a generally accepted approach in determining actuarial cost.

Another aspect of asset smoothing methods is whether or not to limit the maximum spread between the actuarial value of assets and the market value of assets. Many public sector pension plans limit the actuarial value of assets to be in any year no more than 120% of market value, or no less than 80% of market value. In fact, the Internal Revenue Service (26 USC 430(g)(3)(B)(iii)) mandates a similar “corridor” for private sector pension plans (a 90%-110% corridor is mandated). Even though it is not mandated for public plans, Cheiron believes that the use of this type of corridor is a sounder actuarial practice, and according to ASOP No. 44 in Section 3.3 b. 1, the actuarial value of assets should “...*fall within a reasonable range around the corresponding market values.*”

STATE MANDATED FUNDING METHOD

For five of the retirement systems (TRS, SURS, SERS, JRS, and GARS), the Illinois Pension Code requires that the systems’ actuaries base the required contribution using a prescribed funding method that achieves 90 percent funding in the year 2045. In the actuarial valuation reports, the systems’ actuaries discuss their concerns with this funding method.

- In TRS’ June 30, 2017 Actuarial Valuation Report, TRS’ actuary recommends an actuarial funding method that targets 100% funding where payments at least cover interest on the unfunded actuarial accrued liability and a portion of the principal balance. With support of the TRS Board, TRS’ actuary reports on an alternative funding method that they consider representative of generally accepted actuarial methods and refers to this method as Actuarial Math 2.0. This method uses the Entry Age Normal method and amortizes the unfunded liability over 20 years.
- In SURS’ June 30, 2017 Actuarial Valuation Report, SURS’ actuary comments that the Statutory funding method generates a contribution that is less than a reasonable actuarially determined contribution. The actuary recommends a funding policy which would use the Entry Age Normal method and contribute the normal cost plus an amortization of the unfunded accrued liability over a closed period of no less than 15 years and no more than 27 years to attain 100 percent funding by 2045.
- In the June 30, 2017 actuarial valuations for SERS, GARS, and JRS, the actuary advises “strengthening the current statutory funding policy” and included examples such as the following:
 - Increasing the 90 percent funding target to 100 percent;
 - Reducing the projection period needed to reach the funding target; and
 - Changing the actuarial cost method for calculating liabilities from the Projected Unit Credit cost method to the Entry Age Normal cost method.

Cheiron concurred with recommendations of the systems’ actuaries. Cheiron concluded that the Pension Code funding method does not meet generally accepted actuarial principles because the systems are not targeted to be funded to 100 percent and the funding of the System is pushed too far into the future. Cheiron recommended that the funding method be changed to

fully fund plan benefits and discontinue the systematic underfunding of the systems. Continuing the practice of underfunding future accruals increases the risk of the systems becoming unsustainable.

Based on the systems’ 2017 actuarial valuation reports, the funded ratio of the systems ranged from 51.3% (CTPF) to 14.9% (GARS) based on the actuarial value of assets as a ratio to the actuarial liability (see Exhibit 1-7). Cheiron has concerns about the solvency of the systems if there is a significant market downturn.

Exhibit 1-7 SYSTEM FUNDED RATIO (ACTUARIAL VALUE OF ASSETS)	
System	Funded Ratio
TRS	40.2%
SURS	44.4%
SERS	35.5%
JRS	35.6%
GARS	14.9%
CTPF	51.3%
Source: 2017 actuarial valuation reports.	

For five of the retirement systems (TRS, SURS, SERS, JRS, and GARS), Cheiron recommended stress testing be done or be expanded to demonstrate the likelihood there will be sufficient assets to pay benefits if there is a significant market downturn. The stress testing should be included within the valuation report and include a thorough explanation of the implications that volatile investment returns and other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether or not there is a potential for unsustainable costs during the statutory funding period. The reason Cheiron recommends such stress testing be included in the valuation report is because the public may only look to the valuation report for this type of information. The stress testing should be contained in the valuation report instead of any supplemental document to the Board that may potentially be overlooked.

RESPONSES TO THE RECOMMENDATIONS

Each of the six retirement systems provided responses to Cheiron’s recommendations contained in the preliminary reports. The systems generally agreed with Cheiron’s recommendations. The complete responses are in Appendix C.

Chapter Two

PRELIMINARY REPORT ON THE TEACHERS' RETIREMENT SYSTEM

In accordance with 30 ILCS 5/2-8.1, Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the Teachers' Retirement System (TRS) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to TRS on December 1, 2017. The preliminary report was based on Cheiron's review of actuarial assumptions included in TRS' 2017 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the Teachers' Retirement System. TRS' written response, provided on December 12, 2017, can be found in Appendix C.

OVERVIEW TEACHERS' RETIREMENT SYSTEM as of June 30, 2017	
Actuarial accrued liability	\$122,904,034,268
Actuarial value of assets	<u>\$49,467,525,209</u>
Unfunded liability	\$73,436,509,059
Funded ratio	40.2%
Employer normal cost	\$1,049,301,284
State contribution (FY19)	\$4,466,178,109
Active members	159,585
Inactive members	136,855
Current benefit recipients	<u>117,990</u>
Total membership	414,430
Interest rate assumption	7.00%
Inflation assumption	2.50%
Actuarial cost method	Projected Unit Credit
Asset valuation method	5-year Smoothing
Executive Director	Dick Ingram
Actuarial Firm	Segal Consulting
Source: June 30, 2017 TRS actuarial valuation report.	

December 20, 2017

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Board of Trustees
Teachers' Retirement System of the State of Illinois
2815 West Washington Street
Springfield, Illinois 62702

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Segal Consulting (Segal) of the required State contribution to the Teachers' Retirement System of the State of Illinois (TRS or System) for Fiscal Year 2019.

In summary, we believe that the assumptions and methods used in the draft June 30, 2017 Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the State funding requirements that do not conform to Actuarial Standards of Practice, were properly calculated in accordance with State law.

Section I of this report describes the review process undertaken by Cheiron. Section II summarizes our findings and recommendations. Section III provides the supporting analysis for those findings and presents more details on our assessment of the actuarial assumptions and methods employed in Segal's Actuarial Certification, as well as our assessment of Segal's determination of the Required State Contribution for Fiscal Year 2019. Section III also includes comments on other issues impacting the funding of the Teachers' Retirement System, including the implications of Article 16 of the Illinois Pension Code, which establishes the statutory funding requirements for the System. **In our opinion, the statutory mandated minimum funding requirements call for inadequate funding and do not meet Actuarial Standards of Practice (ASOP), particularly ASOP No. 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions.** Section IV reviews the projections contained in the draft June 30, 2017 Actuarial Valuation. Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by TRS and Segal. This information includes actuarial assumptions and methods adopted by the TRS Board, plan provisions, the draft June 30, 2017 Actuarial Valuation, minutes of the 2017 TRS Board of Trustee meetings, Segal's investment assumption presentation of June 2017, and various studies and memos prepared by the System's advisors, staff, and Executive Director. A detailed description of all information provided for this review is contained in Appendix B.

To the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Office of the Auditor General and the Teachers' Retirement System of the State of Illinois for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

Janet Cranna, FSA, FCA, MAAA, EA
Principal Consulting Actuary

SIGNED ORIGINAL ON FILE

Gene Kalwarski, FSA, FCA, MAAA, EA
Principal Consulting Actuary

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
TEACHERS' RETIREMENT SYSTEM OF THE STATE OF ILLINOIS
PURSUANT TO 30 ILCS 5/2-8.1**

SECTION I – REPORT SCOPE

Illinois Public Act 097-0694 (the Act) amended the Illinois State Auditing Act (30 ILCS 5/2-8.1) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the Teachers' Retirement System of the State of Illinois (TRS or System) and to issue to the TRS Board this preliminary report on the proposed certification prepared by Segal Consulting (Segal) of the required State contribution for Fiscal Year (FY) 2019. The purpose of this review is to identify any recommended changes to the actuarial assumptions and methods for the TRS Board to consider before finalizing its certification of the required State contribution for FY 2019.

While the Act states that just the actuarial assumptions and valuation are to be reviewed, we have also reviewed the actuarial methodologies (funding and asset smoothing methods) employed in preparing the Actuarial Certification, as these methods can have a material effect on the amount of the State contribution being certified. Finally, we have offered our opinion on the implications of Article 16-158 of the Illinois Pension Code, which impacts the contribution amount certified by Segal.

In conducting this review, Cheiron reviewed the draft June 30, 2017 Actuarial Valuation prepared by Segal, minutes of the 2017 Board of Trustees meetings, and various studies and memos prepared by the System's advisors, staff, and Executive Director. The specific materials we reviewed are listed in Appendix B.

In addition to reviewing the Actuarial Certification of the required State contribution to TRS, the Act requires the State Actuary to conduct a review of the "actuarial practices" of the Board. While the term "actuarial practices" was not defined in the Act, we continue to interpret this language to mean that we reviewed: (1) the use of a qualified actuary (as defined in the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2017 Actuarial Valuation.

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SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2017 Actuarial Valuation of TRS as well as the “actuarial practices” of the TRS Board. Section III of this report provides detailed analysis and rationale for these recommendations.

Proposed Certification of the Required State Contribution

Segal has determined that the FY 2019 required State contribution calculated under the current statutory funding plan is \$4,466,178,109. We have verified the arithmetic calculations made by Segal to develop this required State contribution and have reviewed the assumptions on which it was based. As such, we have accepted Segal’s annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

State Mandated Funding Method

1. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of TRS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Conformance to Statutory Funding Changes of Public Act 100-0023

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modifies the State’s funding policy to require that the contribution impact of all assumption changes be phased-in over a 5-year period. As such, the Act delays the funding of the System. Assumption changes result from more accurately identifying the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact of these changes are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a 5-year period beginning at the date of adoption.

The Act requires that the impact of assumption changes “be implemented in equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.” This amount is then implemented “at the resulting annual rate in each of the remaining fiscal years in that 5-year period.” Segal has interpreted this to mean determining the change in the required State contribution, and phasing in the change over five years in equal dollar amounts. We have verified the arithmetic calculations made by Segal to develop the phase-in of assumption changes in the June 30, 2017 valuation.

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SECTION II – SUMMARY OF RECOMMENDATIONS

Also as a result of P.A. 100-0023, the TRS Board is required to recertify the prior year's State contribution in accordance with the Act. Segal has determined that the FY 2018 recertified required State contribution is \$4,095,316,146, compared to the original FY 2018 amount of \$4,564,952,674. We have verified the arithmetic calculations made by Segal to develop the recertified required State contribution.

2. In this regard, the recertification provided by Segal as a stand-alone document provides insufficient information to support the revised funding amounts and should include an exhibit demonstrating how the new amounts were determined.

Optional Hybrid Plan

P.A. 100-0023 creates an optional hybrid plan for current Tier 2 members and future new hires. The hybrid plan consists of a reduced defined benefit plan and a defined contribution plan. Segal has not reflected the hybrid plan in the June 30, 2017 valuation.

3. We recommend that Segal reflect the hybrid plan in the June 30, 2017 valuation since the State mandated funding method requires projecting the liabilities of the System to 2045. Assumptions for unknown issues should be made and disclosed in the valuation report.

Earnings That Exceed the Governor's Salary

P.A. 100-0023 requires employers to make an additional contribution for participants who have annual earnings that currently exceed, or are projected to exceed, the Governor's current or projected salary. The additional contribution is equal to the employer normal cost rate multiplied by salary in excess of the Governor's current or projected salary.

We have verified that Segal has reflected these additional employer contributions in the development of the net State contribution.

Conformance to Statutory Funding Changes of Public Act 100-0340

Public Act 100-0340 (P.A. 100-0340), enacted on August 25, 2017, modifies the employer contribution rate on salaries paid from federal funds. Beginning July 1, 2017, employers are required to pay the normal cost rate. Previously, employers were required to pay the employer contribution rate. We have verified the arithmetic calculations made by Segal to develop the federal funds contribution.

Assessment of Actuarial Assumptions Used in the 2017 Valuation

30 ILCS 5/2-8.1 requires the State Actuary to identify recommended changes in actuarial assumptions that the TRS Board must consider before finalizing its certification of the required State contribution. We have reviewed the analysis, including Segal's recommended continued

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SECTION II – SUMMARY OF RECOMMENDATIONS

use of a 7.00% discount rate as presented at the June 2017 Board meeting. We conclude that all the actuarial assumptions used in the draft June 30, 2017 Actuarial Valuation are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2017 Valuation

4. We recommend that Segal expand the stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether or not there is a potential for unsustainable costs during the statutory funding period.

Recommended Changes for Future Valuations

5. We recommend the TRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.
6. We continue to recommend evaluating the implications of the one year delay in data used for the valuation to substantiate if it is immaterial.

GASB 67 and 68

The 2017 TRS GASB 67 and 68 information was provided in the 2017 Valuation. We find that the assumptions and methods used to prepare the 2017 TRS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

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SECTION III – SUPPORTING ANALYSIS

In this section we provide detailed analysis and supporting rationale for the recommendations that were presented in Section II of this report.

Proposed Certification of the Required State Contribution

As stated in our summary of recommendations in Section II, we have verified the arithmetic calculations made by Segal to develop this State required contribution, reviewed the assumptions on which it is based, and accepted Segal's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

State Mandated Methods

The Illinois Pension Code (40 ILCS 5/16-158) is deficient in terms of establishing a method that adequately funds the System. This law requires that the actuary base the required contribution using a prescribed funding method that achieves 90% funding in the year 2045. This does not meet generally accepted actuarial principles because the System is never targeted to be funded to 100%, and the funding of the System is pushed too far into the future. In addition, the on-going benefits that will be earned in the future are also being funded only at 90%. The method defined in the Code does not conform to the guidelines in ASOP No. 4, Section 3.14 regarding the allocation procedures of costs to the expected benefit payments which provides:

When selecting a contribution allocation procedure, the actuary should select a contribution allocation procedure that, in the actuary's professional judgment, is consistent with the plan accumulating adequate assets to make benefit payments when due, assuming that all actuarial assumptions will be realized and that the plan sponsor or other contributing entity will make actuarially determined contributions when due.

We recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of TRS (Recommendation #1). Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.

In its draft June 30, 2017 Actuarial Valuation on pages 2 and 3 Segal comments that the statutory funding method calls for contributions in fiscal 2017 that are insufficient to reduce the unfunded actuarial accrued liability. In the same report throughout pages 6 through 13 Segal also demonstrates the implications of the statutory funding amounts on the growth of the unfunded actuarial accrued liability. With support of the TRS Board, Segal reports on an alternative funding policy that they consider representative of generally accepted actuarial methods and refers to this method as *Actuarial Math 2.0*. Using this methodology, the State's contribution amount would be \$7,370,930,484 for FY 2019. We concur with Segal's recommendations and demonstration of an alternative funding approach and agree that it conforms to a goal of full

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SECTION III – SUPPORTING ANALYSIS

funding within a reasonable time period and is in accordance with generally accepted actuarial practices.

The method Segal calls Actuarial Math 2.0 is described in Section 2 beginning on page 30 of their Actuarial Valuation Report with the cost developed on page 31. The method includes the following provisions:

- The use of the Entry Age Normal Method (EAN) instead of the Projected Unit Credit (PUC) method. The method uses the Entry Age Normal Cost Method (the same method called for in the GASB 67 and 68 disclosures). Actuarial methods differ in how they allocate the cost of benefits over a participant's life time. PUC, which is called for in the statutory contribution determination, determines the cost of benefits at the participant's attained age. Therefore, as a participant gets older and the cost of the benefit is discounted over a decreasing period from expected retirement to attained age, their cost—the normal cost—will increase. With a large group and stable population, the actual normal costs don't necessarily increase because the average age of the population remains constant. Under EAN, the normal cost is determined as a level percent of pay from age at entry into the system to normal retirement. This method typically provides a more stable cost as a percent of pay and is the same method adopted by GASB for the Statement 67 and 68 disclosures.
- The unfunded liability under Actuarial Math 2.0 is amortized over 20 years on an increasing basis, with the annual payments scheduled to increase by 2.0%. The rate of 2.0% is to reflect, according to TRS, the expected State revenue growth rate. This assumption should be documented and a reference cited for the source in the valuation report. Amortizing the unfunded liability on an increasing basis can be an issue because it can result in the initial payments not being sufficient to cover the interest cost. However, selection of the 20 years and use of 2.0% as a proxy for the annual increase rate expected for the State's general revenue will result in the first and all future payments covering the interest cost on the unfunded liability as well as a portion of the principal. We have confirmed TRS's statement that, based on this method of amortization, the principal on the unfunded liability will begin to be paid down in the first year. We also confirm that the method meets generally accepted actuarial methods.
- All future changes to the unfunded liability not attributable to the current amortization amounts such as experience, benefit changes, and changes in assumptions are to be amortized over the same 20-year amortization methodology.

Based on the draft June 30, 2017 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 40.2%. We have concerns about the solvency of the System if there is a significant market downturn. This is why we continue to recommend stress testing be done to determine whether there will be sufficient assets under the State mandated funding method to pay benefits if there is a significant market downturn.

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SECTION III – SUPPORTING ANALYSIS

We recommend that Segal expand the stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether or not there is a potential for unsustainable costs during the statutory funding period (Recommendation #4). Segal already includes sensitivity projections in Section 1 of their report beginning on page 14. We would suggest they include similar projections to those shown in charts A and B for the scenarios included to demonstrate the potential magnitude of the unfunded liability change over time. The reason we recommend such stress testing be expanded in the valuation report is because that is the report that most stakeholders of the plan look to for assessing the plan's financial conditions. Supplemental reports, such as Segal's presentations to the Board of insolvency scenarios, may not be publicly identified, and therefore not readily accessible.

Conformance to Statutory Funding Changes of Public Act 100-0023

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modifies the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a 5-year period. As such, the Act further erodes the potential funded status of the System. Assumption changes result from more accurately identifying the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact of these changes are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a 5-year period beginning at the date of adoption.

Public Act 100-0023 states:

A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applies in State fiscal year 2018 or thereafter shall be implemented in equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.

A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applied to the State contribution in fiscal year 2014, 2015, 2016, or 2017 shall be implemented:

- (i) as already applied in State fiscal years before 2018; and*
- (ii) in the portion of the 5-year period beginning in the State fiscal year in which the actuarial change first applied that occurs in State fiscal year 2018 or thereafter, by calculating the change in equal annual amounts over that 5-year period and then*

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implementing it at the resulting annual rate in each of the remaining fiscal years in that 5-year period.

Segal has interpreted this to mean determining the change in the required State contribution, and phasing in the change over five years in equal dollar amounts. We have verified the arithmetic calculations made by Segal to develop the phase-in of assumption changes in the June 30, 2017 valuation.

Also as a result of P.A. 100-0023, the System Actuary is required to recertify to the prior year's valuation in accordance with the Act. In this regard, the recertification provided by Segal as a stand-alone document provides insufficient information to support the revised funding amounts and should include an exhibit demonstrating how the new amounts were determined (Recommendation #2).

In the recertification letter, there should either be clear reference to the dollar amounts in question as a result of the assumption changes as disclosed in the 2016 Actuarial Valuation Report or an added disclosure as part of the recertification that documents the dollar impact of the assumption changes in support of the balance of the recertification amounts. Otherwise this recertification may not be considered a complete actuarial communication as the information in the document as a stand-alone communication is insufficient.

Optional Hybrid Plan

P.A. 100-0023 creates an optional hybrid plan (Tier 3) for current Tier 2 members and future new hires. The optional hybrid plan consists of a reduced defined benefit plan and a defined contribution plan. In general, the defined benefit component is based on a ten-year final average pay (compared to an eight-year final average pay and unlimited pay for Tier 2), a 1.25% multiplier compared to 2.2% for Tier 2.

Segal has not reflected the Tier 3 optional hybrid plan in the June 30, 2017 valuation. Based on our discussions with Segal and their follow-up email, the Tier 3 hybrid plan was not included in the June 30, 2017 Actuarial Valuation because the following benefit and funding provisions need to be clarified: (1) when Tier 3 will be implemented, (2) whether Tier 3 members will be eligible for early retirement, (3) how the school districts' 2% of payroll contributions will interact with the school districts' payment on their Tier 3 unfunded liability, (4) what the utilization of Tier 3 will be, and (5) when there will be legislation to correct/clarify these Tier 3 issues.

We recommend that Segal reflect the optional hybrid plan in the June 30, 2017 valuation since the State mandated funding method requires projecting the liabilities of the System to 2045. Assumptions for unknown issues should be made and disclosed in the valuation report (Recommendation #3).

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Earnings That Exceed the Governor's Salary

P.A. 100-0023 requires employers to make an additional contribution for participants who have annual earnings that currently exceed, or are projected to exceed, the Governor's current or projected salary. The additional contribution is equal to the employer normal cost rate multiplied by salary in excess of the Governor's current or projected salary. This has the effect of shifting contributions from the State to the employers.

We have verified that Segal has reflected these additional employer contributions in the development of the net State contribution.

Conformance to Statutory Funding Changes of Public Act 100-0340

Public Act 100-0340 (P.A. 100-0340), enacted on August 25, 2017, modifies the employer contribution rate on salaries paid from federal funds. Beginning July 1, 2017, employers are required to pay the normal cost rate. Previously, employer were required to pay the employer contribution rate. Therefore, P.A. 100-0340 shifts contributions from federal funds to the State.

We have verified the arithmetic calculations made by Segal to develop the federal funds contribution.

Assessment of Actuarial Assumptions Used in the 2017 Valuation

A. Economic Assumptions

1. The Interest Rate

The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the required State contribution amount. This assumption, which is used to value liabilities for funding purposes, was lowered to 7.00% for the June 30, 2016 Actuarial Valuation. This change was recommended by Segal and supported by their report and presentation to the Board in August of 2016. This assumption was reviewed again at the June 2017 Board meeting. We reviewed the presentation materials which contained a number of rationales for their recommendation with which we agree.

After reviewing all the materials (see Appendix B of the report) that were made available, Cheiron concludes that the use of 7.00% for this valuation is reasonable.

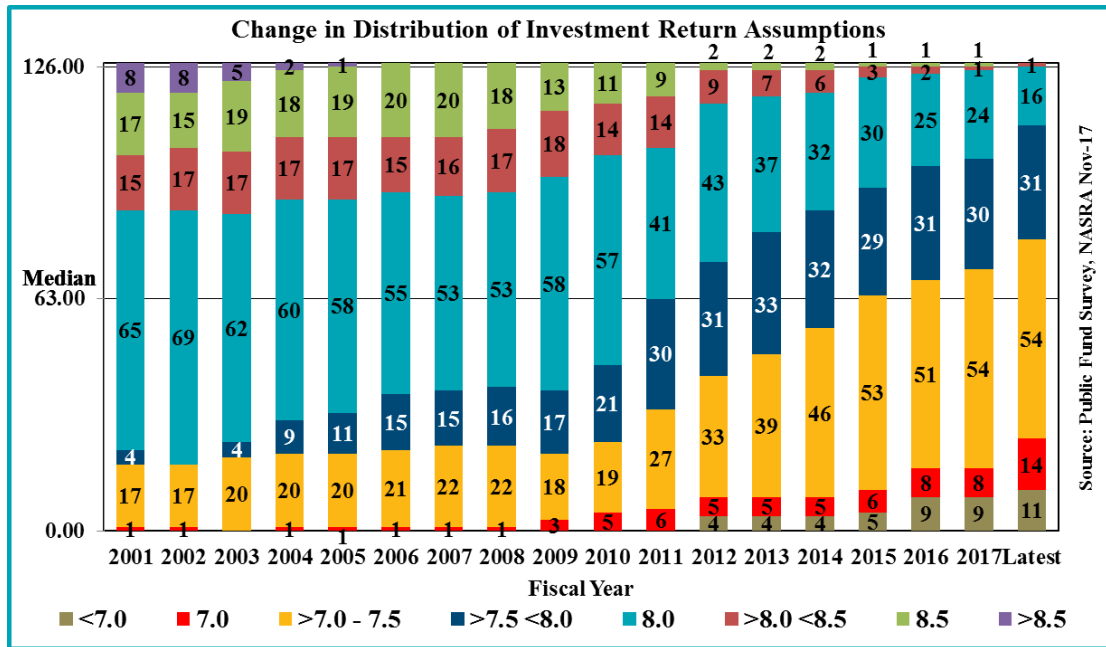
We recommend that the TRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly (Recommendation #5).

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Our rationale for this recommendation:

- A review of the interest and inflation rates does not involve the collection of significant data and can be updated annually. In addition, it keeps the Board focused more closely on these very important assumptions.
- The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 127 large retirement plans. The following chart shows the distribution of investment return assumptions for the survey since 2001. The latest data includes results collected through November 2017.



Over the period shown in the latest survey, there continues to be a pattern of reducing investment return assumptions. Of the 127 plans shown, 105 have reduced their interest rate assumption since Fiscal Year 2011. For these 105 plans, the average reduction is 0.49%. The survey is consistent with the experience of other Cheiron clients, which have generally shown a significant trend of reducing their investment return assumptions over the last several years.

- There has been emerging actuarial practice throughout the country of reducing the discount rates even below the level that the investment consultants believe is achievable. This is because of the very low interest rate environment we are currently in. The lower the interest rate environment, the greater the investment risk that must be taken to achieve an assumed rate of return. For example, in 1995 the yield on ten-year Treasury bonds (a proxy for a risk free investment) was 6.21%. As of

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November 2, 2017 these yields are now 1.87%. This means, back in 1995 in order to achieve 7.00%, a system only had to earn 0.79% more than the ten year treasury yields (“risk free” rates), whereas today a system would have to earn 5.13% above this “risk free” rate. By reducing the investment return assumption, plans are more likely to meet their funding goals without requiring investment performance so much in excess of the risk free rate.

- In addition to taking pressure off of the investment process, there is a growing concern that long-term interest rates will eventually rise. A pattern of rising interest rates generally results in declining bond returns. This in turn will result in even greater investment risks being taken on by the System on the equity side of the assets in order to compensate for both declining bond returns and the need to earn 5.13% above the risk free rate of return.
- As is the case with most maturing pension plans, TRS is experiencing negative cash flows measured as contributions less benefits and expenses. TRS’s negative cash flow is 2.8% of assets and growing. When short-term returns are expected to be lower than the long term expectations, which is the case with TRS, a plan with negative cash flows will have actuarial returns (i.e., dollar weighted returns) that are less than their “time weighted” returns.
- GASB 67 and 68 pronouncements may subject many public pension plans to use a lower interest rate for accounting disclosures and pension expense determinations in fiscal years 2014 and later. It is important to note, however, that these new standards do not define funding requirements for a plan.
- The federal government, which promulgates minimum funding standards for corporate pension plans, already requires corporate pension plans to utilize interest assumptions that are based on short-term and mid-term bond rates, which are very low (26 USC 430(h)(2)(B)).

2. *Inflation Assumption*

We find the 2.50% inflation assumption to be reasonable.

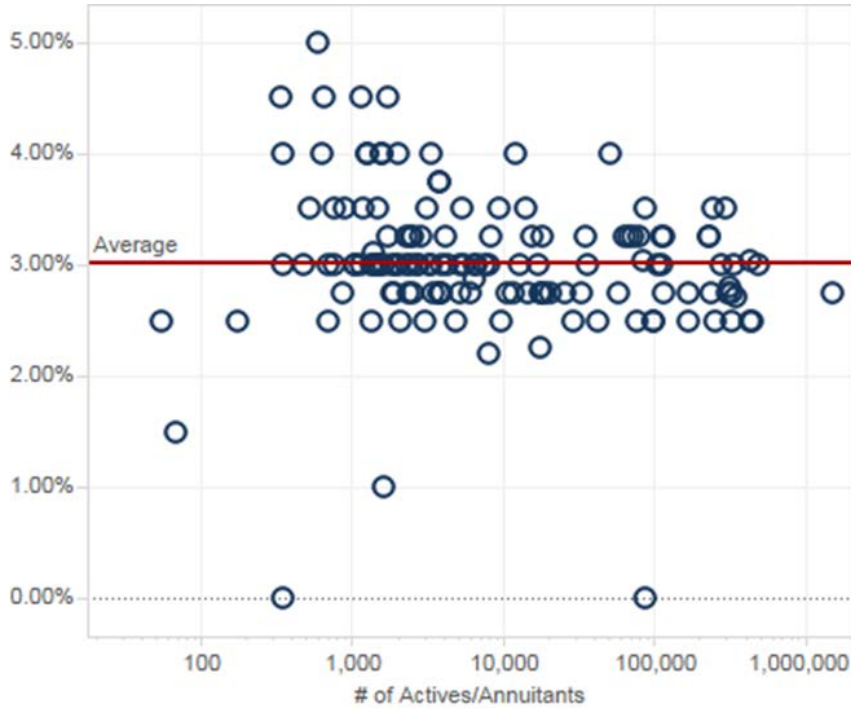
Our rationale for concurring with the 2.50% assumption:

- The July 2017 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years) inflation will average somewhere between 2.0% and 3.2% (<http://www.ssa.gov/oact/tr/2017/tr2017.pdf>). Under the intermediate cost projection the Social Security Administration uses an assumption of 2.6%.

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- The *National Conference on Public Employees Retirement Systems* (NCPERS) December 2016 Public Retirement Systems Study includes the following graphic of respondents' inflation assumptions:



This shows that the current 2.50% assumption, which TRS uses, is on the lower end of the inflation assumptions used among the 159 systems that responded to this study, with 3.0% as the average. However, we note that 40% of the systems in the two most recent studies reduced their inflation assumption between the 2015 and 2016 studies with an average reduction of 0.39%. The downward trend in this assumption is further supported by the 3.0% average for the 2016 study being a 0.2% reduction from the prior year.

3. *Salary (Annual Compensation) Increase Assumption*

The salary assumption, which is service based, ranges from 9.25% (at one year of service) to 3.25% (at 20 or more years of service) and includes an inflation component of 2.50% and a real wage growth component of 0.75%

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We find the assumption and the basis for setting it as reasonable.

Our rationale for concurring with the salary increase assumption:

- The June 2017 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (between 2027 and 2091) real wage differential will average somewhere between 0.58% and 1.82%.
- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a continued trend of lower salary increases for public sector employees.

4. Cost of Living for Tier 2 Assumption

For Tier 2 participants, benefits are increased annually equal to 50% of the consumer price index urban rates with a maximum of 3.0%. Therefore, the COLA assumption is 1.25%.

We find the assumption and the basis for setting it reasonable.

5. Tier 2 Capped Pay Assumption

Benefits for members hired after January 1, 2011, are calculated using pay that is capped under 40 ILCS 5/1-160. The pay cap increase assumption is 1.25%.

We find the assumption and the basis for setting it reasonable.

B. Demographic Assumptions

All demographic assumptions were reviewed with appropriate assumption changes adopted by the Board in August 2016. Segal has not identified any changes to these assumptions and there is no additional evidence to support a change from those assumptions adopted in August 2016.

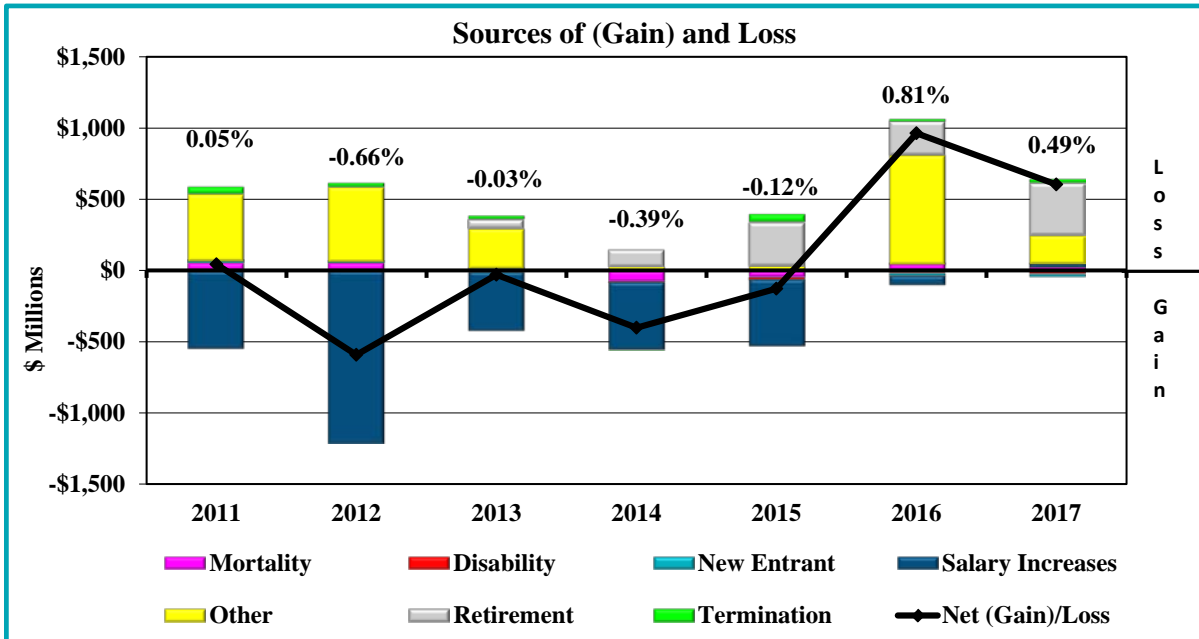
In its annual actuarial valuation reports, TRS regularly reports sources of liability gains and losses. In the 2017 report, these are shown in Section 2 on page 29. In the chart below, we have collected similar data from TRS's past valuation reports dating back to 2011 and presented a historical review of past demographic and salary increase experience gains and losses.

The chart on the following page shows the pattern of annual gains and losses attributable to seven different sources as shown in the legend. When the colored bar slices appear above zero on the Y axis, that represents an experience loss, and below zero represents an

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experience gain for that year. The net liability (gain)/loss is shown by the black line on the graph above. This net (gain)/loss as a percent of liability is shown above the bars.



The percentages shown above the bars refer to net (gain)/loss as a percentage of liability.

As a result of the recent experience study and assumption changes implemented in the June 30, 2016 Actuarial Valuation, a number of the consistent trends over this time period have been addressed.

Data Reconciliation:

The draft June 30, 2017 Actuarial Valuation includes a breakdown of gains and losses. We found this helpful in reconciling the changes in the unfunded liability from 2016 to 2017.

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Below, we summarize all the demographic assumptions that we reviewed and we have concluded all are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. Rates of Termination

Termination rates based on service, for causes other than death, disability, or retirement.

Age	<u>Under 5 Years of Service</u>		<u>5 or More Years of Service</u>	
	Male	Female	Male	Female
25	9.5%	8.4%	6.0%	6.5%
30	8.8%	11.3%	2.8%	5.0%
35	10.2%	11.6%	2.1%	3.5%
40	12.3%	10.8%	1.7%	2.2%
45	12.6%	10.3%	1.5%	1.9%
50	16.7%	11.8%	1.9%	1.7%
55	20.7%	17.0%	5.0%	3.8%
60	16.4%	16.9%	4.6%	4.0%
65	30.2%	35.0%	4.6%	4.0%

2. Rates of Mortality

Healthy Post-Retirement: RP-2014 White Collar Annuitant Tables projected generationally with scale MP-2014, with female rates multiplied by 76% for ages 50 to 77, and 106% for ages 78 to 114, and male rates multiplied by 115% for ages 78 to 114.

Disability Post-Retirement: RP-2014 Disabled Retiree Tables projected generationally with scale MP-2014.

Beneficiaries Post-Retirement: RP-2014 White Collar Annuitant Tables projected generationally with scale MP-2014, with female and male rates multiplied by 112% for ages 50 to 114.

Pre-Retirement: RP-2014 White Collar Employee Tables projected generationally with scale MP-2014.

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3. Rates of Disability

Age	Males	Females
25	0.029%	0.030%
30	0.023%	0.061%
35	0.030%	0.069%
40	0.051%	0.112%
45	0.068%	0.140%
50	0.117%	0.192%
55	0.138%	0.240%
60	0.179%	0.227%
65	0.536%	0.410%

4. Rates of Retirement

a. For Members Hired before January 1, 2011:

Age	Service				
	5 – 18	19 - 30	31	32-33	34+
54	0%	6%	8%	38%	60%
55	0%	10%	8%	38%	60%
56	0%	7%	8%	38%	45%
57	0%	7%	12%	40%	45%
58	0%	7%	12%	40%	40%
59	0%	25%	38%	60%	40%
60	14%	30%	48%	60%	40%
61	14%	27%	33%	45%	40%
62	14%	27%	50%	45%	40%
63	14%	27%	38%	50%	40%
64	24%	37%	50%	60%	40%
65-67	26%	37%	50%	50%	40%
68-69	26%	33%	50%	50%	40%
70	100%	100%	100%	100%	100%

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b. For Members Hired on or after January 1, 2011:

Age	Service				
	9 – 18	19 - 30	31	32-33	34+
≤ 61	0%	0%	0%	0%	0%
62	13%	15%	20%	25%	25%
63	8%	10%	15%	20%	20%
64	8%	10%	15%	20%	20%
65	8%	10%	15%	20%	20%
66	20%	10%	15%	20%	20%
67	20%	40%	70%	70%	70%
68	20%	40%	40%	40%	40%
69	20%	40%	40%	40%	40%
70	100%	100%	100%	100%	100%

5. Percent Married

For valuation purposes, 85% of members are assumed to be married. Male members are assumed to be three years older than their spouses, and female members are assumed to be three years younger than their spouses.

6. Severance Pay

20% of retirees are assumed to receive severance pay and the average severance payment will be 2.5% of other pensionable earnings in the last year of employment.

7. Optional Service Purchases

The liability for retirement benefits for active members who have not previously purchased optional service is increased to cover the employer cost of out-of-system service purchased in the last two years prior to retirement. The amount purchased varies by the amount of regular service at retirement. Representative amounts purchased at retirement, and other assumptions used, are as follows:

Regular Service at Retirement	Maximum Service Purchased
10 years	0.204 years
20 years	0.537 years
25 years	1.029 years
30 years	1.424 years
34 or more	None

- a. Actual optional service credit for each current member is provided by TRS;
- b. No additional service purchases will be assumed for members who currently have optional service credit;

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- c. Members will not purchase service if it does not improve their pension benefit; and
- d. When optional service is purchased within the last two years prior to retirement, 25% of the cost is covered by member payments and the remaining cost is the responsibility of the employer.

8. Sick Leave Service Credit

The assumed unused and uncompensated sick leave service credit at retirement varies by the amount of regular service at retirement. Representative assumed amounts of unused and uncompensated sick leave service are as follows:

Regular Service at Retirement	Sick Leave Service Credit
20 years	0.938 years
25 years	1.115 years
30 years	1.276 years
34 years	1.450 years
35 or more	None

9. Administrative Expenses

\$26,549,011 of administrative expenses is expected to be paid for the year beginning July 1, 2017. \$27,496,337 of administrative expenses is expected to be paid for the year beginning July 1, 2018 and each year thereafter, increased by the rate at which payroll is expected to increase.

10. 2.2 Upgrade Assumption

For those active members who have already made a payment to upgrade past service prior to June 30, 1998, their benefits are based on their upgrading at the valuation date. For all other active members, they are assumed to upgrade at retirement.

11. Census and Assets

The current actuarial valuation was based on the latest membership data available, which were submitted by the System for active, inactive, and retired members as of the prior valuation date. The valuation assumptions were used to project results to account for the one-year difference in the census date and the valuation date. Any change in liability due to changes in census between the collection date of the census information and the valuation date is captured in the next actuarial valuation.

We continue to recommend evaluating the implications of the one year delay in data used for the valuation to substantiate if it is immaterial (Recommendation #6). The implications of the use of the prior year's data brought forward to represent the current year's

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data in the report should be numerically demonstrated to allow for the evaluation of the significance to the resulting liabilities and plan costs.

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C. Actuarial Methods

Actuarial methods consist of three components: (1) the funding method, which is the attribution of total costs to past, current, and future years; (2) the method of calculating the actuarial value of assets (i.e., asset smoothing); and, (3) the amortization basis of the Unfunded Actuarial Liability (UAL). Since the amortization basis is governed by State law, we do not comment on it here.

1. Cost Method

The System uses the projected unit credit cost method (PUC) to assign costs to years of service, as required under the Pension Code (40 ILCS 5/16). **We have no objections with respect to using the PUC method, although we, as Segal does, would prefer the Entry Age Normal (EAN) funding method as it is more consistent with the requirement in 40 ILCS 5/16 -158 for level percentage of pay funding.**

Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date but not beyond) is taken into account in calculating these benefits. The present value of these benefits based on past service and future compensation is the actuarial accrued liability for a given active participant. Under the PUC cost method, the value of an active participant's benefits tends to increase more sharply over his or her later years of service than over his or her earlier ones. As a result of this pattern of benefit value increasing, while the PUC method is not an unreasonable method, more plans use the EAN funding method to mitigate this effect. It should also be noted that the EAN method is the required method to calculate liability for GASB 67 & GASB 68.

2. Asset Smoothing Method

The actuarial value of assets for the System is a smoothed market value. Unanticipated changes in market value are recognized over five years in the actuarial value of assets. The primary purpose for smoothing out gains and losses over multiple years is so fluctuations in the actuarial value of assets will be less volatile over time than fluctuations in the market value of assets.

The December 2016 NCPERS study previously referenced found that the majority of plans responding to the survey have a five-year smoothing period.

Smoothing the market gains and losses over a period of five years to determine the actuarial value of assets is a generally accepted approach in determining actuarial cost, and we concur with its use.

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Another aspect of asset smoothing methods is whether or not to limit the maximum spread between the actuarial value of assets and the market value of assets. Many public sector pension plans limit the actuarial value of assets to be in any year no more than 120% of market value, and no less than 80% of market value. In fact, the Internal Revenue Service (26 USC 430(g)(3)(B)(iii)) mandates this “corridor” for private sector pension plans (a 90%-110% corridor is mandated). Even though this is not mandated for public plans, we believe that the use of this type of corridor is a sounder actuarial practice, and according to ASOP No. 44 in Section 3.3 b. 1, the actuarial value of assets should “...fall within a reasonable range around the corresponding market values.”

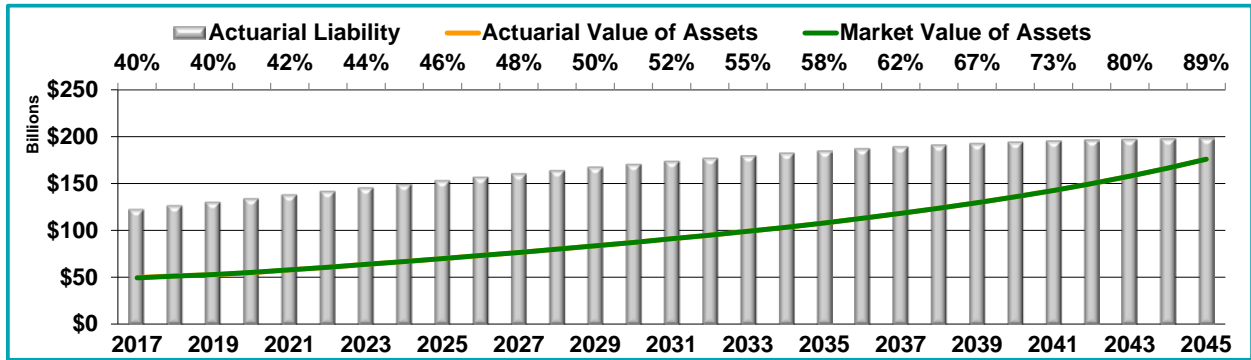
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SECTION IV – PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2017 Actuarial Valuation of TRS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

The graphs shown below are independent approximations of the projections performed by the State Actuary to verify that the System's funding projections are reasonable. They do not reflect all the precision of the projections applied by the System's actuary, but instead they are intended to verify the reasonableness of the modeling done by the System's actuary.

The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As seen in the graph on page 7 and the detailed figures in Section 5 of the draft June 30, 2017 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projections. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funding ratio for each year is shown at the top of the graph. For example, in 2031, the funding ratio is approximately 52% with assets being approximately \$91 billion and liabilities being approximately \$174 billion.

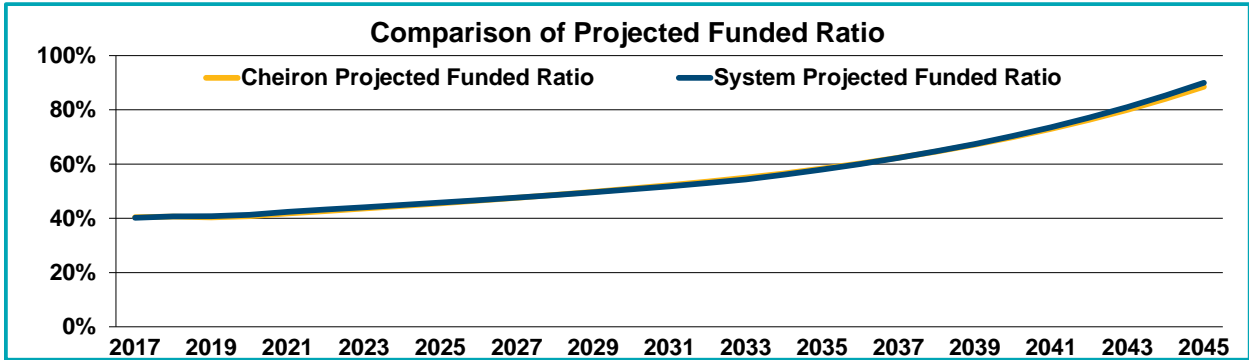


Source: Cheiron projection analysis.

When we compare our projected funding ratio against the results shown in the draft June 30, 2017 Actuarial Valuation, **we find a very close match in expected funded ratio**. This close match of the funded ratio indicates that the projections done by the System's actuary are reasonable and the fact we show slightly different funded ratios is a function of Cheiron's approximation.

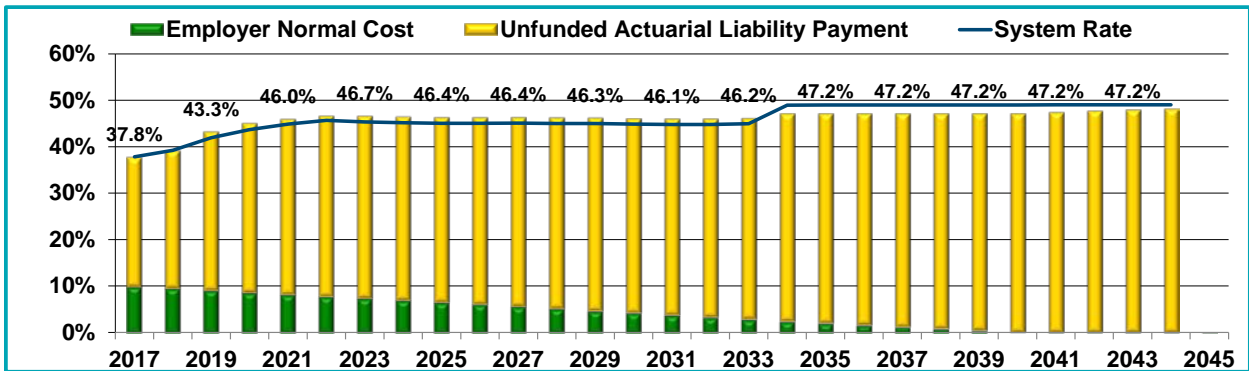
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Source: Cheiron projection analysis.

The following graph shows the expected contributions calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for the 2017 year was set based on the June 30, 2016 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2018 (Fiscal Year Ending June 30, 2019). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by participants not covered by employee contributions based on the statutory funding method; and 2) an amortization of the unfunded liability. The normal cost is shown by the green bars and the amortization of the UAL by the yellow bars. The percentages show the total contribution rate calculated by Cheiron which is equal to the sum of the bars. The graph shows that a larger percentage of the total contribution is being made toward the UAL payment later in the period. The blue line shows the projected contribution rate as a percent of payroll from the draft June 30, 2017 Actuarial Valuation. The difference between Cheiron's approximation and the System's projections is the difference between the top of the bars and the line. The contributions are being limited by the maximum contribution described in the General Obligation Bond Act prior to 2033, which is why the rate increases after 2033.



Source: Cheiron projection analysis.

Our conclusion is that **the projections performed by the System's actuary are reasonable.**

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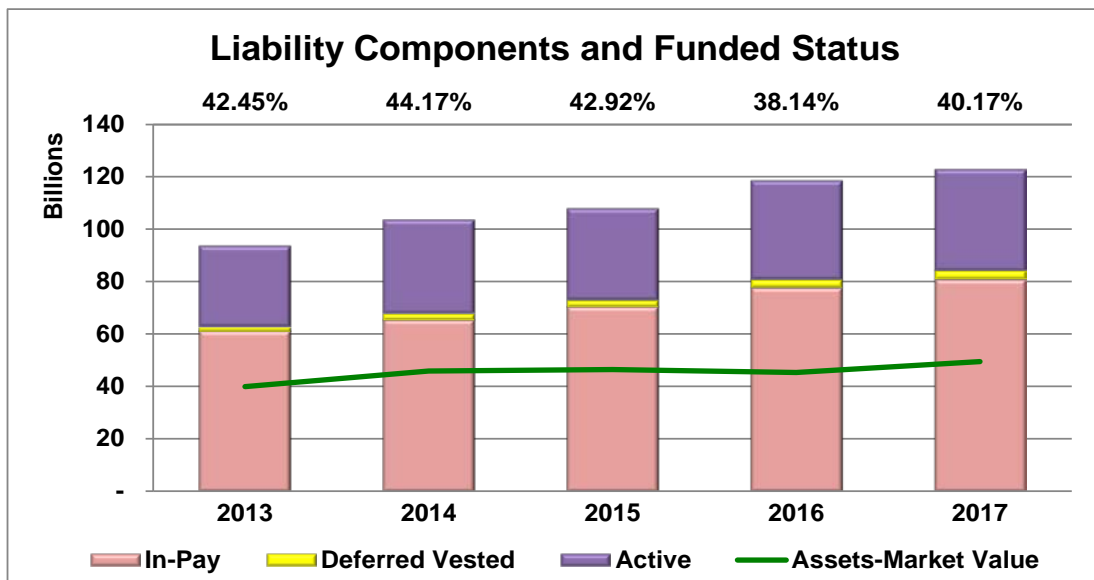
We have added a new section in this year's report focusing on various measures of funding adequacy. We will examine the System's funded status, the statutory funding requirements compared to contributions needed to pay down the Unfunded Actuarial Liability (UAL), the sources of change in UAL, and net cash flow. The actuarial valuation report prepared by Segal includes traditional actuarial measurements, which should be enhanced by the additional stress testing and projection analysis that we requested. Given the unique and substantial funding challenges faced by the Illinois pension systems, we created this new section on funding adequacy measures and trends to supplement that information from the Segal report and better inform plan trustees and other stakeholders about the funding shortfall.

1. Plan Funded Status

The first funding adequacy measure we present is a historical funded status trend for the past five years. Funded status for this measure is defined as the ratio of the market value of assets to the actuarial liability. The chart below shows TRS' funded status since 2013 has gone from 42.45% funded to 40.17% funded in 2017, a decline in funded status of 2.28%. In addition to showing the funded status, this chart also shows the breakdown of the plan's liabilities by membership status:

- Active status – this is the liability (present value of benefits already earned) for future payments to members who are currently working in the System,
- Deferred Vested status – this is the liability for members who are no longer working in the system, and
- In-Pay status – this is the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown demonstrates the increasing maturity of the plan, as the in-pay status liabilities are becoming a larger portion of the total plan liabilities. In addition, this chart shows that plan assets only cover around half of the liabilities for just those members currently in-pay status.



Source: Cheiron analysis of funding adequacy.

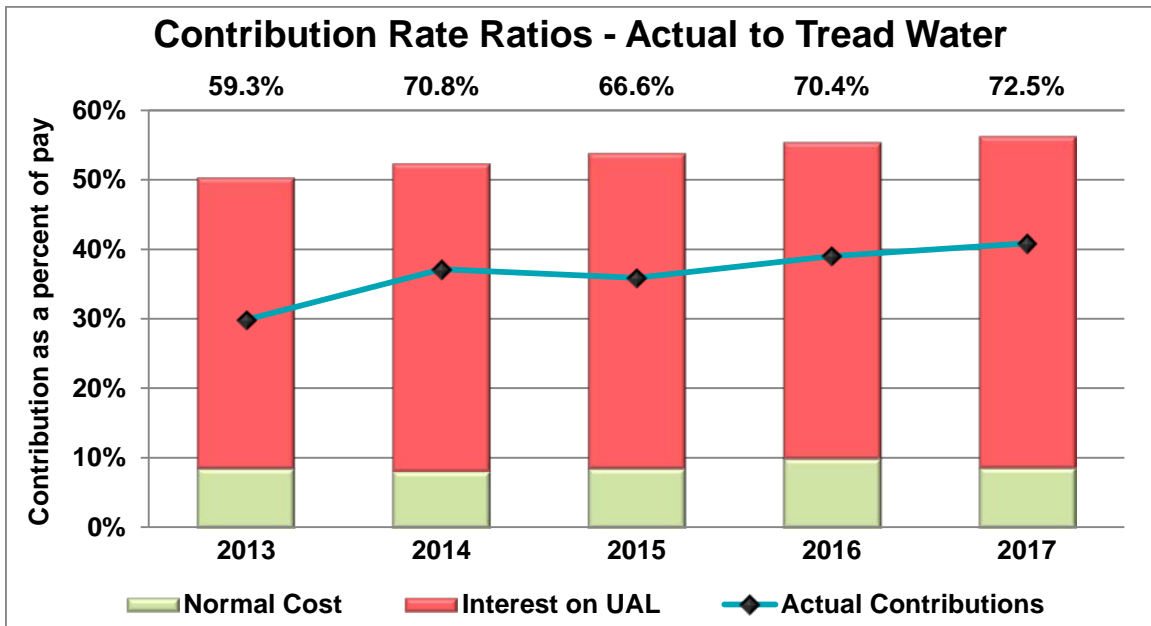
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SECTION V – ANALYSIS OF FUNDING ADEQUACY

2. Contributions as a Percent of Payroll Compared to Tread Water Contribution

The next funding adequacy measure compares the TRS historical statutory contribution rates to tread water contribution rates. The tread water contribution rates consist of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability (UAL). The reason that this sum is referred to as the tread water contribution rate is because it is the contribution required so that the UAL will remain constant, or “tread water” (absent experience gains or losses). This tread water concept may be better understood with a credit card analogy. If a credit card holder fails to pay each month the amount of purchases made in that month (i.e., normal cost) and the monthly finance charge on the unpaid purchases from prior months (i.e., the interest on the UAL), his or her credit card debt will grow.

As the chart below shows, over the past five years, the statutory contribution rate was significantly less than the tread water rate. **The statutory contribution as a percent of the tread water rate is shown at the top of the graph for each year.** The deficiency between the actual contribution rate and the tread water rate has been decreasing slightly since 2013, but based on current projections is expected to continue to exist for many more years under the current statutory funding requirements, which indicates the dollar value of the UAL will continue to grow.



Source: Cheiron analysis of funding adequacy.

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3. Sources of Changes in the UAL

Our third funding adequacy metric identifies the factors that have contributed to the changes in the UAL from year to year between 2008 and 2017. Except for gains due to investment returns in 2014, 2015 and 2017, liability experience gains in 2008 and 2012, and assumption changes in 2009, all other factors have resulted in increases in the UAL in every year. The components for change to UAL shown in the chart below are:

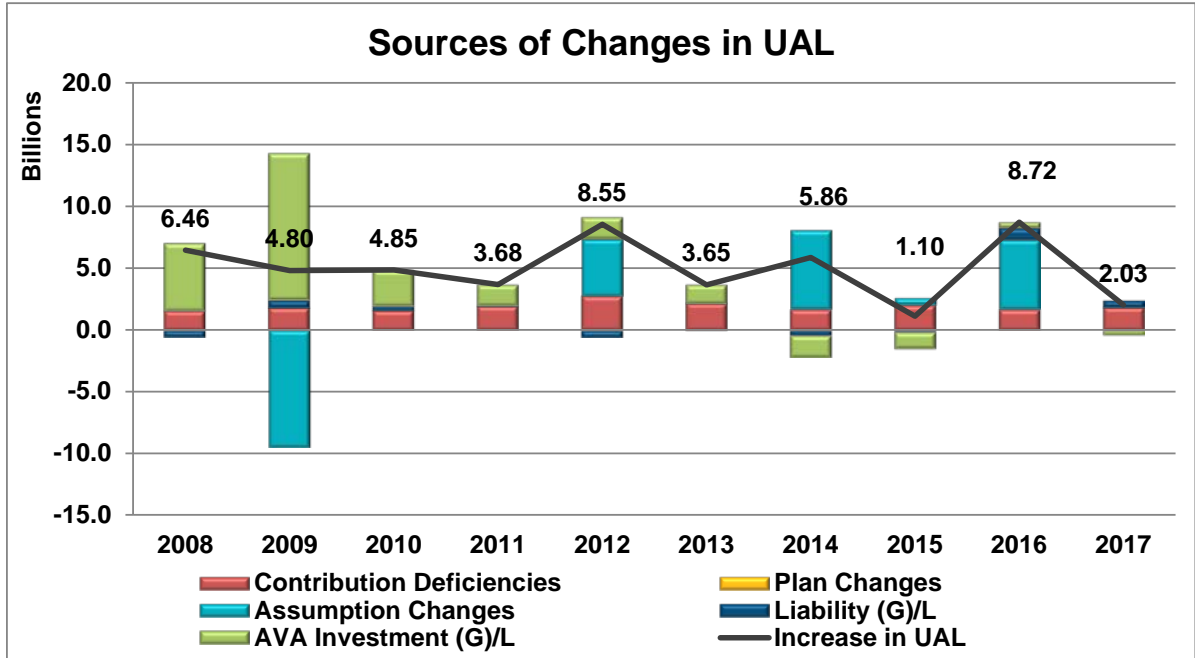
- **Contribution Deficiencies**, which are based on comparisons to the tread water contribution, have increased the UAL by \$18.7 billion over this period.
- **Assumption Changes** are changes to actuarial assumptions as the System updated expectations on future investment returns and life expectancy. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations. Over this period assumption changes have increased the UAL by \$7.8 billion.
- **AVA (Actuarial Value of Assets) Investment (G)/L** is the net investment gain or loss due to assets earning more or less than assumed. These have increased the UAL over this period by \$22.3 billion.
- **Plan Changes** are any modifications of the design of the plan which have affected benefits already accrued. Since most of the changes to the System's plan affect only future benefits the impact has been negligible during this period.
- **Liability (G)/L** are the changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.). During this period these were generally small and had a net effect of only increasing the UAL by \$0.9 billion.

The sum of all the components total change in UAL is shown as the black line and values in the chart.

We expect that this chart will help stakeholders understand the sources of growth in the UAL over the past decade and inform discussions about the current funding requirements and adequacy.

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Source: Cheiron analysis of funding adequacy.

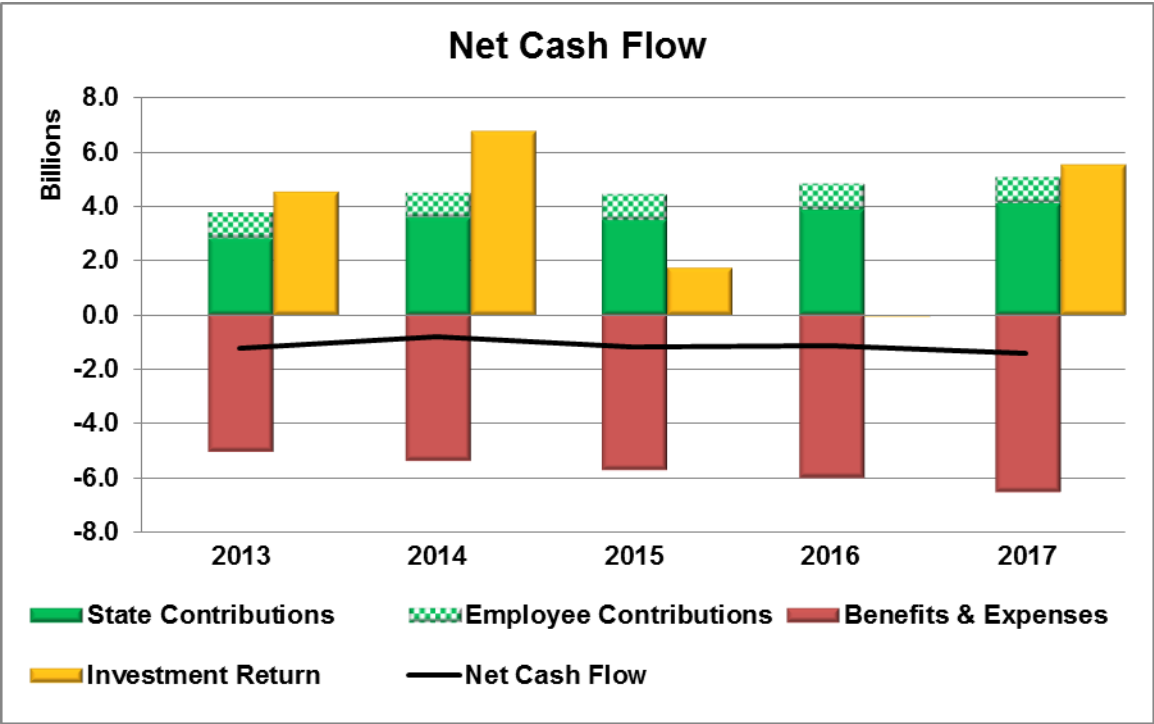
4. Net Cash Flow Analysis

The last funding adequacy measure we present is an analysis of the plan’s net cash flow before taking into account investment return, which is defined as State and Member contributions less benefit payments and administrative expenses. This measure is an indication of a pension plan’s maturity level in terms of its net cash flow relative to plan assets. In a very mature plan, it is expected that cash flows will be negative as the benefits and expense far exceed contributions. In a very immature plan, the contributions typically are more than the payouts so the net cash flow is positive. The more negative net cash flow is, the more vulnerable it is to market downturns. This is because when a pension plan has more payouts than contributions, then plan assets are needed to pay some portion of the payouts. So, with a market downturn not only does the plan suffer a loss in investment income, but also some portion of its principal, leaving fewer assets left to invest and recapture during a recovery.

Looking at the chart on the following page, TRS has a significant negative net cash flow (black line). This measure should continue to be monitored as negative cash flow increases the System’s vulnerability to market downturns.

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Source: Cheiron analysis of funding adequacy.

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STATUS OF RECOMMENDATIONS FROM THE 2016 STATE ACTUARY’S REPORT

Response to Recommendations in 2016

In the State Actuary’s Preliminary Report on the Teachers’ Retirement System of Illinois presented December 15, 2016, Cheiron made several recommendations. Below we summarize how these recommendations were reflected in either the System’s comments last year or in this year’s draft June 30, 2017 Actuarial Valuation.

Recommendations to Retirement System from 2016 State Actuary Report	Status	Comments
<p>1. We recommend that the funding method be changed to at least fully fund future plan benefit accruals to avoid continued systematic underfunding of TRS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.</p>	Partially Implemented	<p>The System has adopted a funding policy that would meet recommendation; however, the actual funding of the system is based on State statute and a change in the funding method and funding policy would require a statutory change.</p> <p>The System funding policy targets full funding after 20 years and is considered actuarially sound under the method called <i>Actuarial Math 2.0</i>.</p> <p>Recommendation repeated.</p>
<p>2. We recommend that the System’s actuary expand the stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs.</p>	Partially Implemented	<p>While the TRS report shows some sensitivity testing of the implications and sensitivity of future funded status and funding requirements resulting from returns greater and less than the assumed return rate, this does not represent stress testing. Stress testing is a valuable tool by which risks of the plan, such as plan insolvency, can be identified. More detailed projections of the impact of the alternative scenarios on the unfunded actuarial liability could enhance the presentation.</p> <p>Response stated “Segal does not feel it is appropriate to include more extensive insolvency scenarios in the valuation”.</p>

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STATUS OF RECOMMENDATIONS FROM THE 2016 STATE ACTUARY'S REPORT

Recommendations to Retirement System from 2016 State Actuary Report	Status	Comments
		Segal's April 2017 and October 2017 Board presentations included some sensitivity testing. Recommendation repeated.
3. We recommend the TRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.	Implemented	The economic assumptions were reviewed at the June 2017 Board meeting. The Board decided to continue use of a 7.00% rate of return.
4. We continue to recommend evaluating the implications of the one year delay in data used for the valuation to substantiate if it is immaterial.	Not Implemented	Recommendation repeated.

Chapter Three

PRELIMINARY REPORT ON THE STATE UNIVERSITIES RETIREMENT SYSTEM

In accordance with 30 ILCS 5/2-8.1, Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the State Universities Retirement System (SURS) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to SURS on December 1, 2017. The preliminary report was based on Cheiron's review of actuarial assumptions included in SURS' 2017 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the State Universities Retirement System. SURS' written response, provided on December 13, 2017, can be found in Appendix C.

OVERVIEW	
STATE UNIVERSITIES RETIREMENT SYSTEM	
as of June 30, 2017	
Actuarial accrued liability	\$41,853,348,000
Actuarial value of assets	<u>\$18,594,326,238</u>
Unfunded liability	\$23,259,021,762
Funded ratio	44.4%
Employer normal cost	\$402,624,000
State contribution (FY19)	\$1,655,154,000
Active members	75,969
Inactive members	90,819
Current benefit recipients	<u>64,545</u>
Total membership	231,333
Interest rate assumption	7.25%
Inflation assumption	2.75%
Actuarial cost method	Projected Unit Credit
Asset valuation method	5-year Smoothing
Executive Director	Martin Noven
Actuarial Firm	Gabriel, Roeder, Smith & Company
Source: June 30, 2017 SURS actuarial valuation report.	

December 20, 2017

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Board of Trustees
State Universities Retirement System of Illinois
1901 Fox Drive
P.O. Box 2710
Champaign, Illinois 61825-2710

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS), of the required State contribution to the State Universities Retirement System of Illinois (SURS or System) for Fiscal Year 2019.

In summary, we believe that the assumptions and methods used in the draft June 30, 2017 Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the State funding requirements that do not conform to Actuarial Standards of Practice, were properly calculated in accordance with State law.

Section I of this report describes the review process undertaken by Cheiron. Section II summarizes our findings and recommendations. Section III provides the supporting analysis for those findings and presents more details on our assessment of the actuarial assumptions and methods employed in GRS's actuarial certification, as well as our assessment of GRS's determination of the Required State Contribution for Fiscal Year 2019. Section III also includes comments on other issues impacting the funding of the State Universities Retirement System, including the implications of Article 15 of the Illinois Pension Code, which establishes the statutory funding requirements for the System. **In our opinion, the statutory mandated minimum funding requirements call for inadequate funding and do not meet Actuarial Standards of Practice (ASOP), particularly ASOP No. 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions.** Section IV reviews the projections contained in the draft June 30, 2017 Actuarial Valuation. Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by SURS and GRS. This information includes actuarial assumptions and methods adopted by the SURS Board, plan provisions, the draft June 30, 2017 Actuarial Valuation, the 2015 Experience Review Report, the NEPC 2017 Capital Market Assumptions report, 2017 minutes of the SURS Board of Trustee meetings, and various memos prepared by the System's advisors, staff, and

Executive Director. A detailed description of all information provided for this review is contained in Appendix B.

To the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Office of the Auditor General and the State Universities Retirement System of Illinois for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

Michael J. Noble, FSA, FCA, MAAA, EA
Principal Consulting Actuary

SIGNED ORIGINAL ON FILE

Gene Kalwarski, FSA, FCA, MAAA, EA
Principal Consulting Actuary

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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SECTION I – REPORT SCOPE

Illinois Public Act 097-0694 (the Act) amended the Illinois State Auditing Act (30 ILCS 5/2-8.1) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the State Universities Retirement System of Illinois (SURS or System), and to issue to the SURS Board this preliminary report on the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contributions for Fiscal Year (FY) 2019. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the SURS Board to consider before finalizing its certification of the required State contribution for FY 2019.

While the Act states that just the actuarial assumptions and valuation are to be reviewed, we have also reviewed the actuarial methodologies (funding and asset smoothing methods) employed in preparing the Actuarial Certification, as these methods can have a material effect on the amount of the State contribution being certified. Finally, we have offered our opinion on the implications of Article 15-155 of the Illinois Pension Code, which impacts the contribution amount certified by GRS.

In conducting this review, Cheiron reviewed the draft June 30, 2017 Actuarial Valuation prepared by GRS, the 2015 Experience Review Report, the NEPC 2017 Capital Market Assumptions report, 2017 minutes of the SURS Board of Trustees meetings, and various memos prepared by the System's advisors, staff, and Executive Director. The specific materials we reviewed are listed in Appendix B.

In addition to reviewing the actuarial certification of the required State contribution to SURS, the Act requires the State Actuary to conduct a review of the "actuarial practices" of the Board. While the term "actuarial practices" was not defined in the Act, we continue to interpret this language to mean that we review: (1) the use of a qualified actuary (as defined in the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2017 Actuarial Valuation.

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SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2017 Actuarial Valuation of SURS as well as the “actuarial practices” of the SURS Board. Section III of this report provides detailed analysis and rationale for these recommendations.

Proposed Certification of the Required State Contribution

Gabriel, Roeder, Smith & Company (GRS) has determined that the FY 2019 required State contribution calculated under the current statutory funding plan is \$1,655,154,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based. As such, we have accepted GRS’s annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions. We also note that the SURS Board in 2016 did accept our 2015 recommendation to retain the services of an independent actuary to conduct a full scope actuarial audit. This audit, which was performed by Segal Consulting, fully replicated GRS’s June 30, 2015 Actuarial Valuation and validated the results of that valuation.

State Mandated Funding Method

1. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SURS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Conformance to Statutory Funding Changes of Public Act 100-0023

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modifies the State’s funding policy to require that the contribution impact of all assumption changes be phased-in over a 5-year period. As such, the Act delays the funding of the System. Assumption changes result from more accurately identifying the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact of these changes are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a 5-year period beginning at the date of adoption.

The Act requires that the impact of assumption changes “be implemented in equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.” This amount is then implemented “at the resulting annual rate in each of the remaining fiscal years in that 5-year period.” GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of payroll, and

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SECTION II – SUMMARY OF RECOMMENDATIONS

reflecting one-fifth of that percentage change over five years. The method used by GRS will result in the cost impact due to assumption changes being recognized as increasing dollar amounts. This is because the recognition as an equal percentage of pay gets applied to an increasing payroll over a 5-year period. The language of the Act, which indicates recognition of equal dollar amounts, would result in a decreasing adjustment as a percentage of payroll, provided payroll actually grows each year.

2. We recommend that GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act.

Also as a result of P.A. 100-0023, the SURS Board is required to recertify the prior year's valuation in accordance with the Act. GRS has determined that the FY 2018 recertified required State contribution is \$1,629,307,606, compared to the original FY 2018 amount of \$1,753,685,000. Based on the method used by GRS, we have verified the arithmetic calculations made by GRS to develop the phase-in of assumption changes in the recertified June 30, 2016 valuation.

Optional Hybrid Plan

P.A. 100-0023 creates an optional hybrid plan for current Tier 2 members and future new hires. The hybrid plan consists of a reduced defined benefit plan and a defined contribution plan. Employers are required to contribute the normal cost plus an additional 2% of pay for each employee who participates in the optional hybrid plan or Tier 2 in lieu of the optional hybrid plan, for fiscal year 2021 and after.

GRS has reflected the hybrid plan in the June 30, 2017 valuation. This is appropriate since the State mandated funding method requires projecting the liabilities of the System to 2045.

For SURS, it is assumed that the Optional Hybrid Plan will be established by July 1, 2019 and members will be able to participate beginning in fiscal year 2020. Based on consultation with SURS staff, GRS has assumed that, when available, 60% of new members will elect the Optional Hybrid Plan, 20% will elect the Tier 2 Plan, and 20% will elect the Self Managed Plan. While not developed from direct experience since the plan is not yet available, these assumptions seem reasonable based on the plan design and the expectations of GRS and SURS staff.

Earnings That Exceed the Governor's Salary

P.A. 100-0023 requires employers to make an additional contribution for participants who have annual earnings that currently exceed, or are projected to exceed, the Governor's current or projected salary. The additional contribution is equal to the employer normal cost rate multiplied by salary in excess of the Governor's current or projected salary.

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SECTION II – SUMMARY OF RECOMMENDATIONS

GRS notes that the estimated additional contribution has been calculated and provided by SURS. This includes a component in which the contribution is adjusted down for members whose employers are already make normal cost adjustments. We have verified that GRS has reflected these additional employer contributions in the development of the net State contribution.

Assessment of Actuarial Assumptions Used in the 2017 Valuation

30 ILCS 5/2-8.1 requires the State Actuary to identify recommended changes in actuarial assumptions that the SURS Board must consider before finalizing its certification of the required State contribution. We have reviewed all the actuarial assumptions used in the State Universities Retirement System's draft June 30, 2017 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2017 Valuation

3. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth), can have on future State costs. In particular, the tests should demonstrate whether or not there is a potential for unsustainable costs during the statutory funding period. While GRS did not include such stress testing in this year's report, last year they did prepare under separate cover a stress testing report showing various implications of volatile investment returns as well as illustrating different assumptions regarding future election rates to the Self-Managed Plan (SMP), but did not include such stress testing in this year's draft report. We recommend that stress testing be added into this year's report. Because the public may only look to the valuation report for this type of information, we believe it should be contained here instead of any supplemental document to the Board that may potentially be overlooked.

Recommended Changes for Future Valuations

4. We recommend that the SURS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.

GASB 67 and 68

The 2017 SURS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2017 SURS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

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SECTION III – SUPPORTING ANALYSIS

In this section we provide detailed analysis and supporting rationale for the recommendations that were presented in Section II of this report.

Proposed Certification of the Required State Contribution

As stated in our summary of recommendations in Section II, we have verified the arithmetic calculations made by GRS to develop this required State contribution, reviewed the assumptions on which it is based, and accepted GRS's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

However, the SURS Board in 2016 did retain the services of an independent actuary to conduct a full scope actuarial audit. This audit, which was performed by Segal Consulting, fully replicated GRS's June 30, 2015 Actuarial Valuation, and validated the results of that valuation. The audit results also found, with minor exception, that the methods and assumptions used in the valuation were reasonable, and that the census data appeared complete and, in Segal's opinion, was sufficient to support the conclusions reached in the valuation report.

State Mandated Methods

The Illinois Pension Code (40 ILCS 5/15-155) is deficient in terms of establishing a method that adequately funds the System. This law requires that the actuary base the required contribution using a prescribed funding method that achieves 90% funding in the year 2045. This does not meet generally accepted actuarial principles because the System is not targeted to be funded to 100% and the funding of the System is pushed too far into the future. In addition, the on-going benefits that will be earned in the future are also being only funded at 90%. The method defined in the Code does not conform to the guidelines in ASOP No. 4, Section 3.14 regarding the allocation procedures of costs to the expected benefit payments which provides:

When selecting a contribution allocation procedure, the actuary should select a contribution allocation procedure that, in the actuary's professional judgment, is consistent with the plan accumulating adequate assets to make benefit payments when due, assuming that all actuarial assumptions will be realized and that the plan sponsor or other contributing entity will make actuarially determined contributions when due.

We recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SURS (Recommendation #1). Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.

The GRS draft June 30, 2017 Actuarial Valuation includes a recommended funding policy which would contribute the normal cost plus an amortization payment that would seek to fully pay off the total unfunded accrued liability over a closed period of no less than 15 years and no more than 27 years (which would result in full funding by 2045). Assuming a 27-year amortization

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schedule, GRS calculated a fiscal year 2019 State contribution amount of \$2,060,593,000 (including SMP and Employer contributions). We concur with GRS's recommendation and demonstration of an alternative funding approach and agree that it conforms to a goal of full funding within a reasonable time period and is in accordance with generally accepted actuarial practices.

Based on the draft June 30, 2017 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 44.4%. We have concerns about the solvency of the System if there is a significant market downturn. This is why we continue to recommend stress testing be done to determine whether there will be sufficient assets under the State mandated funding method to pay benefits if there is a significant market downturn.

We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether or not there is a potential for unsustainable costs during the statutory funding period (Recommendation #3).

As mentioned in Section II, while GRS did not include such stress testing in this year's report, last year they did prepare, under separate cover, a stress testing report showing various implications of volatile investment returns as well as illustrating different assumptions regarding future election rates to the Self-Managed Plan (SMP), but did not include such stress testing in this year's draft report. The reason we recommend such stress testing be included in the valuation report is because that is the report that most stakeholders of the plan look to for assessing the plan's financial conditions. Supplemental reports, such as GRS's stress testing report, may not be publicly identified, and therefore not readily accessible.

Conformance to Statutory Funding Changes of Public Act 100-0023

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modifies the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a 5-year period. As such, the Act further erodes the potential funded status of the System. Assumption changes result from more accurately identifying the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact resulting from more accurately identifying the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a 5-year period beginning at the date of adoption

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SECTION III – SUPPORTING ANALYSIS

Also as a result of P.A. 100-0023, the System Actuary is required to recertify the prior year's valuation in accordance with the Act. Based on the method used by GRS we request additional disclosure of calculations made by GRS to develop the phase-in of assumption changes in the recertified June 30, 2016 valuation.

Public Act 100-0023 states:

A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applies in State fiscal year 2018 or thereafter shall be implemented in equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.

A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applied to the State contribution in fiscal year 2014, 2015, 2016, or 2017 shall be implemented:

- (i) as already applied in State fiscal years before 2018; and*
- (ii) in the portion of the 5-year period beginning in the State fiscal year in which the actuarial change first applied that occurs in State fiscal year 2018 or thereafter, by calculating the change in equal annual amounts over that 5-year period and then implementing it at the resulting annual rate in each of the remaining fiscal years in that 5-year period.*

GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of expected 2018 payroll, and reflecting one-fifth of that percentage change over five years. In the recertification letter and exhibits, there is a clear demonstration of the dollar amounts to be smoothed as a result of the assumption changes as disclosed in the 2013, 2014, and 2015 actuarial valuation reports and the calculation of the annual rate change based on projected FY 2018 Total Payroll. This rate adjustment is then recognized over a 5-year period as an adjustment to the contribution rate that would otherwise be required from the State. A similar calculation is shown in the draft 2017 Actuarial Valuation. The method used by GRS will result in the cost impact due to assumption changes being recognized as increasing dollar amounts. This is because the recognition as an equal percentage of pay gets applied to an increasing payroll over a 5-year period. The language of the Act, which indicates recognition of equal dollar amounts, would result in a decreasing adjustment as a percentage of payroll, provided payroll actually grows each year.

We recommend that GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act (recommendation #2).

We note that on December 5, 2017 GRS provided an additional disclosure to the Board which demonstrated the impact of using a level dollar adjustment method. GRS concluded that "the method used is a reasonable interpretation of the language contained in Public Act 100-0023.

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SECTION III – SUPPORTING ANALYSIS

Optional Hybrid Plan

P.A. 100-0023 creates an optional hybrid plan for current Tier 2 members and future new hires. The optional hybrid plan consists of a reduced defined benefit plan and a defined contribution plan. Employers are required to contribute for each employee who participates in the optional hybrid plan or Tier 2 in lieu of the optional hybrid plan, the normal cost plus for fiscal year 2021 and after an additional 2% of pay.

GRS has reflected the hybrid plan in the June 30, 2017 valuation by anticipating that future participants elect the optional hybrid plan and adjusting the contribution requirement to reflect this information. For SURS, it is assumed that the Optional Hybrid Plan will be established by July 1, 2019 and members will be able to participate beginning in fiscal year 2020. Based on consultation with SURS staff, GRS has assumed that, when available, 60% of new members will elect the optional hybrid plan, 20% will elect the Tier 2 Plan, and 20% will elect the Self Managed Plan. While not developed from direct experience since the plan is not yet available, these assumptions seem reasonable based on the plan design and the expectations of GRS and SURS staff.

Earnings That Exceed The Governor's Salary

P.A. 100- 0023 requires employers to make an additional contribution for participants who have annual earnings that currently exceed, or are projected to exceed, the Governor's current or projected salary. The additional contribution is equal to the employer normal cost rate multiplied by salary in excess of the Governor's current or projected salary.

GRS notes that the estimated additional contribution has been calculated and provided by SURS. This includes a component in which the contribution is adjusted down for members whose employers are already make normal cost adjustments. We have verified that GRS has reflected these additional employer contributions in the development of the net State contribution.

Assessment of Actuarial Assumptions Used in the 2017 Valuation

A. Economic Assumptions

1. The Interest Rate

The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the required State contribution amount. This assumption, which is used to value liabilities for funding purposes, was maintained at 7.25% for the draft June 30, 2017 Actuarial Valuation.

After reviewing all the materials (see Appendix B of the report) that were made available, Cheiron concludes that the use of 7.25% for this valuation is reasonable.

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We recommend that the SURS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly (Recommendation #4).

Our rationale for these recommendations:

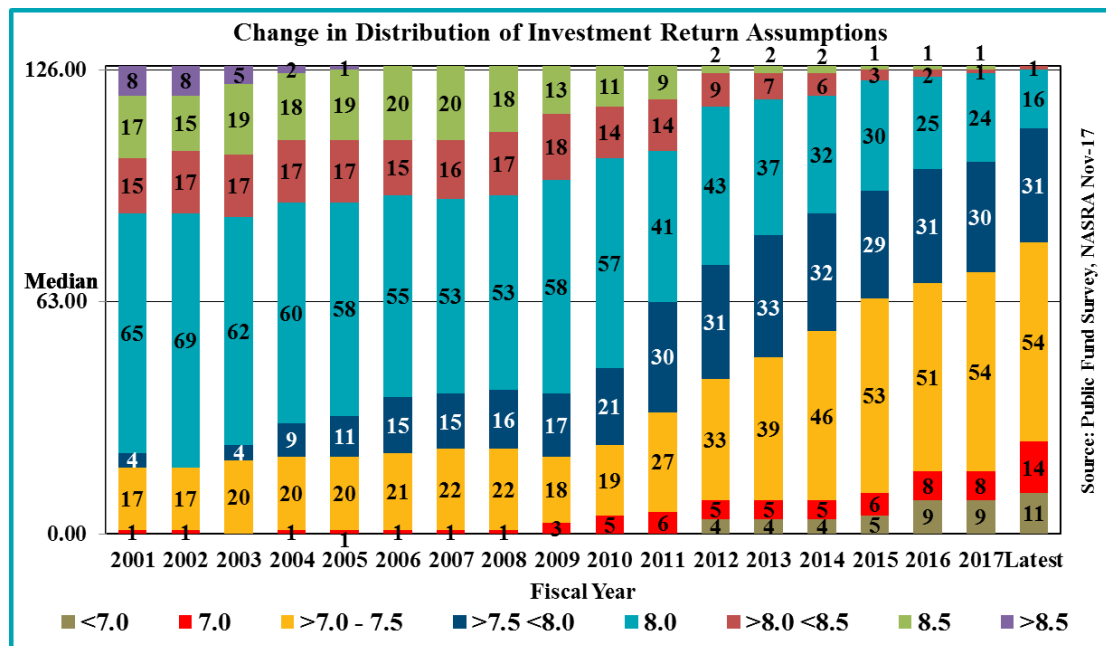
- A review of the interest and inflation rates does not involve the collection of significant data and can be updated annually. In addition, it keeps the Board focused more closely on these very important assumptions.
- The February 2, 2017 NEPC 2017 Capital Market Assumptions report shows an expected geometric return on the System's current actual asset allocation and proposed long-term allocation to be 7.4% over a 30-year period. However, NEPC's shorter term (5-7 years) expectations are in the 6.3%-6.4% range. These returns are "time weighted" measurements as opposed to "dollar weighted" measurements. Given the fact that the assumed actuarial investment return is based on a dollar weighted measurement, and that the next 5-7 years' returns will be in the 6.3%-6.4% range, then the longer term returns will have to exceed 7.5% in order for the long-term dollar weighted return to equal 7.25%.
- There has been emerging actuarial practice throughout the country of reducing the discount rates even below the level that the investment consultants believe is achievable. This is because of the very low interest rate environment we are currently in. The lower the interest rate environment, the greater the investment risk that must be taken to achieve an assumed rate of return. For example, in 1995 the yield on ten-year Treasury bonds (a proxy for a risk free investment) was 6.21%. As of November 2, 2017 these yields are now 1.87%. This means, back in 1995 in order to achieve 7.25%, a system only had to earn 1.04% more than the ten-year treasury yields ("risk free" rates), whereas today a system would have to earn 5.38% above the "risk free" rate. By reducing the investment return assumption, plans are more likely to meet their funding goals without requiring investment performance so much in excess of the risk free rate.
- In addition to taking pressure off of the investment process, there is a growing concern that long-term interest rates will eventually rise. A pattern of rising interest rates generally results in declining bond returns. This in turn will result in even greater investment risks being taken on by the System on the equity side of the assets in order to compensate for both declining bond returns and the need to earn 5.38% above the risk free rates of return.
- As is the case with most maturing pension plans, SURS is experiencing negative cash flows measured as contributions less benefits and expenses. SURS' negative cash flow is 2.8% of assets and growing. This negative cash flow is expected to grow in the coming years. When short-term returns are expected to be lower than the

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long-term expectations, which is the case with SURS, a plan with negative cash flows will have actuarial returns (i.e., dollar weighted returns) that are less than their “time weighted” returns.

- The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 127 large retirement plans. The following chart shows the distribution of investment return assumptions for the survey since 2001. The latest data includes results collected through November 2017.



Over the period shown in the latest survey, there continues to be a pattern of reducing investment return assumptions. Of the 127 plans shown, 105 have reduced their interest rate assumption since Fiscal Year 2011. For these 105 plans, the average reduction is 0.49%. The survey is consistent with the experience of other Cheiron clients, which have generally shown a significant trend of reducing their investment return assumptions over the last several years. Note that the 2018 values are forecasts by NASRA based on announcements by the systems and could change.

- GASB 67 and 68 pronouncements may subject many public pension plans to use a lower interest rate for accounting disclosures and pension expense determinations in fiscal years 2014 and later. For example, SURS had to use 7.01% as of June 30, 2016, and 7.09% as of June 30, 2017 for accounting purposes as compared to the 7.25% rate assumed for the funding valuations as of these dates. This means that on a closed plan basis with no new entrants, the assets are projected to be insufficient to pay all benefits for current members based on the current and projected contribution levels. It

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is important to note, however, that these new standards do not define funding requirements for a plan.

- The federal government, which promulgates minimum funding standards for corporate pension plans, already requires corporate pension plans to utilize interest rate assumptions that are based on short-term and mid-term bond rates, which are very low (26 USC 430(h)(2)(B)).

2. *Inflation Assumption*

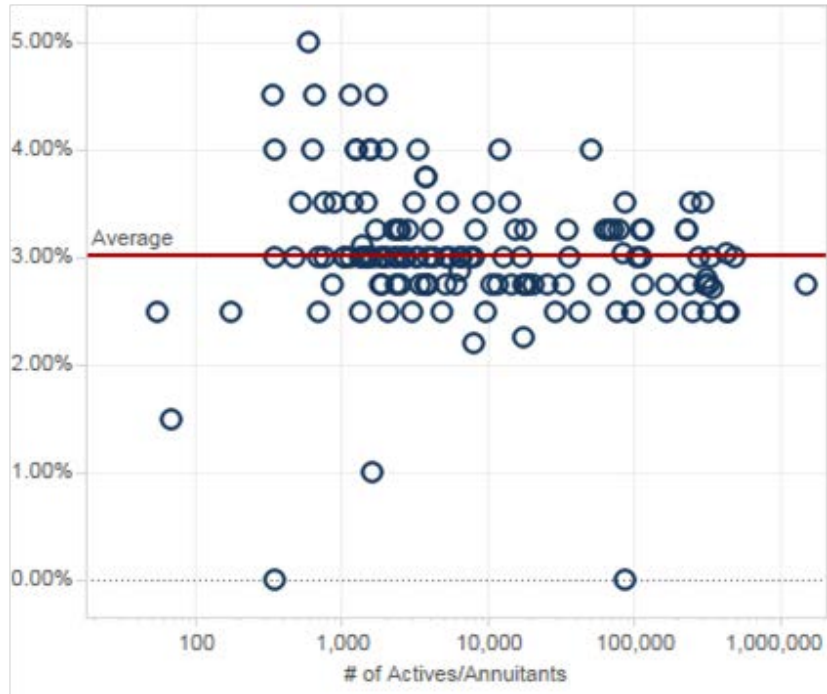
We find the 2.75% inflation assumption to be reasonable.

Our rationale for concurring with the 2.75% assumption:

- The July 2017 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (next 75 years), inflation will average somewhere between 2.0% and 3.2% (<http://www.ssa.gov/oact/tr/2017/tr2017.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.6%.
- As shown on page 35 of the NEPC 2017 Capital Market Assumptions report, there continues to be support for this assumption as a long-term rate even though the historic short-term averages are being lowered by the current historically low rates.
- The *National Conference on Public Employees Retirement Systems* (NCPERS) December 2016 Public Retirement Systems Study includes the following graphic of respondents' inflation assumptions:

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This shows that the current 2.75% SURS assumption is lower than the average inflation assumptions used among the 159 systems that responded to this study, with 3.0% as the average. However, we note that 40% of the systems in the two most recent studies reduced their inflation assumption between the 2015 and 2016 studies with an average reduction of 0.39%. The downward trend in this assumption is further supported by the 3.0% average for the 2016 study being a 0.2% reduction from the prior year.

3. *Salary (Annual Compensation) Increase Assumption*

Salary Increases for the 2017 valuation and are shown on the following page.

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Illustrative rates of increase per individual employee per annum, compounded annually:

Service Year	Total Increase
0	15.00%
1	12.00%
2	9.00%
3	7.25%
4	6.50%
5	6.00%
6	5.75%
7	5.50%
8	5.25%
9	5.00%
10	4.75%
11	4.50%
12-13	4.25%
14-33	4.00%
34+	3.75%

These increases include the wage inflation assumption of 3.75% comprised of an inflation assumption of 2.75% per annum and 1.00% per annum productivity assumption.

The assumed rate of total payroll growth is 3.75%.

We find the assumption and the basis for setting it as reasonable.

Our rationale for concurring with GRS's recommended salary increase assumption:

- The June 2017 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (between 2027 and 2091), real wage differential will average somewhere between 0.58% and 1.82%.
- This assumption is supported by credible data as shown on page 9 of the 2015 Experience Review performed by GRS.
- During the year ending June 30, 2017, there was again an experience gain from this assumption (i.e., salary increases were less than assumed) as shown on page 23 of the draft June 30, 2017 Actuarial Valuation. The table on page 24 shows that there have been gains due to salary increases for the last four years. However, this alone should not be a consideration for changing this assumption long term, and may be more indicative of the state of the current economy.
- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a continued trend of lower salary increases for public sector employees.

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4. *Cost-of-Living Adjustment Assumption*

Benefits are increased annually as described on page 49 of the draft June 30, 2017 Actuarial Valuation. Annual increases are 3.0% for those hired prior to January 1, 2011 and based upon ½ of the Consumer Price Index for those hired on or after January 1, 2011, which is 1.375% based on the inflation assumption of 2.75%.

We find the assumption and the basis for setting it reasonable.

5. *Capped Pay Assumption*

Benefits for members hired after January 1, 2011 are calculated using pay that is capped under 40 ILCS 5/1-160. The pay cap is shown on page 58 of the draft June 30, 2017, Actuarial Valuation to be \$112,408.42 for 2017. The optional hybrid plan pay cap is equal to the Social Security Wage Base, which is \$127,200 for 2017.

We find the assumption and the basis for setting it reasonable.

6. *Effective Rate of Interest*

The Effective Rate of Interest (“ERI”) is the interest rate that is applied to member contribution balances. The ERI, for the purpose of determining the money purchase benefit, is established by the State Comptroller annually. The ERI for other purposes such as the calculation of purchases of service credit, refunds for excess contributions, portable plan refunds, and lump sum portable retirements is determined by the SURS Board annually and certified to the Governor. For purposes of the actuarial valuation, the assumed ERI is 7.00%. **While we find this assumption and the basis for setting it as reasonable, we would like to point out that crediting member accounts with an annual rate of 7.00% is generous given today’s low interest rate environment.**

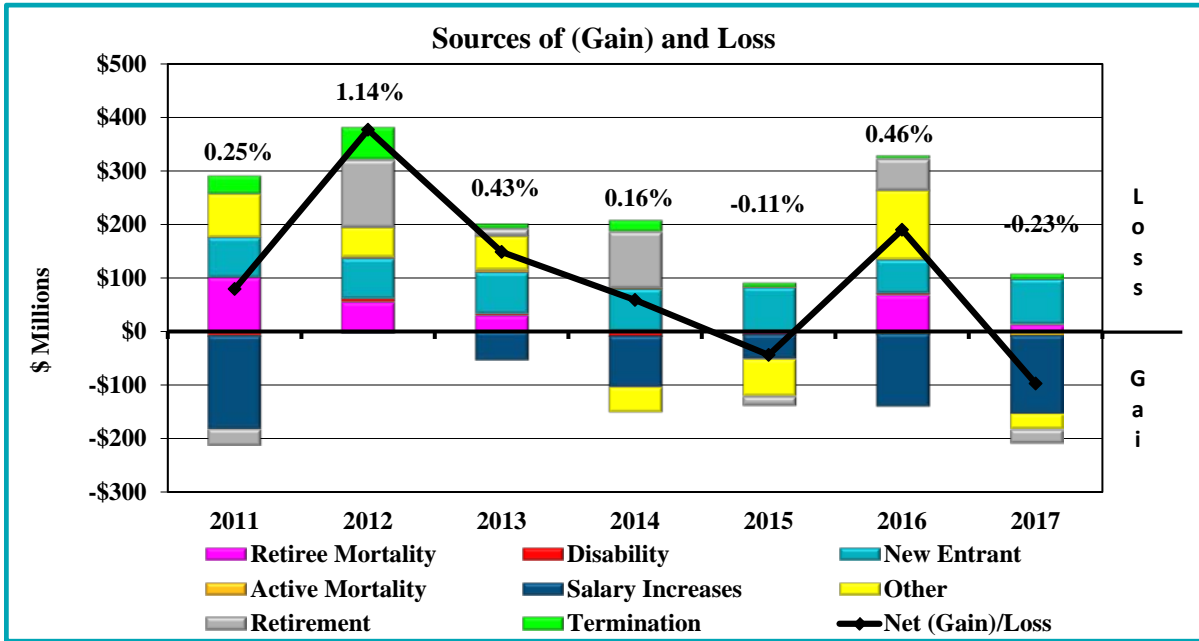
B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2017 Actuarial Valuation, these are shown on page 24. In the chart on the following page, we have collected similar data from GRS’s past valuation reports dating back to 2011 and presented a historical review of past demographic and salary increase experience gains and losses.

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The chart below shows the pattern of annual gains and losses attributable to eight different sources as shown in the legend. When the colored bar slices appear above zero on the Y-axis, that represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, that represents an experience gain for that year with liabilities less than expected. This net liability (gain)/loss is shown by the black line. This net (gain)/loss as a percent of liability is shown above the bars.



The percentages shown above the bars refer to net (gain)/loss as a percentage of liability.

Key observations from this chart are as follows:

1. In every year since 2011, there have been experience losses attributable to new entrants joining SURS. New entrant losses are expected because participants are hired and accrue service between valuations. There is also an offsetting gain to the assets due to contributions from these new entrants. This is not a reason for concern unless the new entrant loss is more than expected for participants hired in the last year.
2. Prior to 2014, there were consistent losses attributable to SURS retiree mortality. GRS addressed this with staff and determined that much of this loss was due to unexpected changes in benefit amounts paid. This may occur when initial benefits are based on estimates which are later adjusted based on finalized information. Starting in 2013, GRS has received additional data from SURS to better measure expected benefits. While these losses essentially disappeared in 2014 and 2015, a loss, similar in size to the earlier losses, occurred in 2016, but the loss in 2017 was small. We will monitor future valuations to determine if this is an indication that the assumption needs to be modified.

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3. A trend of salary gains has appeared in most years. However, as we discussed in the salary assumption section, this is likely to be a reflection of the general economic environment rather than a problem with the long-term assumption.
4. Since 2011, termination from employment experience has consistently shown losses, but they have been small since 2013. This assumption was reexamined in the recent GRS 2015 Experience Review and was slightly modified to produce fewer expected number of terminations. This change is better reflective of the actuarial experience of the System.
5. Disability and active mortality experience are too small to be noticed on the chart, given their insignificant size relative to other experience items. Since there have been both gains and losses in each of these areas during the period shown, they are not an immediate area of concern.
6. The net liability (gain)/loss is shown by the black line on the graph above. This net (gain)/loss as a percent of liability is shown above the bars. The percent is generally quite small and there is not a consistent pattern of either gains or losses.

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Below we summarize the demographic assumptions that we reviewed, and we have concluded all are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. Mortality

The mortality assumptions are as follows:

Base Table with 2014 Base Year	Male Set Forward	Female Set Forward	Male Multiplier	Female Multiplier
RP-2014 White Collar Employee, sex distinct (pre-retirement)	None	None	110% pre 60, 80% at ages 60+	90% pre 60, 90% at ages 60+
RP-2014 White Collar Healthy Annuitant, sex distinct (non-disabled post-retirement)	1 year	1 year	100%	100%
RP-2014 Disabled Annuitant, sex distinct (disabled post-retirement)	9 years	10 years	100%	100%

The provision for future mortality improvement is based on the generational application of the MP-2014 improvement scales.

Age	Sample Mortality Rates							
	Future Life Expectancy (years) in 2017				Future Life Expectancy (years) in 2030			
	Postretirement		Disabled - Retiree		Postretirement		Disabled - Retiree	
	Male	Female	Male	Female	Male	Female	Male	Female
35	52.09	54.17	29.80	34.56	53.33	55.36	31.72	36.32
40	46.85	48.96	26.36	30.47	48.08	50.14	28.14	32.12
45	41.70	43.80	23.14	26.67	42.91	44.97	24.74	28.18
50	36.66	38.72	20.07	23.00	37.84	39.86	21.50	24.37
55	31.76	33.71	17.06	19.36	32.90	34.82	18.33	20.61
60	26.99	28.80	14.15	15.84	28.07	29.87	15.25	16.97
65	22.37	24.07	11.37	12.60	23.38	25.09	12.34	13.60
70	17.97	19.57	8.80	9.79	18.91	20.53	9.63	10.65
75	13.90	15.37	6.56	7.42	14.76	16.25	7.24	8.13

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2. Marriage Assumption

Members are assumed to be married in the following proportions:

Age	Males	Females
20	25%	40%
30	70	75
40	80	80
50	85	80
60	85	70

3. Termination Rates

A table of termination rates based on experience in the 2010-2014 period. The assumption is a table of turnover rates by years of service.

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A sample of these rates follows:

Years of Service	All Members
0	20.00%
1	20.00
2	15.00
3	14.00
4	12.00
5	10.00
6	9.00
7	7.50
8	6.75
9	6.00
10	5.25
11	4.50
12	4.00
13	3.70
14	3.20
15	3.00
16	3.00
17	3.00
18	3.00
19	3.00
20	2.50
21	2.50
22	2.50
23	2.50
24	2.50
25	2.00
26	2.00
27	2.00
28	2.00
29	2.00

Part-time members with less than three years of service (all members classified as part-time for valuation purposes) are assumed to terminate at the valuation date.

Members that terminate with at least five years of service (10 years of service for Tier 2 members) are assumed to elect the most valuable option on a present value basis, either refund of contributions or a deferred benefit.

Termination rate for 29 years of service used for Tier 2 members until retirement eligibility is met.

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4. Retirement Rates

Upon eligibility, active members are assumed to retire as follows:

Age	<u>Members Hired before</u> <u>January 1, 2011 and Eligible</u> <u>for</u>		<u>Members Hired on or after</u> <u>January 1, 2011 and Eligible</u> <u>for</u>		<u>Optional Hybrid Plan</u> <u>Members Eligible for</u>	
	Normal Retirement	Early Retirement	Normal Retirement	Early Retirement	Normal Retirement	Early Retirement
Under 50	50.0%	-	-	-	-	-
50	45.0	-	-	-	-	-
51	45.0	-	-	-	-	-
52	45.0	-	-	-	-	-
53	40.0	-	-	-	-	-
54	40.0	-	-	-	-	-
55	38.0	7.50%	-	-	-	-
56	36.0	6.0	-	-	-	-
57	30.0	4.5	-	-	-	-
58	30.0	5.5	-	-	-	-
59	30.0	6.0	-	-	-	-
60	11.0	-	-	-	-	-
61	11.0	-	-	-	-	-
62	13.0	-	-	35.0%	-	-
63	13.0	-	-	15.0	-	-
64	13.0	-	-	15.0	-	-
65	17.0	-	-	15.0	-	-
66	17.0	-	-	15.0	-	-
67	15.0	-	50.0%	-	75.0%	-
68	15.0	-	35.0	-	40.0	-
69	15.0	-	30.0	-	35.0	-
70-74	15.0	-	15.0	-	15.0	-
75-79	20.0	-	20.0	-	20.0	-
80+	100.0	-	100.0	-	100.0	-

Members that retire are assumed to elect the most valuable option on a present value basis, either refund of contributions (or portable lump sum retirement, if applicable) or a retirement annuity.

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5. Disability Rates

A table of disability incidence with sample rates follows:

Age	Males	Females	Age	Males	Females
20	0.042%	0.060%	50	0.206%	0.249%
21	0.043%	0.064%	51	0.219%	0.257%
22	0.044%	0.067%	52	0.231%	0.264%
23	0.045%	0.071%	53	0.244%	0.272%
24	0.046%	0.074%	54	0.256%	0.279%
25	0.047%	0.078%	55	0.264%	0.287%
26	0.048%	0.081%	56	0.271%	0.294%
27	0.049%	0.085%	57	0.279%	0.302%
28	0.050%	0.088%	58	0.286%	0.309%
29	0.051%	0.092%	59	0.294%	0.317%
30	0.054%	0.099%	60	0.301%	0.324%
31	0.056%	0.107%	61	0.309%	0.332%
32	0.059%	0.114%	62	0.316%	0.339%
33	0.061%	0.122%	63	0.324%	0.347%
34	0.064%	0.129%	64	0.331%	0.354%
35	0.067%	0.137%	65	0.339%	0.362%
36	0.071%	0.144%	66	0.346%	0.369%
37	0.074%	0.152%	67	0.354%	0.377%
38	0.078%	0.159%	68	0.361%	0.384%
39	0.081%	0.167%	69	0.369%	0.392%
40	0.091%	0.174%	70	0.369%	0.392%
41	0.101%	0.182%	71	0.369%	0.392%
42	0.111%	0.189%	72	0.369%	0.392%
43	0.121%	0.197%	73	0.369%	0.392%
44	0.131%	0.204%	74	0.369%	0.392%
45	0.144%	0.212%	75	0.369%	0.392%
46	0.156%	0.219%	76	0.369%	0.392%
47	0.169%	0.227%	77	0.369%	0.392%
48	0.181%	0.234%	78	0.369%	0.392%
49	0.194%	0.242%	79	0.369%	0.392%

Disability rates apply during the retirement eligibility period.

6. Operational Expenses

The amount of operational expenses for administration incurred in the latest fiscal year are supplied by SURS staff and incorporated in the Normal Cost.

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7. Spouse's Age

The female spouse is assumed to be three years younger than the male spouse.

8. Missing Data

Members with an unknown gender are assumed to be female. Active and inactive members with an unknown date of birth are assumed to be 37-years-old at the valuation. An assumed spouse date of birth is calculated for current service retirees in the traditional plan for purposes of calculating future survivor benefits. The female spouse is assumed to be three years younger than the male spouse. Seventy percent of current total male retirees and 80% of current total female retirees in the traditional plan that have not elected a survivor refund are assumed to have a spouse at the valuation date.

9. Benefit Commencement Age

Inactive members eligible for a deferred benefit are assumed to commence benefits at their earliest normal retirement age. For Tier 1 members, this is age 62 with at least five years of service, age 60 with at least eight years of service, or immediately with at least 30 years of service. For Tier 2 members, this is age 67 with 10 or more years of service.

10. Load on Final Average Salary

No load is assumed to account for higher than assumed pay increases in final years of employment before retirement.

11. Load on Liabilities for Service Retirees with Non-finalized Benefits

A load of 10% on liabilities for service retirees whose benefits have not been finalized as of the valuation date is assumed to account for finalized benefits that on average are 10% higher than 100% of the preliminary estimated benefit. A load of 5% is used if a "best formula" benefit was provided in the data by Staff.

12. Valuation of Inactives

An annuity benefit is estimated based on information provided by staff for Tier 1 inactive members with five or more years of service and Tier 2 members with 10 or more years of service.

13. Reciprocal Service

Reciprocal service is included for current inactive members for purposes of determining vesting eligibility and eligibility age to commence benefits.

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The recently updated actuarial assumptions (including retirement and termination rates) were based on SURS service only. Therefore, reciprocal service was not included for current active members. Reciprocal service will be collected and analyzed in the future and will be considered in the next experience review.

14. Projection Assumptions

The number of total active members throughout the projection period will remain the same as the total number of active members in the defined benefit plans and the SMP in the current valuation.

Future new hires are assumed to elect to participate in the offered plans as follows:

- 60% elect to participate in the Optional Hybrid Plan.
 - 75% are assumed to elect the Tradition Plan (consistent with the current election split).
 - 25% are assumed to elect the Portable Plan (consistent with the current election split).
- 20% elect to participate in the Self Managed Plan.
- 20% elect to participate in the Tier 2 Plan.
 - 75% are assumed to elect the Tradition Plan (consistent with the current election split).
 - 25% are assumed to elect the Portable Plan (consistent with the current election split).

New entrants have an average age of 37.1 and average capped pay of \$40,441 and average uncapped pay of \$43,362 (2017 dollars). These values are based on the average age and average pay of current members. The range profile is based on the age at hire and assumed pay at hire (using the actuarial assumptions, inflated to 2017 dollars) of current active members with service between one and four years.

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Age	Number Males	Average Pay			Number Females	Average Pay			Total Number	Average Pay		
		Tier 2 Capped Male	OHP Capped Male	Uncapped Male		Tier 2 Capped Female	OHP Capped Female	Uncapped Female		Tier 2 Capped Total	OHP Capped Total	Uncapped Total
<20	46	\$18,659	\$18,659	\$18,659	42	\$16,791	\$16,791	\$16,791	88	\$17,767	\$17,767	\$17,767
20 - 24	667	28,055	28,055	28,055	1,004	27,205	27,205	27,205	1,671	27,544	27,544	27,544
25 - 29	1,516	38,300	38,427	38,614	2,090	36,036	36,112	36,237	3,606	36,988	37,085	37,236
30 - 34	1,339	45,371	45,960	48,192	1,818	39,324	39,565	40,341	3,157	41,889	42,278	43,671
35 - 39	964	45,934	46,670	50,025	1,309	38,359	38,697	39,923	2,273	41,572	42,078	44,208
40 - 44	645	44,847	45,592	47,833	1,014	37,079	37,346	38,354	1,659	40,099	40,552	42,039
45 - 49	571	41,560	42,321	44,978	863	34,291	34,551	35,282	1,434	37,185	37,645	39,143
50 - 54	537	40,206	41,192	46,145	711	33,280	33,647	35,123	1,248	36,260	36,894	39,866
55 - 59	422	38,279	39,495	46,410	500	32,431	32,976	35,050	922	35,108	35,960	40,249
60 - 64	230	33,523	34,581	39,898	236	30,822	31,504	34,940	466	32,155	33,023	37,387
65 - 69	13	21,922	22,949	32,512	11	16,208	16,208	16,208	24	19,303	19,859	25,039
Total	6,950	40,441	41,003	43,362	9,598	35,378	35,610	36,426	16,548	37,504	37,875	39,339

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15. Self-Managed Plan (SMP) Contribution Assumptions

The projected SMP contributions are equal to 7.6% of SMP payroll, plus estimated SMP expenses minus SMP employer forfeitures. Estimated SMP expenses for FY 2018 are \$478,854 and actual FY 2016 SMP employer forfeitures used to reduce the certified contributions for FY 2019 are \$8,079,804. Estimated SMP expenses for FY 2019 and after are assumed to increase by 2.75%. Estimated SMP employer forfeitures used to reduce the certified contributions for FY 2020 and after are assumed to be 7.5% of the gross SMP employer contribution.

16. Pensionable Earnings Greater than 6%

No additional assumption was made for earnings used in the calculations of the final average compensation. The participant's employer is required to pay the present value of the increase in benefits resulting from the portion of the increase in excess of 6.00%.

17. Governor's Pay

The Governor's pay is \$177,500 as of June 30, 2017, and is expected to increase each year by the assumed rate of total payroll growth of 3.75%.

C. Actuarial Methods

Actuarial methods consist of three components: (1) the funding method, which is the attribution of total costs to past, current, and future years; (2) the method of calculating the actuarial value of assets (i.e., asset smoothing); and (3) the amortization basis of the Unfunded Actuarial Liability (UAL). Since the amortization basis is governed by State law, we do not comment on it here.

1. Cost Method

The System uses the projected unit credit cost method (PUC) to assign costs to years of service, as required under the Pension Code (40 ILCS 5/15). **We have no objections with respect to using the PUC method, although we would prefer the Entry Age Normal (EAN) funding method as it is more consistent with the requirement in 40 ILCS 5/15 -155 requirement for level percentage of pay funding.**

Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date but not beyond) is taken into account in calculating these benefits. The present value of these benefits based on past service and future compensation is the actuarial accrued liability for a given active participant. Under the PUC cost method, the

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value of an active participant's benefits tends to increase more sharply over his or her later years of service than over his or her earlier ones. As a result of this pattern of benefit values increasing, while the PUC method is not an unreasonable method, more plans use the EAN funding method to mitigate this effect. It should also be noted that the EAN method is the required method to calculate liability for GASB 67 & GASB 68.

2. *Asset Smoothing Method*

The actuarial value of assets for the System is a smoothed market value. Unanticipated changes in market value are recognized over five years in the actuarial value of assets. The primary purpose for smoothing out gains and losses over multiple years is so fluctuations in the actuarial value of assets will be less volatile over time than fluctuations in the market value of assets.

The December 2016 NCPERS study previously referenced found that the majority of plans responding to the survey have a five-year smoothing period.

Smoothing the market gains and losses over a period of five years to determine the actuarial value of assets is a generally accepted approach in determining actuarial cost, and we concur with its use.

Another aspect of asset smoothing methods is whether or not to limit the maximum spread between the actuarial value of assets and the market value of assets. Many public sector pension plans limit the actuarial value of assets to be in any year no more than 120% of market value, and no less than 80% of market value. In fact, the Internal Revenue Service (26 USC 430(g)(3)(B)(iii)), mandates this "corridor" for private sector pension plans (a 90%-110% corridor is mandated). Even though this is not mandated for public plans, we believe that the use of this type of corridor is a sounder actuarial practice, and according to ASOP No. 44 in Section 3.3 b 1, the actuarial value of assets should "...fall within a reasonable range around the corresponding market values."

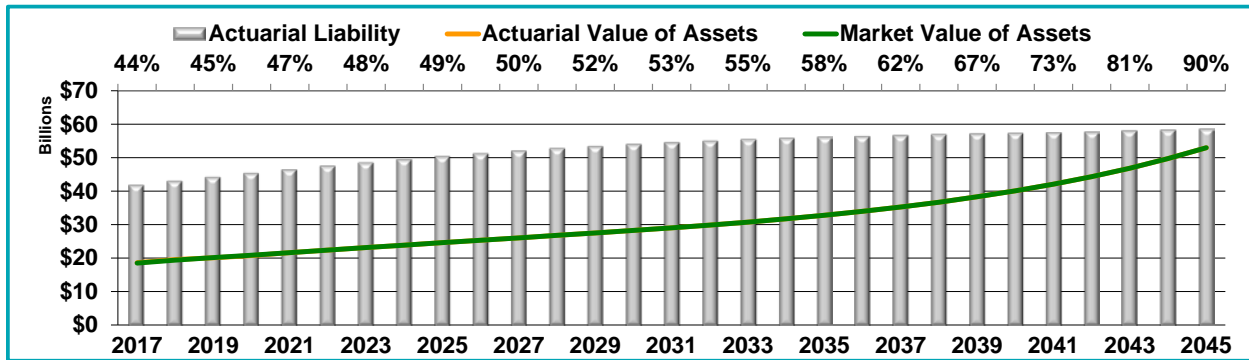
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SECTION IV– PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2017 Actuarial Valuation of SURS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

The graphs shown below are independent approximations of the projections performed by the State Actuary to verify that the System's funding projections are reasonable. They do not reflect all the precision of the projections applied by the System's actuary, but instead they are intended to verify the reasonableness of the modeling done by the System's actuary.

The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As pointed out on page 8 of the draft June 30, 2017 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projections. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio for each year is shown at the top of the graph. For example, in 2033, the funded ratio is approximately 55%, with assets being approximately \$31 billion and liabilities being approximately \$55 billion.

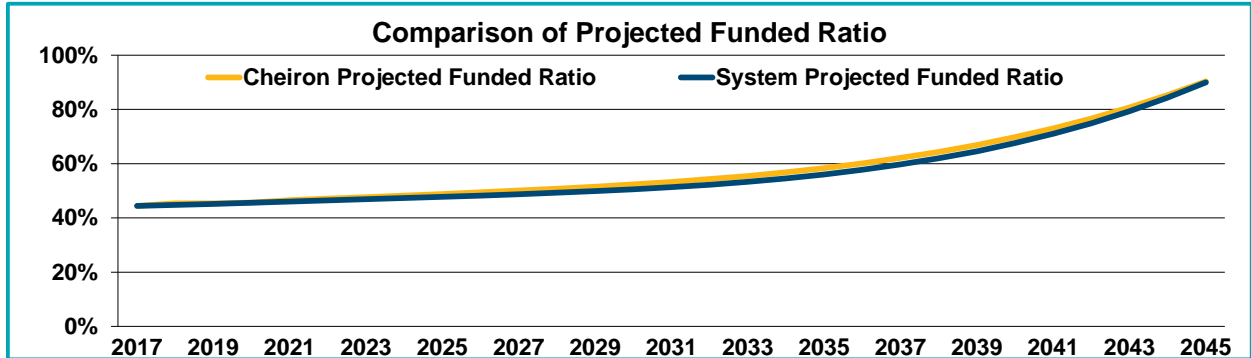


Source: Cheiron projection analysis.

When we compare our projected funded ratio against the results shown in the draft June 30, 2017 Actuarial Valuation, **we find a very close match in expected funded ratio**. This close match of the funded ratio indicates that the projections done by the System's actuary are reasonable and the fact we show slightly lower funded ratios is a function of Cheiron's approximation.

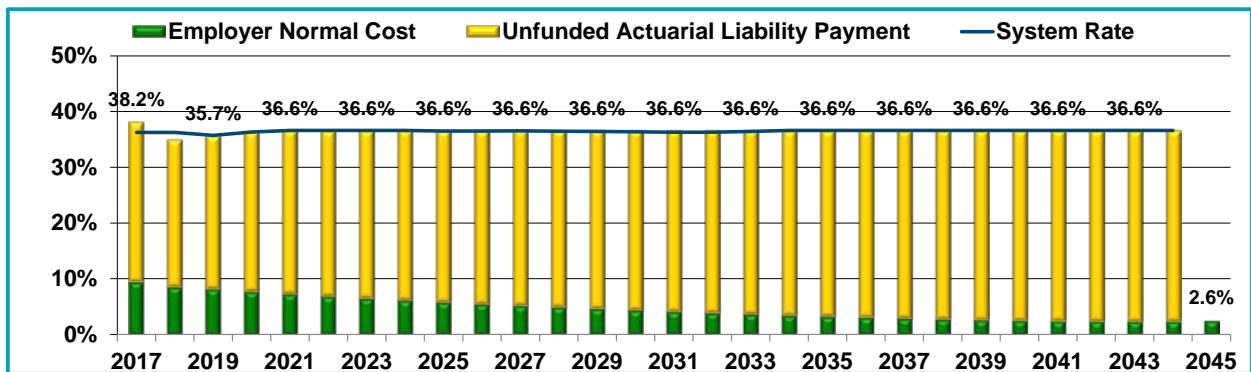
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SECTION IV– PROJECTION ANALYSIS



Source: Cheiron projection analysis.

The following graph shows the expected contributions calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for the 2017 year was set based on the June 30, 2016 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2018 (Fiscal Year Ending June 30, 2019). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by participants not covered by employee contributions based on the statutory funding method; and 2) an amortization of the unfunded liability. The normal cost amounts are shown by the green bars and the amortization of the UAL amounts by the yellow bars. The percentages shown are the total contribution rates calculated by Cheiron which are equal to the sum of the bars. The graph shows that a larger percentage of the total contribution is being made toward the UAL payment later in the period. The blue line shows the projected contribution rates as a percentage of payroll from the draft June 30, 2017 Actuarial Valuation. The difference between Cheiron’s approximation and the System’s projections is the difference between the top of the bars and the line.



Source: Cheiron projection analysis.

Our conclusion is that **the projections performed by the System’s actuary are reasonable.**

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SECTION V– ANALYSIS OF FUNDING ADEQUACY

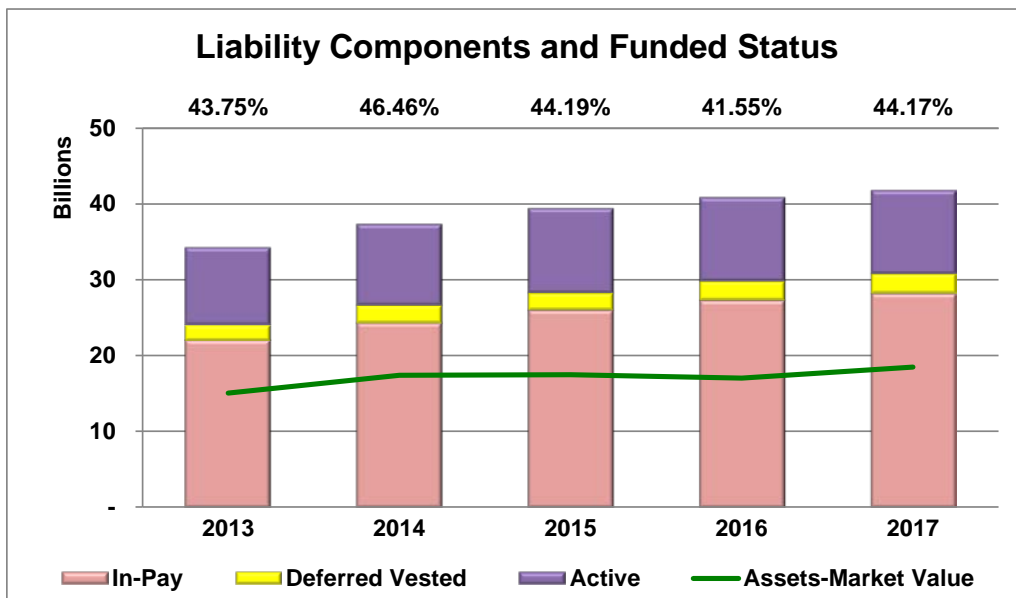
We have added a new section in this year’s report focusing on various measures of funding adequacy. We will examine the System’s funded status, the statutory funding requirements compared to contributions needed to pay down the Unfunded Actuarial Liability (UAL), the sources of change in UAL, and net cash flow. The actuarial valuation report prepared by GRS includes traditional actuarial measurements, which should be enhanced by the additional stress testing and projection analysis that we requested. Given the unique and substantial funding challenges faced by the Illinois pension systems, we created this new section on funding adequacy measures and trends to supplement that information from the GRS report and better inform plan trustees and other stakeholders about the funding shortfall.

1. Plan Funded Status

The first funding adequacy measure we present is a historical funded status trend for the past five years. Funded status for this measure is defined as the ratio of the market value of assets to the actuarial liability. The chart below shows SURS’ funded status since 2013 has gone from 43.75% funded to 44.17% funded in 2017, an increase in funded status of 0.42%. In addition to showing the funded status, this chart also shows the breakdown of the plan’s liabilities by membership status:

- Active status – this is the liability (present value of benefits already earned) for future payments to members who are currently working in the System,
- Deferred Vested status – this is the liability for members who are no longer working in the system, and
- In-Pay status – this is the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown demonstrates the increasing maturity of the plan, as the in-pay status liabilities are becoming a larger portion of the total plan liabilities. In addition, this chart shows that plan assets only cover just over half of the liabilities for just those members currently in-pay status.



Source: Cheiron analysis of funding adequacy.

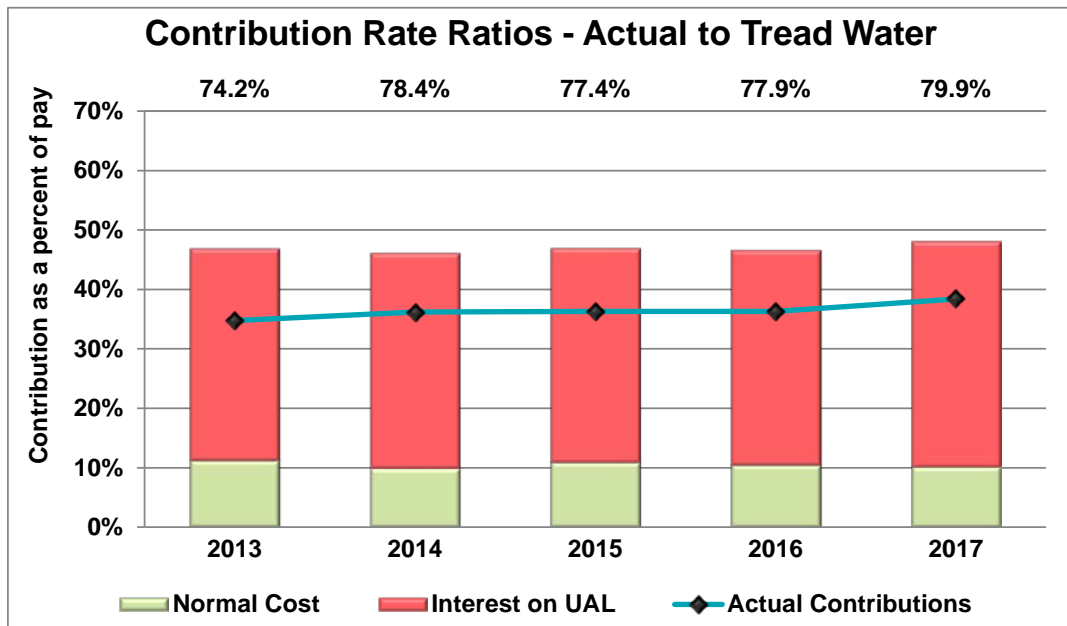
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2. Contributions as a Percent of Payroll Compared to Tread Water Contribution

The next funding adequacy measure compares the SURS historical statutory contribution rates to tread water contribution rates. The tread water contribution rates consist of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability (UAL). The reason that this sum is referred to as the tread water contribution rate is because it is the contribution required so that the UAL will remain constant, or “tread water” (absent experience gains or losses). This tread water concept may be better understood with a credit card analogy. If a credit card holder fails to pay each month the amount of purchases made in that month (i.e., normal cost) and the monthly finance charge on the unpaid purchases from prior months (i.e., the interest on the UAL), his or her credit card debt will grow.

As the chart below shows, over the past five years, the statutory contribution rate was significantly less than the tread water rate. **The statutory contribution as a percent of the tread water rate is shown at the top of the graph for each year.** The deficiency between the actual contribution rate and the tread water rate has been decreasing slightly since 2013, but based on current projections is expected to continue to exist for many more years under the current statutory funding requirements, which indicates the dollar value of the UAL will continue to grow.



Source: Cheiron analysis of funding adequacy.

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3. Sources of Changes in the UAL

Our third funding adequacy metric identifies the factors that have contributed to the changes in the UAL from year to year between 2008 and 2017. Most factors have resulted in increases in the UAL in every year. The UAL was decreased by assumption changes in 2009 and 2013, gains due to investment returns in 2014 and 2015 and liability experience and investment returns this year. The components for change to UAL shown in the chart on the following page are:

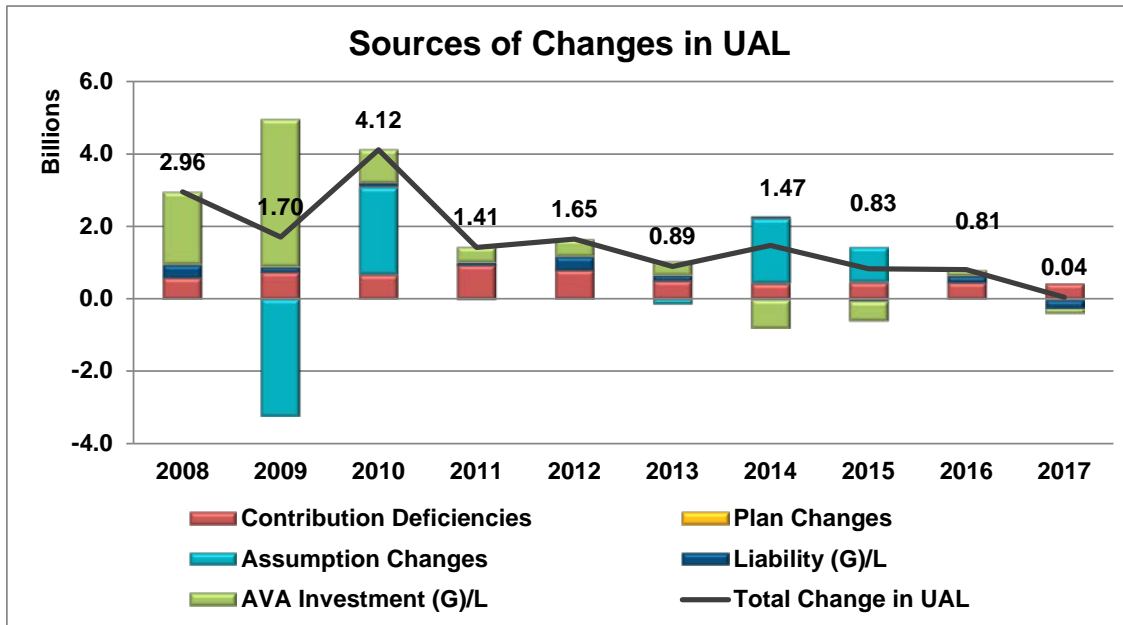
- **Contribution Deficiencies**, which are based on comparisons to the tread water contribution, have increased the UAL by \$6.0 billion over this period.
- **Assumption Changes** are changes to actuarial assumptions as the System updated expectations on future investment returns and life expectancy and asset smoothing in 2009. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations. Over this period assumption changes have increased the UAL by \$1.7 billion.
- **AVA (Actuarial Value of Assets) Investment (G)/L** is the net investment gain or loss due to assets earning more or less than assumed. These have increased the UAL over this period by \$7.0 billion.
- **Plan Changes** are any modifications of the design of the plan, which have affected benefits already accrued. Since most of the changes to the System's plan affect only future benefits the impact has been negligible during this period.
- **Liability (G)/L** are the changes in the UAL due to liability experience (i.e. mortality, terminations, salary increases, etc.). These were generally small and had a net effect of increasing the UAL by \$1.2 billion during this period.

The sum of all the components total change in UAL is shown as the black line and values in the chart.

We expect that this chart will help stakeholders understand the sources of growth in the UAL over the past decade and inform discussions about the current funding requirements and adequacy.

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Source: Cheiron analysis of funding adequacy.

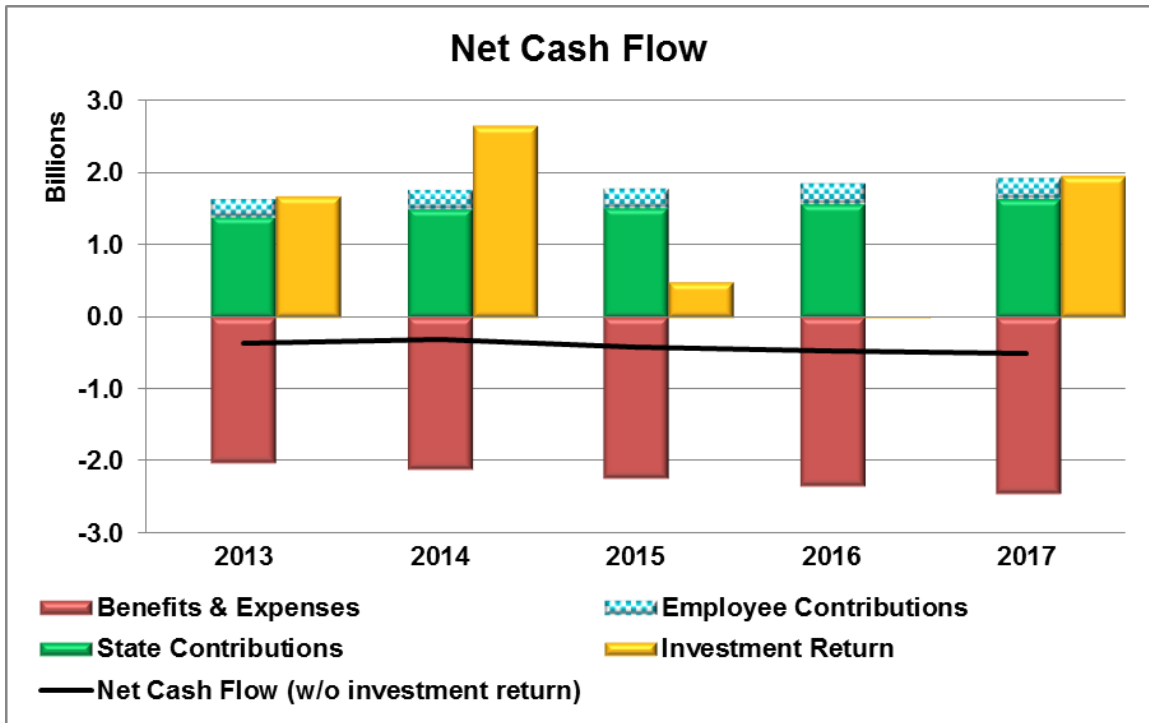
4. Net Cash Flow Analysis

The last funding adequacy measure we present is an analysis of the plan’s net cash flow before taking into account investment return, which is defined as State and Member contributions less benefit payments and administrative expenses. This measure is an indication of a pension plan’s maturity level in terms of its net cash flow relative to plan assets. In a very mature plan, it is expected that cash flows will be negative as the benefits and expense far exceed contributions. In a very immature plan, the contributions typically are more than the payouts so the net cash flow is positive. The more negative net cash flow is, the more vulnerable it is to market downturns. This is because when a pension plan has more payouts than contributions, then plan assets are needed to pay some portion of the payouts. So, with a market downturn not only does the plan suffer a loss in investment income, but also some portion of its principal, leaving fewer assets left to invest and recapture during a recovery.

Looking at the following chart, SURS has significant negative net cash flow (black line). This measure should continue to be monitored as negative cash flow increases the System’s vulnerability to market downturns.

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Source: Cheiron analysis of funding adequacy.

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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STATUS OF RECOMMENDATIONS FROM THE 2016 STATE ACTUARY'S REPORT

Response to Recommendations in 2016

In the State Actuary's Preliminary Report on the State Universities Retirement System of Illinois presented December 15, 2016, Cheiron made several recommendations. Below we summarize how these recommendations were reflected in either the System's comments last year or in this year's draft June 30, 2017 Actuarial Valuation.

Recommendations to Retirement System from 2016 State Actuary Report	Status	Comments
1. We continue to recommend that the funding method be changed to at least fully fund future plan benefit accruals to avoid continued systematic underfunding of SURS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.	Partially Implemented	The System has adopted a funding policy that would meet recommendation; however, the actual funding of the system is based on State statute and a change in the funding method and funding policy would require a statutory change. Recommendation repeated.
2. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. On November 29, 2016, GRS provided stress tests demonstrating five volatile return scenarios in a separate communication from the valuation report.	Partially Implemented	Gabriel, Roeder, Smith & Company (GRS) provided extensive stress testing scenarios outside the report, but did not include such stress testing in this year's report; however, they did include in the report various explanations on the implications of assumptions not being met. Recommendation modified.
3. We recommend that the SURS Board consider lowering the current 7.25% interest rate assumption to 7.00% or lower and that rate should be	Implemented	The Board reviewed the interest rate and impact of negative cash flow during the June 2017 Meeting and voted to maintain the interest rate assumption at 7.25%.

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STATUS OF RECOMMENDATIONS FROM THE 2016 STATE ACTUARY'S REPORT

Recommendations to Retirement System from 2016 State Actuary Report	Status	Comments
developed taking into account the negative cash flow of SURS and the anticipated future interest rate environment.		Recommendation removed.
4. We recommend that the SURS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.	Implemented	The Board reviewed the interest rate and other economic assumptions at the June 2017 Meeting.

Chapter Four

PRELIMINARY REPORT ON THE STATE EMPLOYEES' RETIREMENT SYSTEM

In accordance with 30 ILCS 5/2-8.1, Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the State Employees' Retirement System (SERS) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to SERS on December 4, 2017. The preliminary report was based on Cheiron's review of actuarial assumptions included in SERS' 2017 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the State Employees' Retirement System. SERS' written response, provided on December 14, 2017, can be found in Appendix C.

OVERVIEW	
STATE EMPLOYEES' RETIREMENT SYSTEM	
as of June 30, 2017	
Actuarial accrued liability	\$46,701,348,277
Actuarial value of assets	<u>\$16,558,873,542</u>
Unfunded liability	\$30,142,474,735
Funded ratio	35.5%
Employer normal cost	\$668,709,844
State contribution (FY19)	\$2,165,841,000
Active members	60,612
Inactive members	24,759
Current benefit recipients	71,805
Eligible for deferred benefits	<u>199</u>
Total membership	157,375
Interest rate assumption	7.00%
Inflation assumption	2.75%
Actuarial cost method	Projected Unit Credit
Asset valuation method	5-year Smoothing
Executive Director	Tim Blair
Actuarial Firm	Gabriel, Roeder, Smith & Company
Source: June 30, 2017 SERS actuarial valuation report.	

December 20, 2017

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Board of Trustees
State Employees' Retirement System of Illinois
2101 South Veterans Parkway
P.O. Box 19255
Springfield, Illinois 62794-9255

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution to the State Employees' Retirement System of Illinois (SERS or System) for Fiscal Year 2019.

In summary, we believe that the assumptions and methods used in the draft June 30, 2017 Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the State funding requirements that do not conform to Actuarial Standards of Practice, were properly calculated in accordance with State law.

Section I of this report describes the review process undertaken by Cheiron. Section II summarizes our findings and recommendations. Section III provides the supporting analysis for those findings and presents more details on our assessment of the actuarial assumptions and methods employed in GRS's Actuarial Certification, as well as our assessment of GRS's determination of the required State contribution for Fiscal Year 2019. Section III also includes comments on other issues impacting the funding of SERS, including the implications of Article 14 of the Illinois Pension Code, which establishes the statutory funding requirements for the System. **In our opinion, the statutory mandated minimum funding requirements call for inadequate funding, and do not meet Actuarial Standards of Practice (ASOP), particularly ASOP No. 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions.** Section IV reviews the projections contained in the draft June 30, 2017 Actuarial Valuation. Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by SERS and GRS. This information includes actuarial assumptions and methods adopted by the SERS Board, System provisions, the draft June 30, 2017 Actuarial Valuation, the draft 2017 GASB 67/68 Report, the 2017 Economic Assumption Update Review, and minutes of the plan year 2017 SERS Board of Trustee meetings. A detailed description of all information provided for this review is contained in Appendix B.

To the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Office of the Auditor General and the State Employees' Retirement System of Illinois for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

Kenneth A. Kent, FSA, FCA, MAAA, EA
Principal Consulting Actuary

SIGNED ORIGINAL ON FILE

Michael J. Noble, FSA, FCA, MAAA, EA
Principal Consulting Actuary

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
STATE EMPLOYEES' RETIREMENT SYSTEM OF ILLINOIS
PURSUANT TO 30 ILCS 5/2-8.1**

SECTION I – REPORT SCOPE

Illinois Public Act 097-0694 (the Act) amended the Illinois State Auditing Act (30 ILCS 5/2-8.1) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the State Employees' Retirement System of Illinois (SERS or System) and to issue to the SERS Board this preliminary report on the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contributions for Fiscal Year (FY) 2019. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the SERS Board to consider before finalizing its certification of the required State contributions for FY 2019.

While the Act states that just the actuarial assumptions and valuation are to be reviewed, we have also reviewed the actuarial methodologies (funding and asset smoothing methods) employed in preparing the Actuarial Certification, as these methods can have a material effect on the amount of the State contribution being certified. Finally, we have offered our opinion on the implications of Article 14-131 of the Illinois Pension Code, which impacts the contribution amount certified by GRS.

In conducting this review, Cheiron reviewed the draft June 30, 2017 Actuarial Valuation, the draft 2017 GASB 67/68 Report, the 2017 Economic Assumption Update Review, and minutes of the plan year 2017 Board of Trustees meetings. The materials we reviewed are listed in Appendix B.

In addition to reviewing the Actuarial Certification of the required State contribution to SERS, the Act requires the State Actuary to conduct a review of the "actuarial practices" of the Board. While the term "actuarial practices" was not defined in the Act, we continue to interpret this language to mean that we review: (1) the use of a qualified actuary (as defined by the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2017 Actuarial Valuation.

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SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2017 Actuarial Valuation of SERS as well as the “actuarial practices” of the SERS Board. Section III of this report contains detailed analysis and rationale for these recommendations.

Proposed Certification of the Required State Contribution

Gabriel, Roeder, Smith & Company (GRS) has determined that the FY 2019 required State contribution calculated under the current statutory funding plan is \$2,165,841,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based. As such, we have accepted GRS’s annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

1. We continue to recommend that the SERS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System’s actuary.

State Mandated Funding Method

2. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SERS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable. We understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Conformance to Statutory Funding Changes of Public Act 100-0023

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modifies the State’s funding policy to require that the contribution impact of all assumption changes be phased-in over a 5-year period. As such, the Act delays the funding of the System. Assumption changes result from more accurately identifying the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact of these changes are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a 5-year period beginning at the date of adoption.

The Act requires that the impact of assumption changes “be implemented in equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.” This amount is then implemented “at the resulting

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SECTION II – SUMMARY OF RECOMMENDATIONS

annual rate in each of the remaining fiscal years in that 5-year period.” GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of payroll, and reflecting one-fifth of that percentage change over five years. The method used by GRS will result in the cost impact due to assumption changes being recognized as increasing dollar amounts. This is because the recognition as an equal percentage of pay gets applied to an increasing payroll over a five year period. The language of the Act, which indicates recognition of equal dollar amounts, would result in a decreasing adjustment as a percentage of payroll, provided payroll actually grows each year.

3. We recommend that GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act.

Also as a result of P.A. 100-0023, the System Actuary is required to recertify the prior year's valuation in accordance with the Act. GRS has determined that the FY 2018 recertified required State contribution is \$2,029,583,000, compared to the original FY 2018 amount of \$2,327,649,000.

4. In this regard, the recertification provided by GRS as a stand-alone document provides insufficient information to support the revised funding amounts and should include an exhibit demonstrating how the new values, both amounts and percentages of payroll, were determined.

Optional Hybrid Plan

P.A. 100-0023 creates an optional hybrid plan for current Tier 2 members and future new hires. The hybrid plan consists of a reduced defined benefit plan and a defined contribution plan. Employers are required to contribute the normal cost plus an additional 2% of pay for each employee who participates in the optional hybrid plan or Tier 2 in lieu of the optional hybrid plan for fiscal year 2021 and after.

GRS identified in the draft June 30, 2017 report that they assumed no members, not covered by Social Security, would elect the Tier 3 benefit plan. They supported this assumption with stress testing showing that altering this 0% election assumption to a 25% election assumption would only decrease the contribution rate developed by the valuation by 0.0085%.

5. We also recommend that GRS include the stress testing they referenced in their determination that Tier 3 benefits will have an immaterial impact on funding both now and in the future based on the relatively small portion of the active population eligible for electing this plan. While the 0.0085% impact they report is small, it would be valuable to have the demonstration included in the report in the event that this assumption needs to be revisited or in the event there are further changes to Tier 3 benefits in the future, as well as simply to provide documentation and disclosure of the work.

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Assessment of Actuarial Assumptions Used in the 2017 Valuation

30 ILCS 5/2-8.1 requires the State Actuary to identify recommended changes in actuarial assumptions that the SERS Board must consider before finalizing its certification of the required State contribution. We have reviewed all the actuarial assumptions used in the draft June 30, 2017 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2017 Valuation

6. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether or not there is a potential for unsustainable costs during the statutory funding period. GRS did include stress testing in last year's final report, but did not include such stress testing in this year's draft report, just various explanations on the implications of assumptions not being met. We recommend that stress testing be added into this year's report. Because the public may only look to the valuation report for this type of information, we believe it should be contained here instead of any supplemental document to the Board that may potentially be overlooked.

Recommended Changes for Future Valuations

7. We recommend the SERS Board continue to annually review the economic assumptions (primarily interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.

GASB 67 and 68

The 2017 SERS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2017 SERS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

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In this section we provide detailed analysis and supporting rationale for the recommendations that were presented in Section II of this report.

Proposed Certification of the Required State Contribution

As stated in our summary of recommendations in Section II, we have verified the arithmetic calculations made by GRS to develop this State required contribution, reviewed the assumptions on which it is based, and accepted GRS's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

Given the size of SERS, the System's low funded ratio, the recent changes in legal requirements, and guidance issued by the Government Finance Officers Association, we are recommending again that the Board periodically undertake a full scope actuarial audit, utilizing the services of a reviewing actuary. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary. Results are compared in a detailed fashion to measure the liabilities for each benefit form and feature. A replication audit will uncover any potential problems in the processing and certification of valuation results. While agreement with this recommendation was documented in the January 10, 2017 Board minutes, we have not seen any additional evidence that this is being done.

We continue to recommend that the SERS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary (Recommendation #1).

State Mandated Funding Method

The Illinois Pension Code (40 ILCS 5/14-131) is deficient in terms of establishing a method that adequately funds the System. This law requires that the actuary base the required contribution using a prescribed funding method that achieves 90% funding in the year 2045. This does not meet generally accepted actuarial principles because the System is never targeted to be funded to 100% and the funding of the System is significantly deferred into the future. In addition, the ongoing benefits that will be earned in the future are also being only funded at 90%. The method defined in the Code does not conform to the guidelines in ASOP No. 4, Section 3.14 regarding the allocation procedures of costs to the expected benefit payments which provides:

When selecting a contribution allocation procedure, the actuary should select a contribution allocation procedure that, in the actuary's professional judgment, is consistent with the plan accumulating adequate assets to make benefit payments when due, assuming that all actuarial assumptions will be realized and that the plan sponsor or other contributing entity will make actuarially determined contributions when due.

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We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SERS (Recommendation #2). Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.

The Board of Trustees has agreed with this recommendation in the adoption of a funding policy. We have reviewed the adopted policy. We agree that the policy is a reasonable method that conforms to the Actuarial Standards of Practice, and we agree with its use in the GASB report as an Actuarially Determined Contribution (ADC). The funding policy calls for a funding amount equal to the normal cost plus a closed 25-year amortization as a level percentage of uncapped payroll of the unfunded actuarial liability. This policy defines a method that would ultimately fully fund the plan and falls within generally accepted actuarial funding methods currently in use for public plans. As of June 30, 2017, the remaining amortization period is 23 years. According to this methodology, the State's contribution amount would be \$2,818,880,078 for FY 2019. It is important though to recognize that this change does not affect the actual funding of the System.

Based on the draft June 30, 2017 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 35.46%. We have concerns about the solvency of the System if there is a significant market downturn. This is why we continue to recommend stress testing be done to determine whether there will be sufficient assets under the State mandated funding method to pay benefits if there is a significant market downturn.

We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether or not there is a potential for unsustainable costs during the statutory funding period (Recommendation #6).

This should include an analysis and discussion of the impact on the annual contribution requirement of the alternative scenarios tested. The reason we recommend such stress testing be included in the valuation report is because that is the report that most stakeholders of the System look to for assessing the System's financial conditions. Supplemental reports, such as the stress testing report GRS provided under separate cover for the prior valuation, may not be publicly identified, and therefore not readily accessible.

Conformance to Statutory Funding Changes of Public Act 100-0023

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modifies the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a 5-year period. As such, the Act further erodes the potential funded

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status of the System. Assumption changes result from more accurately identifying the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact resulting from more accurately identifying the obligations for funding are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a 5-year period beginning at the date of adoption.

Public Act 100-0023 states:

A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applies in State fiscal year 2018 or thereafter shall be implemented in equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.

A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applied to the State contribution in fiscal year 2014, 2015, 2016, or 2017 shall be implemented:

- (i) as already applied in State fiscal years before 2018; and*
- (ii) in the portion of the 5-year period beginning in the State fiscal year in which the actuarial change first applied that occurs in State fiscal year 2018 or thereafter, by calculating the change in equal annual amounts over that 5-year period and then implementing it at the resulting annual rate in each of the remaining fiscal years in that 5-year period.*

We recommend that GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act. (Recommendation #3).

While GRS in their certification letters demonstrates that the present value of future contributions through 2045 are equivalent after the implementation of the phase-in of the impact of assumption changes over five years, it is unclear that their phase-in method conforms to the law.

As calculated, GRS starts with determining the difference in the contribution rates before and after the assumption changes as percentages of payroll, divides this percentage by five to get one-fifth of the change, and then recognizes an additional one-fifth for each year of the phase-in period. The method used by GRS will result in the cost impact due to assumption changes being recognized as increasing dollar amounts. This is because the recognition as an equal percentage of pay gets applied to an increasing payroll over a 5-year period. The language of the Act, which indicates recognition of equal dollar amounts, would result in a decreasing adjustment as a percentage of payroll, provided payroll actually grows each year.

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Also as a result of P.A. 100-0023, the System Actuary is required to recertify to the prior year's valuation in accordance with the Act.

In this regard, the recertification provided by GRS as a stand-alone document provides insufficient information to support the revised funding amounts and should include an exhibit demonstrating how the new values, both amounts and percentages of payroll, were determined (Recommendation #4).

In the recertification letter, there should either be clear reference to the dollar amounts in question as a result of the assumption changes as disclosed in the 2016 Actuarial Valuation Report or an added disclosure as part of the recertification that documents the dollar impact of the assumption changes in support of the balance of the recertification amounts. Otherwise this recertification may not be considered a complete actuarial communication as the information in the document as a stand-alone communication is insufficient.

Optional Hybrid Plan

P.A. 100-0023 creates an optional hybrid plan for current Tier 2 members and future new hires. The optional hybrid plan consists of a reduced defined benefit plan and a defined contribution plan. Employers are required to contribute for each employee who participates in the optional hybrid plan or Tier 2 in lieu of the optional hybrid plan, the normal cost plus for fiscal year 2021 and after an additional 2% of pay.

We also recommend that GRS include the stress testing they referenced in their determination that Tier 3 benefits will have an immaterial impact on funding both now and in the future based on the relatively small portion of the active population eligible for electing this plan. While the 0.0085% impact they report is small, it would be valuable to have the demonstration included in the report in the event that this assumption needs to be revisited or in the event there are further changes to Tier 3 benefits in the future, as well as simple to provide documentation and disclosure of the work (Recommendation #5).

Assessment of Actuarial Assumptions Used in the 2017 Valuation

A. Economic Assumptions

1. Interest Rate

The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the required State contribution amount. This assumption, which is used to value liabilities for funding purposes, was maintained at 7.00% for the draft June 30, 2017 Actuarial Valuation.

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After reviewing all the materials (see Appendix B of this report) that were made available, Cheiron concludes that maintaining the interest rate at 7.00% for this valuation is reasonable.

We recommend that the SERS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly (Recommendation #7).

Our rationale for this recommendation:

- A review of the interest and inflation rates does not involve the collection of significant data and can be updated annually. In addition, it keeps the Board focused more closely on these critical assumptions.
- In GRS's July 6, 2017 Economic Assumption Update Review, they presented the opinions of eight independent investment consultants on the future expected earnings of the System and concluded that, adjusting for GRS's assumed rate of inflation, the 20-year expected geometric mean of the SERS portfolio is 7.01% (See Exhibit B of the GRS July 6, 2017 Economic Assumption Update Review). They also presented the distribution of the 20-year average geometric net nominal return for these eight consultants. This showed that SERS has a 49.62% chance of meeting or exceeding the current 7.00% assumption (See the seventh column, bottom row). This supports the Board maintaining this assumption for the current valuation.

Distribution of 20-year Average Geometric Net Nominal Return

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return					Probability of exceeding	Probability of exceeding
	25 th	40 th	50 th	60 th	75 th	7.00%	7.25%
(1)	(2)	(8)	(4)	(5)	(6)	(7)	(8)
1	4.39%	39.14%	6.24%	6.94%	8.11%	39.14%	28.8%
2	5.00%	43.92%	6.63%	7.24%	8.28%	43.92%	30.8%
3	4.94%	45.99%	6.73%	7.41%	8.55%	45.99%	32.9%
4	5.01%	47.96%	6.86%	7.56%	8.74%	47.96%	41.1%
5	5.36%	52.09%	7.14%	7.81%	8.94%	52.09%	43.2%
6	5.46%	53.01%	7.20%	7.85%	8.96%	53.01%	44.5%
7	5.62%	54.53%	7.28%	7.91%	8.97%	54.53%	56.8%
8	5.84%	60.32%	7.74%	8.47%	9.68%	60.32%	60.5%
Average	5.20%	49.62%	6.98%	7.65%	8.78%	49.62%	42.3%

The 20-year geometric average return is 7.01%

- GRS's July 6, 2017 Economic Assumption Update Review also presented the expectation of the Illinois State Board of Investment's investment consultant Meketa Investment Group. After adjusting for GRS's assumed rate of inflation, Meketa's

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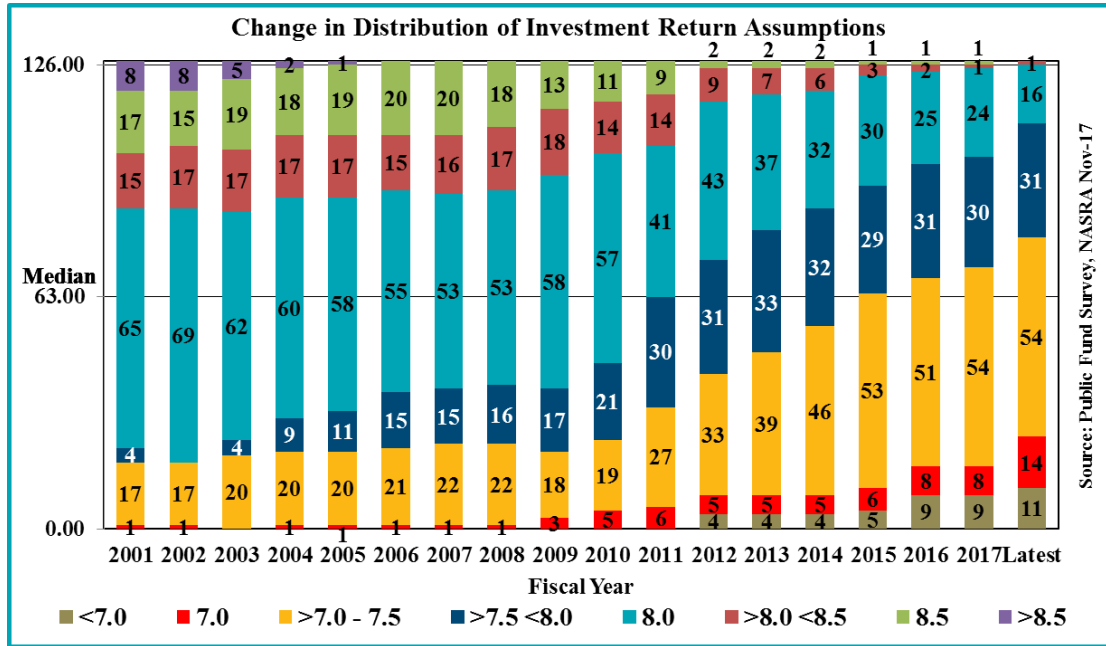
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expected 20-year geometric average return of the SERS portfolio is 7.65% (See Exhibit A of the GRS July 6, 2017 Economic Assumption Update Review). Based on the capital market assumptions provided by Meketa, SERS has a 58.0% chance of meeting or exceeding the current assumption of 7.00%. Given that SERS is only 35.4% funded on a market asset value, an expectation of achieving the investment return only 50% of the time could result in spiraling cost increases following years that the returns are below the assumption. This supports the reasonableness of assuming a 7.00% interest rate for the current year.

- There has been emerging actuarial practice throughout the country of reducing the discount rates even below the level that the investment consultants believe is achievable. This is because of the very low interest rate environment we are in currently. The lower the interest rate environment, the greater the investment risk that must be taken to achieve an assumed rate of return. For example, in 1995 the yield on ten-year Treasury bonds (a proxy for a risk free investment) was 6.21%. As of November 2, 2017, these yields are now 1.87%. This means back in 1995 in order to achieve 7.00%, a system only had to earn 0.79% more than the ten-year treasury yields (“risk free” rates), whereas today a system would have to earn 5.13% above the “risk free” rate. By reducing the investment return assumption, plans are more likely to meet their funding goals without requiring investment performance so much in excess of the risk free rate.
- In addition to taking pressure off the investment process, there is a growing concern that long-term interest rates will eventually rise. A pattern of rising interest rates generally results in declining bond returns. This in turn will result in even greater investment risks being taken by the System on the equity side of the assets to compensate for both declining bond returns and the need to earn 5.13% above the risk free rates of return.
- SERS is projected to have a negative cash flow (contribution income less benefit and expense payouts) in Fiscal Year Ending 2018. The cash flow is expected to grow increasingly negative over time to over a billion dollars per year by 2028 as shown in the graph on page 15 and table 4d on pages 27 and 28 of the draft 2017 Actuarial Valuation Report. When short-term returns are expected to be lower than the long-term expectations, which is the current case with SERS, a plan with negative cash flows will have actuarial returns (i.e., dollar-weighted returns) that are less than their “time-weighted” returns.
- The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 127 large retirement plans. The following chart shows the distribution of investment return assumptions for the survey since 2001. The latest data includes results collected through November 2017.

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Over the period shown in the latest survey, there continues to be a pattern of reducing investment return assumptions. Of the 127 plans shown, 105, including the Illinois Retirement Systems, have reduced their interest rate assumption since Fiscal Year 2011. For these 105 plans, the average reduction is 0.49%. The survey is consistent with the experience of other Cheiron clients, which have generally shown a significant trend of reducing their investment return assumptions over the last several years. Note that the 2018 values are forecasts by NASRA based on announcements by the systems and could change.

- GASB 67 and 68 pronouncements may subject many public pension plans to use a lower interest rate for accounting disclosures and pension expense determinations. For example, SERS had to use 6.64% as of June 30, 2016, and 6.78% as of June 30, 2017 for accounting purposes as compared to the 7.00% rate assumed for the funding valuations as of these dates. This means that on a closed plan basis with no new entrants, the assets are projected to be insufficient to pay all benefits for current members based on the current and projected contribution levels. It is important to note, however, that these standards do not define funding requirements for plans.
- The federal government, which promulgates minimum funding standards for corporate pension plans, requires corporate pension plans to utilize interest rate assumptions based on short-term and mid-term bond rates, which are very low (26 USC 430(h)(2)(B)).

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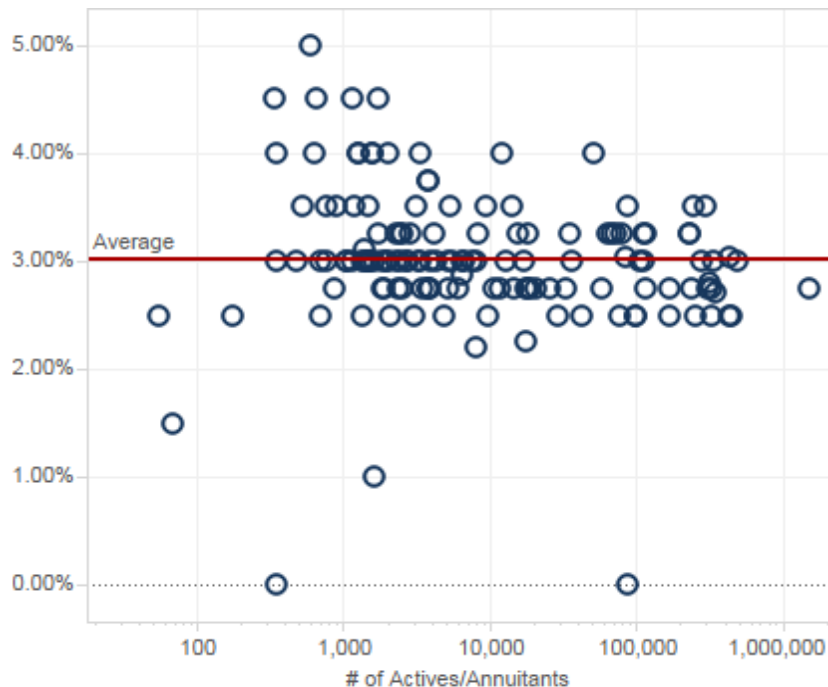
2. *Inflation Assumption*

We find the 2.75% inflation assumption to be reasonable.

Our rationale for concurring with the 2.75% assumption:

- GRS's July 6, 2017 Economic Assumption Update Review included a survey of the inflation assumptions of eight independent investment consultants and found they ranged from 1.56% to 2.50%, with an average of 2.15%.
- The July 2017 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (next 75 years), inflation will average somewhere between 2.0% and 3.2% (<https://www.ssa.gov/oact/tr/2017/tr2017.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.6%.
- As shown on page two of the GRS July 6, 2017 Economic Assumption Update Review, there continues to be support for this assumption as a long-term rate even though the historic short-term averages are being lowered by the current historically low rates.

The *National Conference on Public Employee Retirement Systems* (NCPERS) December 2016 Public Retirement Systems Study includes the following graphic of respondents' inflation assumptions:



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This shows that the current 2.75% SERS assumption is lower than the average inflation assumptions used among the 159 systems that responded to this study, with 3.0% as the average. However, we note that 40% of the systems in the two most recent studies reduced their inflation assumption between the 2015 and 2016 studies with an average reduction of 0.39%. The downward trend in this assumption is further supported by the 3.0% average for the 2016 study being a 0.2% reduction from the prior year.

3. *Salary (Annual Compensation) Increase Assumption*

The salary increase assumption is shown in the table below.

Illustrative rates of increase per individual employee per annum, compounded annually:

Age	Annual Increase
25	7.67%
30	6.20%
35	5.30%
40	4.97 %
45	4.58%
50	4.26%
55	4.05%
60	3.85%
65	3.47%
70	3.25%

These increases include the wage inflation assumption of 3.25% comprised of an inflation assumption of 2.75% per annum and 0.50% per annum productivity assumption.

We find the assumption and the basis for setting it as reasonable and consistent with the inflation assumption.

Our rationale for concurring with GRS’s recommended salary increase assumption:

- The July 2017 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (between 2027 and 2091) real wage differential will average somewhere between 0.58% and 1.82%.
- This assumption is comprised of inflation and productivity, which is employer-specific, and is supported by credible data as shown on pages 12-15 of the April 2014 Experience Review Study performed by GRS Further, the July 2017 Economic Assumption Update Review notes that the average salary increase in excess of the assumption for seniority and merit was approximately 2.9% for the plan year ending June 30, 2016. While this is lower than the 3.25% assumption, it reflects

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the current low interest economic conditions while the wage assumption is a long-term assumption

- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a continued trend of lower salary increases for public sector employees.

4. Cost of Living Adjustment Assumption

Benefits are increased annually as described on pages 53 and 56 through 58 of the draft June 30, 2017 Actuarial Valuation. Annual increases are three percent for those hired prior to January 1, 2011 and based on ½ of the Consumer Price Index for those hired on or after January 1, 2011, which is 1.375% based on the inflation assumption of 2.75%.

We find the assumption and the basis for setting it reasonable.

5. Expenses

As estimated and advised by SERS staff, assumed plan expenses are based on current expenses and are expected to increase in relation to the projected capped payroll.

We find the assumption reasonable however more information on the expected expenses as a function of capped payroll would be a valuable additional disclosure.

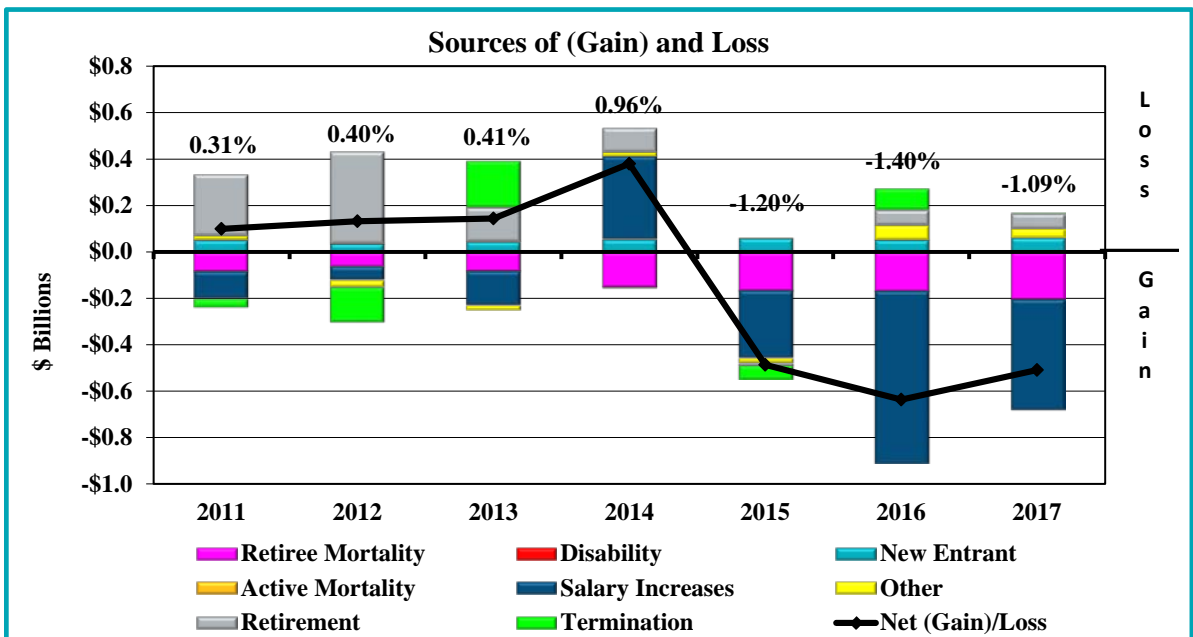
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B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2017 Actuarial Valuation, these are shown on page 20. In the chart below, we have collected similar data from GRS's past valuation reports dating back to 2011 and use these to present a historical review of past demographic and salary increase experience gains and losses.

The chart that follows shows the pattern of annual gains and losses attributable to eight different sources as shown in the legend. When the colored bar slices appear above zero on the Y-axis, that represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, that represents an experience gain for that year with liabilities less than expected. The net liability (gain)/loss is shown by the black line. This net (gain)/loss as a percent of liability is shown above the bars.



The percentages shown above the bars refer to net (gain)/loss as a percentage of liability.

Key observations from this chart are as follows:

1. From 2014 forward, when the assumptions were changed, there has been a net gain on the valuation. These are consistently due primarily from gains in salary, which means actual salary increases are less than the assumed increases.
2. There have also been consistent gains due to retiree mortality reflecting additional conservatism in the expected longevity of retirees.

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3. In every year since 2011, there have been small experience losses attributable to new entrants joining SERS. This continuing source of losses due to new entrants is expected for most pension plans. This is because members who are hired after the valuation date may earn a partial year of service credit that does not show up until the following valuation, at which point the extra liabilities for their initial partial year are treated as a liability loss. These losses could be anticipated in future assumptions through a load developed in anticipation that new entrants will begin on average with some past service credits.

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Below we summarize the demographic assumptions that we reviewed, and we have concluded all are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. Mortality

Post-Retirement Mortality

The mortality basis was updated with the June 30, 2016 Actuarial Valuation and is based on 105 percent of the RP-2014 Healthy Annuitant mortality tables, sex distinct, with generational mortality improvements using the MP-2014 two-dimensional mortality improvement scales recently released by the Society of Actuaries. This assumption provides a margin for future mortality improvements. No adjustment is made for post-disabled mortality.

The combination of a conservative mortality table and projection tables that are more conservative than the most recently released MP-2017 tables may mean there is an overestimate of life expectancy within the valuation. However, given the nature of the statutory funding method, conservative assumptions will help support a stable contribution as a percent of pay.

Pre-Retirement Mortality, including terminated vested members prior to attaining age 50

The mortality basis was updated with the June 30, 2016 Actuarial Valuation and is based on a percentage of 75% for males and 90% for females of the RP-2014 Total Employee mortality table with generational mortality improvement factors using the MP-2014 two-dimensional mortality improvement scales, to reflect that experience shows active members having lower mortality rates than retirees of the same age. Five percent of deaths among active employees are assumed to be in the performance of their duty.

Given the significant dependence of the statutory funding requirements on new hires over the next 30 years, we concur that reflecting generational mortality improvement is appropriate for this plan.

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2. Termination

Illustrative rates of withdrawal from the System for Tier 1 members are as follows:

Service (Beginning of Year)	Service Based Withdrawal			
	Regular Formula Employees		Alternate Formula Employees	
	Males	Females	Males	Females
0	0.2300	0.2300	0.0325	0.0600
1	0.1200	0.1200	0.0325	0.0450
2	0.0950	0.0850	0.0325	0.0450
3	0.0700	0.0650	0.0200	0.0400
4	0.0625	0.0500	0.0175	0.0300
5	0.0425	0.0475	0.0175	0.0300
6	0.0425	0.0350	0.0175	0.0300
7	0.0350	0.0350	0.0175	0.0200
8	0.0300	0.0300	0.0150	0.0200
9	0.0250	0.0250	0.0150	0.0200
10	0.0250	0.0250	0.0150	0.0200
11	0.0200	0.0200	0.0125	0.0175
12	0.0200	0.0200	0.0125	0.0175
13	0.0200	0.0200	0.0100	0.0150
14	0.0150	0.0150	0.0100	0.0150
15	0.0150	0.0150	0.0100	0.0150
16	0.0150	0.0150	0.0100	0.0150
17	0.0150	0.0150	0.0100	0.0150
18	0.0150	0.0150	0.0100	0.0150
19	0.0150	0.0150	0.0100	0.0150
20	0.0150	0.0100	0.0100	0.0150
21	0.0150	0.0100	0.0100	0.0150
22	0.0150	0.0100	0.0100	0.0150
23	0.0150	0.0100	0.0100	0.0150
24	0.0150	0.0100	0.0100	0.0150
25	0.0150	0.0100	0.0100	0.0150
26	0.0150	0.0100	0.0100	0.0150
27	0.0150	0.0100	0.0100	0.0150
28	0.0150	0.0100	0.0100	0.0150
29	0.0150	0.0100	0.0100	0.0150
30+	0.0150	0.0100	0.0100	0.0150

It is assumed that terminated employees will not be rehired. The rates apply only to employees who have not fulfilled the service requirement necessary for retirement at any given age.

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Illustrative rates of withdrawal from the System for Tier 2 members are as follows:

Service (Beginning of Year)	Service Based Withdrawal			
	Regular Formula Employees		Alternate Formula Employees	
	Males	Females	Males	Females
0	0.2700	0.2500	0.0500	0.0775
1	0.1400	0.1600	0.0350	0.0475
2	0.0800	0.1000	0.0350	0.0475
3	0.0800	0.0800	0.0225	0.0425
4	0.0625	0.0700	0.0200	0.0325
5	0.0500	0.0600	0.0200	0.0325
6	0.0450	0.0550	0.0200	0.0325
7	0.0400	0.0500	0.0200	0.0225
8	0.0350	0.0450	0.0175	0.0225
9	0.0300	0.0400	0.0175	0.0225
10	0.0250	0.0350	0.0175	0.0225
11	0.0200	0.0250	0.0150	0.0200
12	0.0200	0.0200	0.0150	0.0200
13	0.0200	0.0200	0.0125	0.0175
14	0.0150	0.0150	0.0125	0.0175
15	0.0150	0.0150	0.0100	0.0150
16	0.0150	0.0150	0.0100	0.0150
17	0.0150	0.0150	0.0100	0.0150
18	0.0150	0.0150	0.0100	0.0150
19	0.0150	0.0150	0.0100	0.0150
20	0.0150	0.0150	0.0100	0.0150
21	0.0150	0.0150	0.0100	0.0150
22	0.0150	0.0150	0.0100	0.0150
23	0.0150	0.0150	0.0100	0.0150
24	0.0150	0.0150	0.0100	0.0150
25	0.0150	0.0150	0.0100	0.0150
26	0.0150	0.0150	0.0100	0.0150
27	0.0150	0.0150	0.0100	0.0150
28	0.0150	0.0150	0.0100	0.0150
29	0.0150	0.0150	0.0100	0.0150
30+	0.0150	0.0150	0.0100	0.0150

3. Unused Sick Leave and Optional Service Purchases

Current and future active member's service is increased 4.5 months to account for increases of service at retirement due to converting unused sick leave and vacation days and purchasing applicable optional service.

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4. Marriage Assumption

85.0% of active male participants and 65.0% of active female participants are assumed to be married. Actual marital status at benefit commencement is used for retirees.

5. Social Security Offset for Survivor Benefits

There is no offset assumption for male surviving spouses because it is assumed their own primary insurance amount (PIA) is as great as their spouses' PIA. 60% of married male members are assumed to have a dual income household. For the dual income household, it is assumed the offset at age 60 is 45.0 percent of the original survivor benefit. It is assumed the offset at age 62 is 10.0% of the original survivor benefit. Furthermore, it is assumed that 50% of retirees on or after July 1, 2009, will elect to remove the offset provision. In exchange for the removal, the member's retirement annuity is reduced by 3.825% monthly as mandated by Statutes (40 ILCS 5/14-121).

6. Disability

Because members who receive disability benefits typically spend less than one year on disability, they are considered active members. Therefore, a load of 1.65% of pay on the normal cost is applied to reflect the near-term cash flow. This assumption is based on 110% of the most recent disability benefit payment information as a percent of payroll and will be updated at each valuation date as experience emerges.

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7. Retirement

Employees are assumed to retire in accordance with the rates shown below. The rates apply only to employees who have fulfilled the service requirement necessary for retirement at any given age.

Retirement Rates for Regular Formula Employees		
Age	Males	Females
50	15.00%	25.00%
51	15.00%	25.00%
52	25.00%	30.00%
53	25.00%	25.00%
54	20.00%	20.00%
55	17.50%	16.00%
56	17.50%	16.00%
57	15.00%	16.00%
58	15.00%	16.00%
59	15.00%	16.00%
60	10.00%	16.00%
61	10.00%	12.50%
62	20.00%	20.00%
63	17.50%	17.50%
64	15.00%	17.50%
65	20.00%	25.00%
66	25.00%	20.00%
67	20.00%	20.00%
68	20.00%	20.00%
69	17.50%	20.00%
70	17.50%	20.00%
71	17.50%	15.00%
72	15.00%	20.00%
73	17.50%	20.00%
74	20.00%	20.00%
75	100.00%	100.00%

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Early Retirement Rates for Regular Formula Employees		
Age	Males	Females
55	4.50%	4.50%
56	6.00%	4.00%
57	5.00%	7.00%
58	7.50%	9.50%
59	9.50%	12.00%

Age	Retirement Rates for Alternate Formula Employees		Eligible for Regular Formula	
	Eligible for Alternate Formula		Benefits Only	
	Males	Females	Males	Females
50	60.00%	40.00%	N/A	N/A
51	45.00%	40.00%	N/A	N/A
52	45.00%	35.00%	N/A	N/A
53	40.00%	30.00%	N/A	N/A
54	40.00%	25.00%	N/A	N/A
55	35.00%	30.00%	N/A	N/A
56	35.00%	25.00%	N/A	N/A
57	27.50%	20.00%	N/A	N/A
58	30.00%	20.00%	N/A	N/A
59	25.00%	25.00%	N/A	N/A
60	30.00%	30.00%	5.00%	8.00%
61	25.00%	20.00%	5.00%	8.00%
62	45.00%	45.00%	10.00%	8.00%
63	40.00%	35.00%	10.00%	12.50%
64	30.00%	40.00%	10.00%	12.50%
65	55.00%	40.00%	20.00%	17.50%
66	50.00%	60.00%	20.00%	15.00%
67	50.00%	50.00%	20.00%	40.00%
68	30.00%	15.00%	17.50%	30.00%
69	35.00%	35.00%	17.50%	20.00%
70	50.00%	60.00%	17.50%	25.00%
71	30.00%	50.00%	17.50%	30.00%
72	100.00%	100.00%	100.00%	100.00%

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Members hired after December 31, 2010, eligible for the regular formula benefits will retire according to the following age-based retirement rates:

Retirement Rates for Regular Formula Employees				
Age	Employees Eligible for Normal Retirement	Age	Employees Eligible for Early Retirement	
67	50.0%	62	30.0%	
68	35.0	63	15.0	
69	35.0	64	15.0	
70	35.0	65	15.0	
71	20.0	66	15.0	
72	20.0			
73	20.0			
74	20.0			
75	100.0			

Members hired after December 31, 2010, eligible for the alternate formula benefits will retire according to the following age-based retirement rates:

Retirement Rates for Alternate Formula Employees			
Age	Males	Females	
60	50.0%	50.0%	
61	25.0	20.0	
62	45.0	45.0	
63	40.0	35.0	
64	30.0	40.0	
65	55.0	40.0	
66	50.0	60.0	
67	50.0	50.0	
68	30.0	15.0	
69	35.0	35.0	
70	50.0	60.0	
71	30.0	50.0	
72	100.0	100.0	

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8. Spouse's Age

The female spouse is assumed to be three years younger than the male spouse.

9. Children

It is assumed that married members have 2.2 children, one year apart in age.

The age of the youngest child of a deceased employee at his or her date of death is assumed to be as follows:

Age at Death of Employee	Age of Youngest Child	Age at Death of Employee	Age of Youngest Child
20	2	40	6
25	3	45	8
30	4	50	10
35	5	55	12
		60	14

10. Overtime and Shift Differentials

Reported earnings include base pay alone. It is assumed that overtime and shift differentials will increase total payroll by 3.5% over reported earnings.

11. Load for Inactive Members Eligible for Deferred Vested Pension Benefits

Load of 15 percent to the liability attributable to inactive members eligible for deferred vested pension benefits for increase in final average salary due to participation in a reciprocal system after termination.

12. Missing Data

If year-to-date earnings are not available, then the monthly pay rate is used. If both year-to-date earnings and the monthly pay rate are not available, the annual rate of pay is assumed to be the rate of pay for the population as a whole on the valuation date. For members with less than a year of service, the annual rate of pay is based on the greater of year-to-date earnings or annualized pay rate. If a birth date was not available, the member was assumed to be age 35.

13. Decrement Timing

All decrements are assumed to occur mid-year.

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14. Decrement Relativity

Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.

15. Decrement Operation

Disability and turnover decrements do not operate after member reaches retirement eligibility.

16. Eligibility Testing

Eligibility for benefits is determined based upon the age nearest birthday and service on the date the decrement is assumed to occur.

17. 415(b) and 401(a)(17) Limits

No explicit assumption is made with respect to these items.

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18. Population Projection

For purposes of determining annual appropriation as a percent of total covered payroll, the size of the active group is assumed to remain level at the number of actives as of the valuation date. New entrants are assumed to enter with an average age and an average pay as disclosed below. New entrants are assumed to have the same demographic profile as new entrants in the 15 years prior to the valuation date. The average increase in uncapped payroll for the projection period is 3.25% per annum. New entrants not covered by Social Security are assumed to participate in the Tier 2 defined benefit plan.

Age Group	New Entrant Benefit Groups												Total	
	New Entrants Eligible for Regular Formula Benefits who are Covered by Social Security		New Entrants Eligible for Regular Formula Benefits who are not Covered by Social Security		New Entrants in Positions Formerly Eligible for Alternate Formula Benefits who are Covered by Social Security and are now Eligible for Regular Formula Benefits		New Entrants Eligible for Alternate Formula Benefits who are Covered by Social Security		New Entrants in Positions Formerly Eligible for Alternate Formula Benefits who are not Covered by Social Security and are now Eligible for Regular Formula Benefits		New Entrants Eligible for Alternate Formula Benefits who are not Covered by Social Security			
	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary
Under 20	127	3,689,235	11	447,475	45	1,935,776	21	922,019					193	6,547,030
20-24	2,245	84,748,730	25	1,316,902	1,270	57,075,976	515	23,574,332	283	18,099,737	8	251,731	4,332	184,197,981
25-29	3,838	167,243,099	15	829,969	1,484	69,064,094	618	30,454,069	401	27,027,961	4	129,633	6,370	295,235,758
30-34	3,426	163,599,516	5	243,430	823	41,202,801	463	24,726,638	162	11,337,316	1	31,700	4,890	241,727,940
35-39	2,889	147,564,363	7	386,900	534	28,137,736	371	21,060,414	76	5,308,156	1	57,781	3,876	202,371,880
40-44	2,871	150,399,683	7	402,600	455	25,430,203	287	16,766,146	29	2,017,509			3,649	195,000,441
45-49	2,440	129,147,007	3	189,630	366	20,503,602	219	13,573,027	10	579,126			3,042	164,205,362
50-54	2,006	108,580,572	5	352,761	199	11,752,451	118	7,248,390	10	774,541			2,336	128,545,584
55-59	1,237	64,223,979			131	7,822,880	59	3,362,341	11	840,939			1,443	76,602,900
60-64	456	23,870,203			37	2,331,415	13	1,051,592	3	259,022			509	27,512,232
65-69	28	1,634,927			4	227,177							32	1,862,104
70 & Over														
Total	21,563	\$1,044,701,314	78	\$4,169,667	5,348	\$265,484,111	2,684	\$142,738,968	985	\$66,244,307	14	\$470,845	30,672	\$1,523,809,212
Avg. Salary		\$48,449		\$53,457		\$49,642		\$53,181		\$67,253		\$33,632		\$49,681
Avg. Age		37.65		33.95		32.09		33.30		28.62		24.84		36.00
Percent Male		43%		91%		77%		71%		89%		100%		53%

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C. Actuarial Methods

Actuarial methods consist of three components: (1) the funding method, which is the attribution of total costs to past, current, and future years; (2) the method of calculating the actuarial value of assets (i.e., asset smoothing); and (3) the amortization basis of the Unfunded Actuarial Liability (UAL). Since the amortization basis is governed by State law, we do not comment on it here.

1. Cost Method

The System uses the projected unit credit cost method (PUC) to assign costs to years of service, as required under the Pension Code (40 ILCS 5/14). **We have no objections with respect to using the PUC method, although we would prefer the Entry Age Normal (EAN) funding method as it is more consistent with the requirement in 40 ILCS 5/14-131 for level percentage of pay funding.**

Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date, but not beyond) is taken into account in calculating these benefits. The present value of these benefits based on past service and future compensation is the actuarial accrued liability for a given active participant. Under the PUC cost method, the value of an active participant's benefits tends to increase more sharply over his or her later years of service than over his or her earlier ones. As a result of this pattern of benefit values increasing, while the PUC method is not an unreasonable method, more plans use the EAN funding method to mitigate this effect. It should also be noted that the EAN method is the required method to calculate liability for GASB 67 & GASB 68.

2. Asset Smoothing Method

The actuarial value of assets for the System is a smoothed market value. Unanticipated changes in market value are recognized over five years in the actuarial value of assets. The primary purpose for smoothing out gains and losses over multiple years is so fluctuations in the actuarial value of assets will be less volatile over time than fluctuations in the market value of assets.

The December 2016 NCPERS study previously referenced found that the majority of plans responding to the survey have a five-year smoothing period.

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Smoothing the market gains and losses over a period of five years to determine the actuarial value of assets is a generally accepted approach in determining actuarial cost, and we concur with its use.

Another aspect of asset smoothing methods is whether or not to limit the maximum spread between the actuarial value of assets and the market value of assets. Many public sector pension plans limit the actuarial value of assets to be in any year no more than 120% of market value and no less than 80% of market value. In fact, the Internal Revenue Service (26 USC 430(g)(3)(B)(iii)) mandates this "corridor" for private sector pension plans (a 90-110% corridor is mandated). Even though this is not mandated for public plans, we believe that the use of this type of corridor is a sounder actuarial practice, and according to ASOP No. 44 in Section 3.3 b. 1, the actuarial value of assets should "...fall within a reasonable range around the corresponding market values."

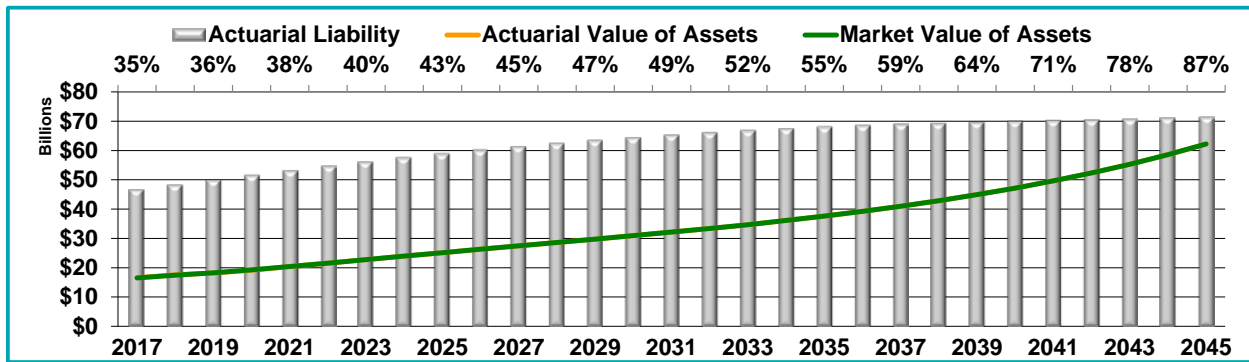
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SECTION IV – PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2017 Actuarial Valuation of SERS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

The graphs shown below are independent approximations of the projections performed by the State Actuary to verify that the System's funding projections are reasonable. They do not reflect all the precision of the projections applied for the System, but instead they are intended to verify the reasonableness of the modeling done by the System's actuary.

The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As pointed out on page 14 of the draft June 30, 2017 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projections. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio for each year is shown at the top of the graph. For example, in 2029, the funded ratio is approximately 47% with assets of approximately \$30 billion and liabilities of approximately \$64 billion.

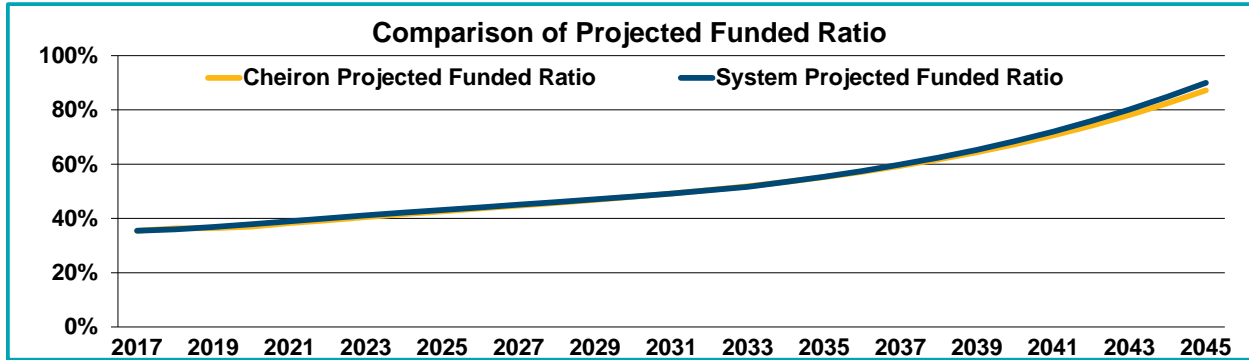


Source: Cheiron projection analysis.

When we compare our projected funded ratio against the results shown in the draft June 30, 2017 Actuarial Valuation, **we find a close match in expected funded ratio**. This close match of the funded ratio indicates that the projections done by the System's actuary are reasonable and the fact we do not achieve the same target 90% funding is a function of Cheiron's approximation.

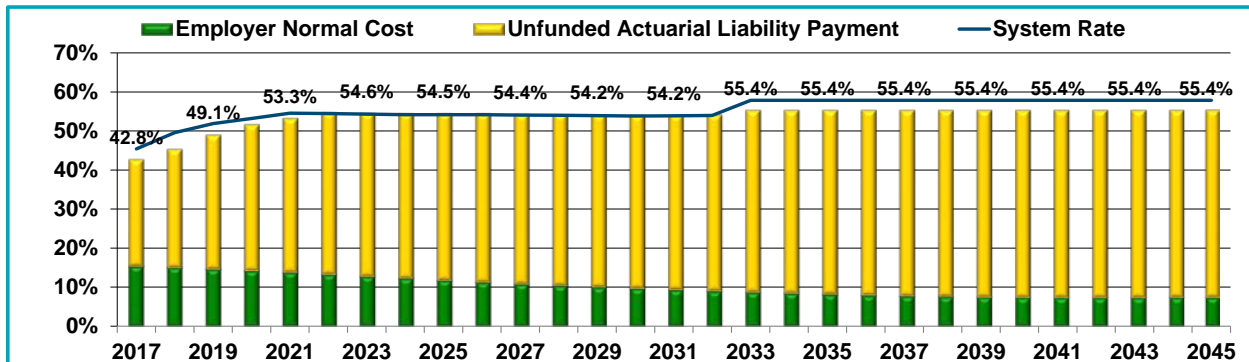
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Source: Cheiron projection analysis.

The following graph shows the expected contribution calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for the 2017 year was set based on the June 30, 2016 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2018 (Fiscal Year Ending June 30, 2019). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by participants not covered by employee contributions based on the statutory funding method; and 2) an amortization of the unfunded liability. The normal cost amounts are shown by the green bars and the amortization of the UAL amounts by the yellow bars. The percentages shown are the total contribution rates calculated by Cheiron, which are equal to the sum of the bars. The graph shows that a larger percentage of the total contribution is being made toward the UAL payment later in the period. The blue line shows the projected contribution rates as percentages of payroll from the System's Actuary's draft June 30, 2017 Actuarial Valuation. The difference between Cheiron's approximation and the System's projections is the difference between the top of the bars and the line. The contributions are being limited by the maximum contribution described in the General Obligation Bond Act prior to 2033, which is why the rate increases after 2033.



Source: Cheiron projection analysis.

Our conclusion is that **the projections performed by the System's actuary are reasonable.**

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

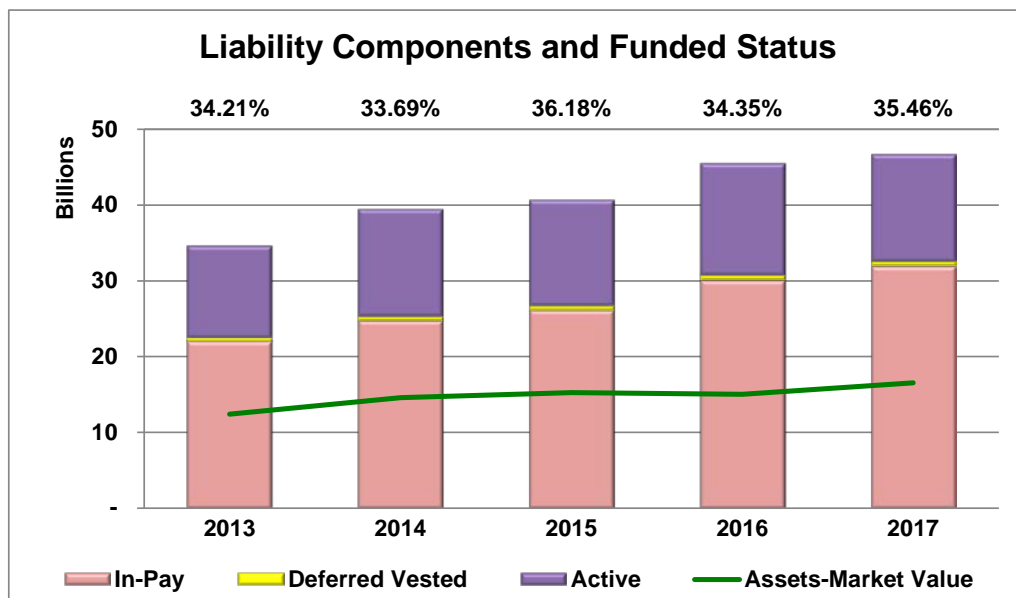
We have added a new section in this year's report focusing on various measures of funding adequacy. We will examine the System's funded status, the statutory funding requirements compared to contributions needed to pay down the Unfunded Actuarial Liability (UAL), the sources of change in UAL, and net cash flow. The Actuarial Valuation Report prepared by GRS includes traditional actuarial measurements, which should be enhanced by the additional stress testing and projection analysis. Given the unique and substantial funding challenges faced by the Illinois pension systems, we created this new section on funding adequacy measures and trends to supplement that information from the GRS report and better inform plan trustees and other stakeholders about the funding shortfall.

1. Plan Funded Status

The first funding adequacy measure we present is a historical funded status trend for the past five years. Funded status for this measure is defined as the ratio of the market value of assets to the actuarial liability. The chart below shows SERS' funded status since 2013 has gone from 34.21% funded to 35.46% funded in 2017, a decline in funded status of 0.31%. In addition to showing the funded status, this chart also shows the breakdown of the plan's liabilities by membership status:

- Active status – this is the liability (present value of benefits already earned) for future payments to members who are currently working in the System,
- Deferred Vested status – this is the liability for members who are no longer working in the system, and
- In-pay status – this is the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown demonstrates the increasing maturity of the plan, as the in-pay status liabilities are becoming a larger portion of the total plan liabilities. In addition, this chart shows that plan assets only cover around half of the liabilities for just those members currently in-pay status.



Source: Cheiron analysis of funding adequacy.

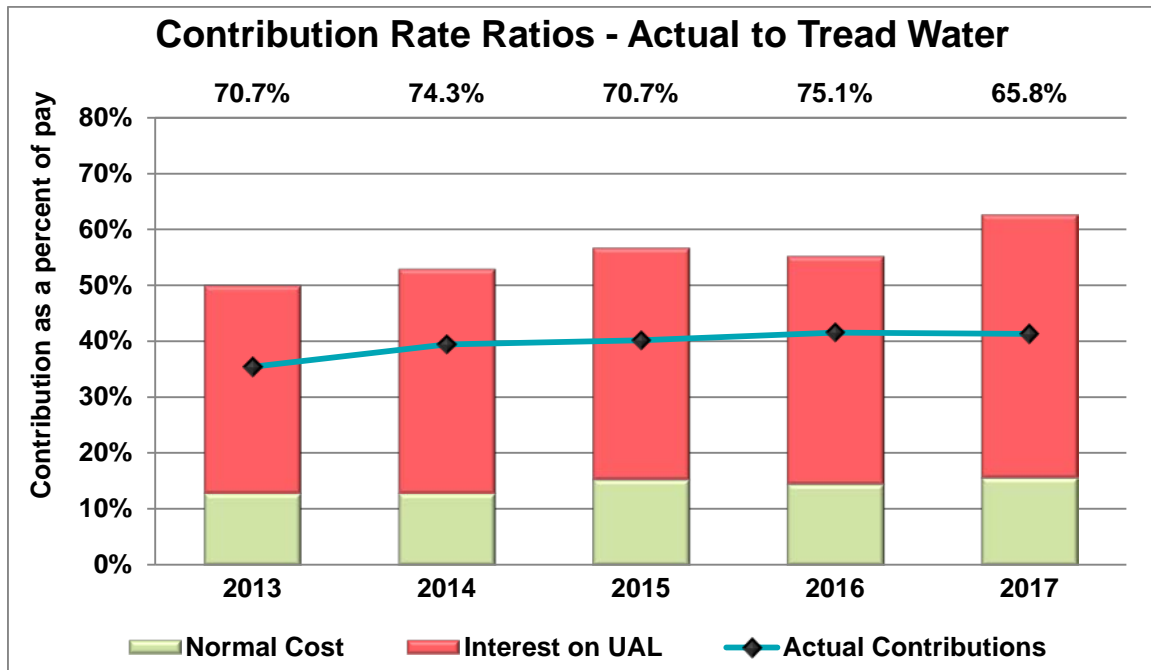
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SECTION V – ANALYSIS OF FUNDING ADEQUACY

2. Contributions as a Percent of Payroll Compared to Tread Water Contribution

The next funding adequacy measure compares the SERS historical statutory contribution rates to tread water contribution rates. The tread water contribution rates consist of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability (UAL). The reason that this sum is referred to as the tread water contribution rate is because it is the contribution required so that the UAL will remain constant, or “tread water” (absent experience gains or losses). This tread water concept may be better understood with a credit card analogy. If a credit card holder fails to pay each month the amount of purchases made in that month (i.e., normal cost) and the monthly finance charge on the unpaid purchases from prior months (i.e., the interest on the UAL), his or her credit card debt will grow.

As the chart below shows, over the past five years, the statutory contribution rate was significantly less than the tread water rate. **The statutory contribution as a percent of the tread water rate is shown at the top of the graph for each year.** The deficiency between the actual contribution rate and the tread water rate has actually increased slightly since 2013 and based on current projections is expected to continue to exist for many more years under the current statutory funding requirements, which indicates the dollar value of the UAL will continue to grow.



Source: Cheiron analysis of funding adequacy.

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

3. Sources of Changes in the UAL

Our third funding adequacy metric identifies the factors that have contributed to the changes in the UAL from year to year between 2008 and 2017. Except for gains due to investment returns in 2014, 2015, and 2017 and liability experience gains in 2015 through 2017, all other factors have resulted in increases in the UAL in every year. The components for change to UAL shown in the chart below are:

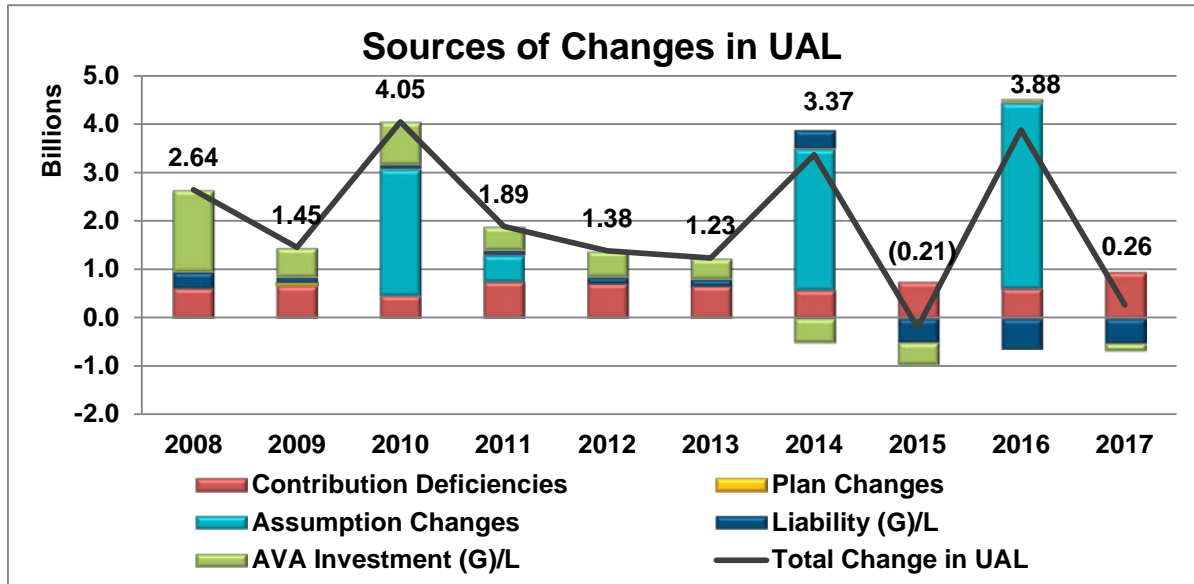
- **Contribution Deficiencies**, which are based on comparisons to the tread water contribution, have increased the UAL by \$6.74 billion over this period.
- **Assumption Changes** are changes to actuarial assumptions as the System updated expectations on future investment returns and life expectancy. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations. Over this period, assumption changes have increased the UAL by \$9.90 billion.
- **AVA (Actuarial Value of Assets) Investment (G)/L** is the net investment gain or loss due to assets earning more or less than assumed. These have increased the UAL over this period by \$3.58 billion.
- **Plan Changes** are any modifications of the design of the plan, which have affected benefits already accrued. Since most of the changes to the System's plan affect only future benefits the impact has only occurred in one year representing \$80 million during this period.
- **Liability (G)/L** are the changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.). These were generally small gain totaling (\$360) million during this period.

The sum of all the components total change in UAL is shown as the black line and values at the top of each set of stacked bars in the chart.

We expect that this chart will help stakeholders understand the sources of growth in the UAL over the past decade and inform discussions about the current funding requirements and adequacy.

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Source: Cheiron analysis of funding adequacy.

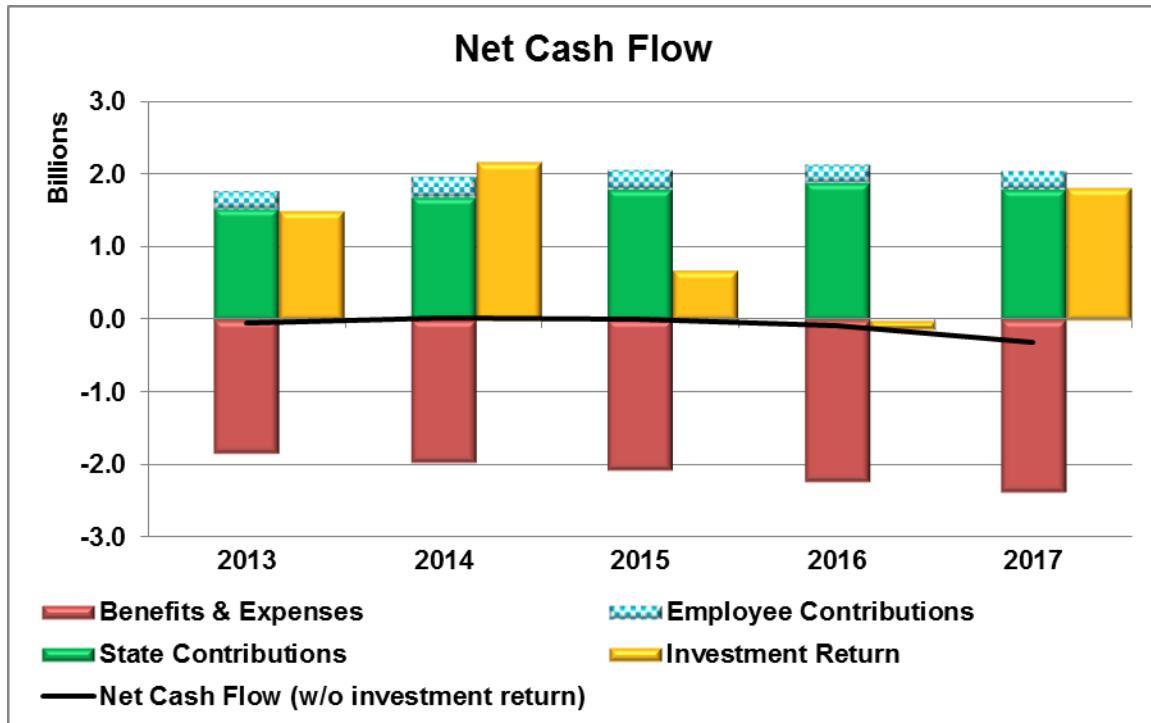
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SECTION V – ANALYSIS OF FUNDING ADEQUACY

4. Net Cash Flow Analysis

The last funding adequacy measure we present is an analysis of the plan's *net cash flow* before taking into account investment return, which is defined as State and Member contributions less benefit payments and administrative expenses. This measure is an indication of a pension plan's maturity level in terms of its net cash flow relative to plan assets. In a very mature plan, it is expected that cash flows will be negative as the benefits and expense are expected to exceed contributions. In a very immature plan, the contributions typically are more than the payouts so the net cash flow is positive. The more negative net cash flow is, the more vulnerable it is to market downturns. This is because when a pension plan has more payouts than contributions, the plan assets are needed to pay some portion of the payouts. So, with a market downturn not only does the plan suffer a loss in investment income, but also some portion of its principal, leaving fewer assets left to invest during a recovery.

Looking at the chart below, SERS has no real risk from this source of measurement, as the net cash flow basis (black line) is practically zero over the measurement period. This measure should continue to be monitored as negative cash flow increases the System's vulnerability to market downturns. But for now it means the assets can be invested for the long term because the amount of additional funds in addition to contribution is like produce from investment dividends and interest.



Source: Cheiron analysis of funding adequacy.

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STATUS OF RECOMMENDATIONS FROM THE 2016 STATE ACTUARY'S REPORT

Response to Recommendations in 2016

In the State Actuary's Preliminary Report on the State Employees' Retirement System of Illinois presented December 15, 2016, Cheiron made several recommendations. Below we summarize how these recommendations were reflected in either the System's comments last year or in this year's draft June 30, 2017 Actuarial Valuation.

Recommendations to Retirement System from 2016 State Actuary Report	Status	Comments
1. We recommend that the SERS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary.	Not Implemented	While discussion of issuance of an RFP is included in the January 10, 2017 minutes we see no evidence the RFP has been issued. Recommendation repeated.
2. We continue to recommend that the funding method be changed to at least fully fund future plan benefit accruals to avoid continued systematic underfunding of SERS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.	Partially Implemented	The System has adopted a funding policy that would meet the recommendation; however, the actual funding of the system is based on State statute and a change in the funding method and funding policy would require a statutory change. Recommendation repeated.
3. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs.	Partially Implemented	SERS included stress testing results in the final FY 2016 valuation report (Page 64). However, they were not included in the 2017 valuation draft. Recommendation modified.

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STATUS OF RECOMMENDATIONS FROM THE 2016 STATE ACTUARY'S REPORT

Recommendations to Retirement System from 2016 State Actuary Report	Status	Comments
4. We recommend the SERS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work, and adjust assumptions accordingly, as they did for this valuation.	Implemented	This review has been performed, evidenced through the <i>Economic Assumption Update Review for the June 30, 2017 Actuarial Valuation</i> dated June 6, 2017.
5. We further recommend that the Boards of the three systems whose assets are commingled, SERS, the Judges' Retirement System (JRS), and the General Assembly Retirement System (GARS), consider whether different interest rate assumptions for these systems are appropriate.	Implemented	The Systems have explained why different assumptions are appropriate. Recommendation removed.

Chapter Five

PRELIMINARY REPORT ON THE JUDGES' RETIREMENT SYSTEM

In accordance with 30 ILCS 5/2-8.1, Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the Judges' Retirement System (JRS) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to JRS on December 4, 2017. The preliminary report was based on Cheiron's review of actuarial assumptions included in JRS' 2017 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the Judges' Retirement System. JRS' written response, provided on December 14, 2017, can be found in Appendix C.

OVERVIEW JUDGES' RETIREMENT SYSTEM as of June 30, 2017	
Actuarial accrued liability	\$2,649,258,572
Actuarial value of assets	<u>\$942,988,992</u>
Unfunded liability	\$1,706,269,580
Funded ratio	35.6%
Employer normal cost	\$40,084,816
State contribution (FY19)	\$140,469,000
Active members	953
Inactive members	23
Current benefit recipients	<u>1,175</u>
Total membership	2,151
Interest rate assumption	6.75%
Inflation assumption	2.75%
Actuarial cost method	Projected Unit Credit
Asset valuation method	5-year Smoothing
Executive Director	Tim Blair
Actuarial Firm	Gabriel, Roeder, Smith & Company
Source: June 30, 2017 JRS actuarial valuation report.	

December 20, 2017

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Board of Trustees
Judges' Retirement System of Illinois
2101 South Veterans Parkway
P.O. Box 19255
Springfield, Illinois 62794-9255

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution to the Judges' Retirement System of Illinois (JRS or System) for Fiscal Year 2019.

In summary, we believe that the assumptions and methods used in the draft June 30, 2017 Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the State funding requirements that do not conform to Actuarial Standards of Practice, were properly calculated in accordance with State law.

Section I of this report describes the review process undertaken by Cheiron. Section II summarizes our findings and recommendations. Section III provides the supporting analysis for those findings and presents more details on our assessment of the actuarial assumptions and methods employed in GRS's Actuarial Certification, as well as our assessment of GRS's determination of the required State contribution for Fiscal Year 2019. Section III also includes comments on other issues impacting the funding of JRS, including the implications of Article 18 of the Illinois Pension Code, which establishes the statutory funding requirements for the System. **In our opinion, the statutory mandated minimum funding requirements call for inadequate funding, and do not meet Actuarial Standards of Practice (ASOP), particularly ASOP No. 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions.** Section IV reviews the projections contained in the draft June 30, 2017 Actuarial Valuation. Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by JRS and GRS. This information includes actuarial assumptions and methods adopted by the JRS Board, System provisions, the draft June 30, 2017 Actuarial Valuation, the draft 2017 GASB 67/68 Report, the 2017 Economic Assumption Update Review, and minutes of the plan year 2017 JRS Board of Trustee meetings. A detailed description of all information provided for this review is contained in Appendix B.

To the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Office of the Auditor General and the Judges' Retirement System of Illinois for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

Elizabeth Wiley, FSA, FCA, MAAA, EA
Consulting Actuary

SIGNED ORIGINAL ON FILE

Michael J. Noble, FSA, FCA, MAAA, EA
Principal Consulting Actuary

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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SECTION I – REPORT SCOPE

Illinois Public Act 097-0694 (the Act) amended the Illinois State Auditing Act (30 ILCS 5/2-8.1) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the Judges' Retirement System of Illinois (JRS or System) and to issue to the JRS Board this preliminary report on the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contributions for Fiscal Year (FY) 2019. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the JRS Board to consider before finalizing its certification of the required State contributions for FY 2019.

While the Act states that just the actuarial assumptions and valuation are to be reviewed, we have also reviewed the actuarial methodologies (funding and asset smoothing methods) employed in preparing the Actuarial Certification, as these methods can have a material effect on the amount of the State contribution being certified. Finally, we have offered our opinion on the implications of Article 18-131 of the Illinois Pension Code, which impacts the contribution amount certified by GRS.

In conducting this review, Cheiron reviewed the draft June 30, 2017 Actuarial Valuation, the draft 2017 GASB 67/68 Report, the 2017 Economic Assumption Update Review, and minutes of the plan year 2017 Board of Trustees meetings. The materials we reviewed are listed in Appendix B.

In addition to reviewing the Actuarial Certification of the required State contribution to JRS, the Act requires the State Actuary to conduct a review of the "actuarial practices" of the Board. While the term "actuarial practices" was not defined in the Act, we continue to interpret this language to mean that we review: (1) the use of a qualified actuary (as defined by the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2017 Actuarial Valuation.

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SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2017 Actuarial Valuation of JRS as well as the “actuarial practices” of the JRS Board. Section III of this report contains detailed analysis and rationale for these recommendations.

Proposed Certification of the Required State Contribution

Gabriel, Roeder, Smith & Company (GRS) has determined that the FY 2019 required State contribution calculated under the current statutory funding plan is \$140,469,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based. As such, we have accepted GRS’s annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

1. We continue to recommend that the JRS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System’s actuary.

State Mandated Funding Method

2. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of JRS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable. We understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Conformance to Statutory Funding Changes of Public Act 100-0023

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modifies the State’s funding policy to require that the contribution impact of all assumption changes be phased-in over a 5-year period. As such, the Act delays the funding of the System. Assumption changes result from more accurately identifying the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. Only one-fifth of the impact of these changes is now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a 5-year period beginning at the date of adoption.

The Act requires that the impact of assumption changes “be implemented in equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.” This amount is then implemented “at the resulting

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SECTION II – SUMMARY OF RECOMMENDATIONS

annual rate in each of the remaining fiscal years in that 5-year period.” GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of payroll, and reflecting one-fifth of that percentage change each year over five years. The method used by GRS will result in the cost impact due to assumption changes being recognized as increasing dollar amounts. This is because the recognition as an equal percentage of pay gets applied to an increasing payroll over a 5-year period. The language of the Act, which indicates recognition of equal dollar amounts, would result in a decreasing adjustment as a percentage of payroll, provided payroll actually grows each year.

3. We recommend that GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act.

Also as a result of P.A. 100-0023, the System Actuary is required to recertify the prior year's valuation in accordance with the Act. GRS has determined that the FY 2018 recertified required State contribution is \$135,622,000, compared to the original FY 2018 amount of \$146,766,000.

4. In this regard, the recertification provided by GRS as a stand-alone document provides insufficient information to support the revised funding amounts and should include an exhibit demonstrating how the new values, both amounts and percentages of payroll, were determined.

Assessment of Actuarial Assumptions Used in the 2017 Valuation

30 ILCS 5/2-8.1 requires the State Actuary to identify recommended changes in actuarial assumptions that the JRS Board must consider before finalizing its certification of the required State contribution. We have reviewed all the actuarial assumptions used in the draft June 30, 2017 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2017 Valuation

5. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether there is a potential for unsustainable costs during the statutory funding period. GRS did include stress testing in last year's final report, but did not include such stress testing in this year's draft report, just various explanations on the implications of assumptions not being met. We recommend that stress testing be added into this year's report. Because the public may only look to the valuation report for this type of information, we believe it should be contained here instead of any supplemental document to the Board that may potentially be overlooked.

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SECTION II – SUMMARY OF RECOMMENDATIONS

Recommended Changes for Future Valuations

6. We recommend the JRS Board continue to annually review the economic assumptions (primarily interest rate and inflation) prior to commencing the valuation work, and adjust assumptions accordingly, as they did for this valuation.

GASB 67 and 68

The 2017 JRS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2017 JRS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

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SECTION III – SUPPORTING ANALYSIS

In this section, we provide detailed analysis and supporting rationale for the recommendations that were presented in Section II of this report.

Proposed Certification of the Required State Contribution

As stated in our summary of recommendations in Section II, we have verified the arithmetic calculations made by GRS to develop this State required contribution, reviewed the assumptions on which it is based, and accepted GRS's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

Given the size of JRS, the System's low funded ratio, the recent changes in legal requirements, and guidance issued by the Government Finance Officers Association, we are recommending again that the Board periodically undertake a full scope actuarial audit, utilizing the services of a reviewing actuary. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary. Results are compared in a detailed fashion to measure the liabilities for each benefit form and feature. A replication audit will uncover any potential problems in the processing and certification of valuation results. While agreement with this recommendation was documented in the January 17, 2017 Board minutes, we have not seen any additional evidence that this is being done.

We continue to recommend that the JRS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary (Recommendation #1).

State Mandated Funding Method

The Illinois Pension Code (40 ILCS 5/18-131) is deficient in terms of establishing a method that adequately funds the System. This law requires that the actuary base the required contribution using a prescribed funding method that achieves 90% funding in the year 2045. This does not meet generally accepted actuarial principles because the System is never targeted to be funded to 100% and the funding of the System is significantly deferred into the future. In addition, the ongoing benefits that will be earned in the future are also being only funded at 90%. The method defined in the Code does not conform to the guidelines in ASOP No. 4, Section 3.14 regarding the allocation procedures of costs to the expected benefit payments, which provides:

When selecting a contribution allocation procedure, the actuary should select a contribution allocation procedure that, in the actuary's professional judgment, is consistent with the plan accumulating adequate assets to make benefit payments when due, assuming that all actuarial assumptions will be realized and that the plan sponsor or other contributing entity will make actuarially determined contributions when due.

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We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of JRS (Recommendation #2). Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.

We have reviewed the adopted policy. We agree that the policy is a reasonable method that conforms to the Actuarial Standards of Practice, and we agree with its use in the GASB report as an Actuarially Determined Contribution (ADC). The funding policy calls for a funding amount equal to the normal cost plus a closed 25-year amortization as a level percentage of capped payroll of the unfunded actuarial liability. This policy defines a method that would ultimately fully fund the plan and falls within generally accepted actuarial funding methods currently in use for public plans. As of June 30, 2017, the remaining amortization period is 23 years. According to this methodology, the State's contribution amount would be \$169,632,403 for FY 2019. It is important though to recognize that this change does not affect the actual funding of the System.

Based on the draft June 30, 2017 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 35.6%. We have concerns about the solvency of the System if there is a significant market downturn. This is why we continue to recommend stress testing be done to determine whether there will be sufficient assets under the State mandated funding method to pay benefits if there is a significant market downturn.

We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether there is a potential for unsustainable costs during the statutory funding period (Recommendation #5).

This should include an analysis and discussion of the impact on the annual contribution requirement of the alternative scenarios tested. The reason we recommend such stress testing be included in the valuation report is because that is the report that most stakeholders of the System look to for assessing the System's financial conditions. Supplemental reports, such as the stress testing report GRS provided separately for the prior valuation, may not be publicly identified, and therefore not readily accessible.

Conformance to Statutory Funding Changes of Public Act 100-0023

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modifies the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a 5-year period. As such, the Act further erodes the potential funded status of the System. Assumption changes result from more accurately identifying the obligations

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SECTION III – SUPPORTING ANALYSIS

for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact resulting from more accurately identifying the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns are now recognized at the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a 5-year period beginning at the date of adoption.

Public Act 100-0023 states:

A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applies in State fiscal year 2018 or thereafter shall be implemented in equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.

A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applied to the State contribution in fiscal year 2014, 2015, 2016, or 2017 shall be implemented:

- (i) as already applied in State fiscal years before 2018; and*
- (ii) in the portion of the 5-year period beginning in the State fiscal year in which the actuarial change first applied that occurs in State fiscal year 2018 or thereafter, by calculating the change in equal annual amounts over that 5-year period and then implementing it at the resulting annual rate in each of the remaining fiscal years in that 5-year period.*

We recommend that GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act (Recommendation #3).

While GRS in their certification letters demonstrates that the present value of future contributions through 2045 are equivalent after the implementation of the phase-in of the impact of assumption changes over five years, it is unclear that their phase-in method conforms to the law.

As calculated, GRS starts with determining the difference in the contribution rates before and after the assumption changes as percentages of payroll, divides this percentage by five to get one-fifth of the change, and then recognizes an additional one-fifth for each year of the phase-in period. The method used by GRS will result in the cost impact due to assumption changes being recognized as increasing dollar amounts. This is because the recognition as an equal percentage of pay is applied to an increasing payroll over a 5-year period. The language of the Act, which indicates recognition of equal dollar amounts, would result in a decreasing adjustment as a percentage of payroll, provided payroll actually grows each year.

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Also as a result of P.A. 100-0023, the System Actuary is required to recertify to the prior year's valuation in accordance with the Act.

In this regard, the recertification provided by GRS as a stand-alone document provides insufficient information to support the revised funding amounts and should include an exhibit demonstrating how the new values, both amounts and percentages of payroll, were determined (Recommendation #4).

In the recertification letter, there should either be clear reference to the dollar amounts in question as a result of the assumption changes as disclosed in the 2013 and 2016 actuarial valuation reports or an added disclosure as part of the recertification that documents the dollar impact of the assumption changes in support of the balance of the recertification amounts. Otherwise, this recertification may not be considered a complete actuarial communication as the information in the document as a stand-alone communication is insufficient.

Assessment of Actuarial Assumptions Used in the 2017 Valuation

A. Economic Assumptions

1. *Interest Rate*

The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the required State contribution amount. This assumption, which is used to value liabilities for funding purposes, was maintained at 6.75% for the draft June 30, 2017 Actuarial Valuation.

After reviewing all the materials (see Appendix B of this report) that were made available, Cheiron concludes that maintaining the interest rate at 6.75% for this valuation is reasonable.

We recommend that the JRS Board continue annual reviews of the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly (Recommendation #6).

Our rationale for this recommendation:

- A review of the interest and inflation rates does not involve the collection of significant data and can be updated annually. In addition, it keeps the Board focused more closely on these critical assumptions.
- In GRS's July 6, 2017 Economic Assumption Update Review, they presented the opinions of eight independent investment consultants on the future expected earnings of the System and concluded that, adjusting for GRS's assumed rate of inflation, the 20-year expected geometric mean of the JRS portfolio is 7.01% (See Exhibit B of the

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GRS July 6, 2017 Economic Assumption Update Review). They also presented the distribution of the 20-year average geometric net nominal return for these eight consultants. This showed that JRS has a 53.35% chance of meeting or exceeding the current 6.75% assumption (See the seventh column, bottom row). This supports the Board maintaining this assumption for the current valuation.

Distribution of 20-year Average Geometric Net Nominal Return

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return					Probability of exceeding	Probability of exceeding
	25 th	40 th	50 th	60 th	75 th	6.75%	7.00%
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	4.39%	5.54%	6.24%	6.94%	8.11%	42.64%	39.14%
2	5.00%	6.01%	6.63%	7.24%	8.28%	47.99%	43.92%
3	4.94%	6.05%	6.73%	7.41%	8.55%	49.70%	45.99%
4	5.01%	6.16%	6.86%	7.56%	8.74%	51.56%	47.96%
5	5.36%	6.47%	7.14%	7.81%	8.94%	55.83%	52.09%
6	5.46%	6.54%	7.20%	7.85%	8.96%	56.84%	53.01%
7	5.62%	6.66%	7.28%	7.91%	8.97%	58.52%	54.53%
8	5.84%	7.02%	7.74%	8.47%	9.68%	63.68%	60.32%
Average	5.20%	6.31%	6.98%	7.65%	8.78%	53.35%	49.62%

The 20-year geometric average return is 7.01%.

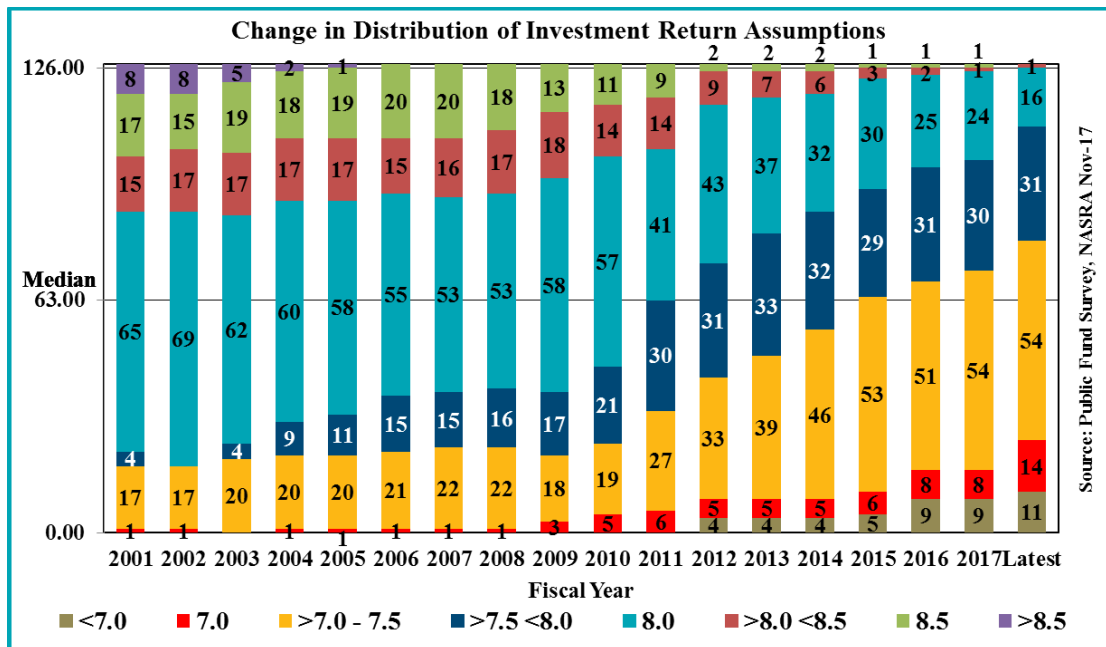
- GRS's July 6, 2017 Economic Assumption Update Review also presented the expectation of the Illinois State Board of Investment's investment consultant Meketa Investment Group. After adjusting for GRS's assumed rate of inflation, Meketa's expected 20-year geometric average return of the JRS portfolio is 7.65% (See Exhibit A of the GRS July 6, 2017 Economic Assumption Update Review). Based on the capital market assumptions provided by Meketa, JRS has a 61.7% chance of meeting or exceeding the current assumption of 6.75%. This supports the reasonableness of assuming a 6.75% interest rate for the current year.
- Due to the nature of the population of JRS, the duration of the cash flow is shorter than other retirement systems, supporting a lower interest rate.
- There has been emerging actuarial practice throughout the country of reducing the discount rates even below the level that the investment consultants believe is achievable. This is because of the very low interest rate environment we are in currently. The lower the interest rate environment, the greater the investment risk that must be taken to achieve an assumed rate of return. For example, in 1995 the yield on ten-year Treasury bonds (a proxy for a risk free investment) was 6.21%. As of November 2, 2017, these yields are now 1.87%. This means that back in 1995, a system only had to earn 0.54% more than the ten-year treasury yields ("risk free" rates) to achieve 6.75%, whereas today a system would have to earn 4.88% above the

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“risk free” rate. By reducing the investment return assumption, plans are more likely to meet their funding goals without requiring investment performance so much in excess of the risk-free rate.

- In addition to taking pressure off the investment process, there is a growing concern that long-term interest rates will eventually rise. A pattern of rising interest rates generally results in declining bond returns. This in turn will result in even greater levels of investment risks being taken on by the System on the equity side of the assets in order to compensate for both declining bond returns and the need to earn 4.88% above the risk free rates of return.
- JRS is projected to have a negative cash flow (contribution income less benefit and expense payouts) in Fiscal Year Ending 2018. The cash flow is expected to grow increasingly negative over time as shown in the graph on page 14 and table 4d of the draft 2017 Actuarial Valuation. When short-term returns are expected to be lower than the long-term expectations, which is the current case with JRS, a plan with negative cash flows will have actuarial returns (i.e., dollar-weighted returns) that are less than their “time-weighted” returns.
- The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 127 large retirement plans. The following chart shows the distribution of investment return assumptions for the survey since 2001. The latest data includes results collected through November 2017.



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Over the period shown in the latest survey, there continues to be a pattern of reducing investment return assumptions. Of the 127 plans shown, 105, including the Illinois Retirement Systems, have reduced their interest rate assumption since Fiscal Year 2011. For these 105 plans, the average reduction is 0.49%. The survey is consistent with the experience of other Cheiron clients, which have generally shown a significant trend of reducing their investment return assumptions over the last several years. Note that the 2018 values are forecasts by NASRA based on announcements by the systems and could be subject to change.

- GASB 67 and 68 pronouncements may subject many public pension plans to use a lower interest rate for accounting disclosures and pension expense determinations. For example, JRS had to use 6.48% as of June 30, 2016, and 6.58% as of June 30, 2017 for accounting purposes as compared to the 6.75% rate assumed for the funding valuations as of these dates. This means that on a closed plan basis with no new entrants, the assets are projected to be insufficient to pay all benefits for current members based on the current and projected contribution levels. It is important to note, however, that these standards do not define funding requirements for plans.
- The federal government, which promulgates minimum funding standards for corporate pension plans, requires corporate pension plans to utilize interest rate assumptions based on short-term and mid-term bond rates, which are very low (26 USC 430(h)(2)(B)).

2. *Inflation Assumption*

We find the 2.75% inflation assumption to be reasonable.

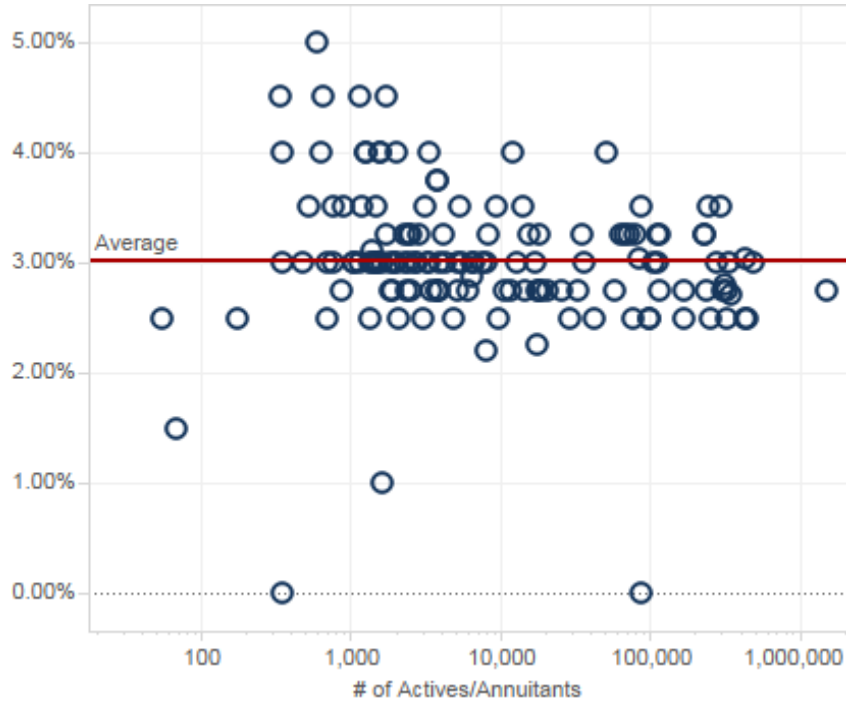
Our rationale for concurring with the 2.75% assumption:

- GRS's July 6, 2017 Economic Assumption Update Review included a survey of the inflation assumptions of eight independent investment consultants and found they ranged from 1.56% to 2.50%, with an average of 2.15%.
- The July 2017 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (next 75 years), inflation will average somewhere between 2.0% and 3.2% (<https://www.ssa.gov/oact/tr/2017/tr2017.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.6%.
- As shown on page two of the GRS July 6, 2017 Economic Assumption Update Review, there continues to be support for this assumption as a long-term rate even though the historic short-term averages are being lowered by the current historically low rates.

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The *National Conference on Public Employee Retirement Systems* (NCPERS) December 2016 Public Retirement Systems Study includes the following graphic of respondents' inflation assumptions:



This shows that the current 2.75% JRS assumption is lower than the average inflation assumptions used among the 159 systems that responded to this study, with 3.0% as the average. However, we note that 40% of the systems in the two most recent studies reduced their inflation assumption between the 2015 and 2016 studies with an average reduction of 0.39%. The downward trend in this assumption is further supported by the 3.0% average for the 2016 study being a 0.2% reduction from the prior year.

3. *Salary (Annual Compensation) Increase Assumption*

The salary increase assumption for uncapped payroll is 3.00% per year, compounded annually for all active members, regardless of age or service. It includes components of 2.75% per annum for inflation and 0.25% per annum for productivity.

We find the assumption and the basis for setting the assumption reasonable and consistent with the inflation assumption.

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Our rationale for concurring with GRS's recommended salary increase assumption:

- The July 2017 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (between 2027 and 2091) real wage differential will average somewhere between 0.58% and 1.82%.
- This assumption is comprised of inflation and productivity, which is employer-specific, and is supported by credible data as shown on pages 11-13 of the April 2016 Experience Review Study performed by GRS. Further, while the July 2017 Economic Assumption Update Review notes that the average increase of active members during the plan year ending June 30, 2016 was 2.0% and other recent years were also low, it further notes that the wage inflation and salary increase assumptions are long-term assumptions. As such, GRS continues to recommend maintaining the three percent assumptions for both wage inflation and future salary growth.
- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a continued trend of lower salary increases for public sector employees.

4. Cost of Living Adjustment Assumption

While Tier 1 members receive an annual automatic three percent COLA, Tier 2 members receive an annual increase equal to the lesser of the three percent received by Tier 1 and the annual change in the Consumer Price Index for all Urban Consumers.

We find the assumption and the basis for setting it reasonable.

5. Capped Pay Assumption

The Tier 2 capped payroll growth is 2.75% per year, compounded annually, which is the inflation assumption.

We find the assumption reasonable.

6. Expenses

Expenses are expected to increase with the projected capped payroll at 2.75% and are included in the service cost.

We find the assumption reasonable.

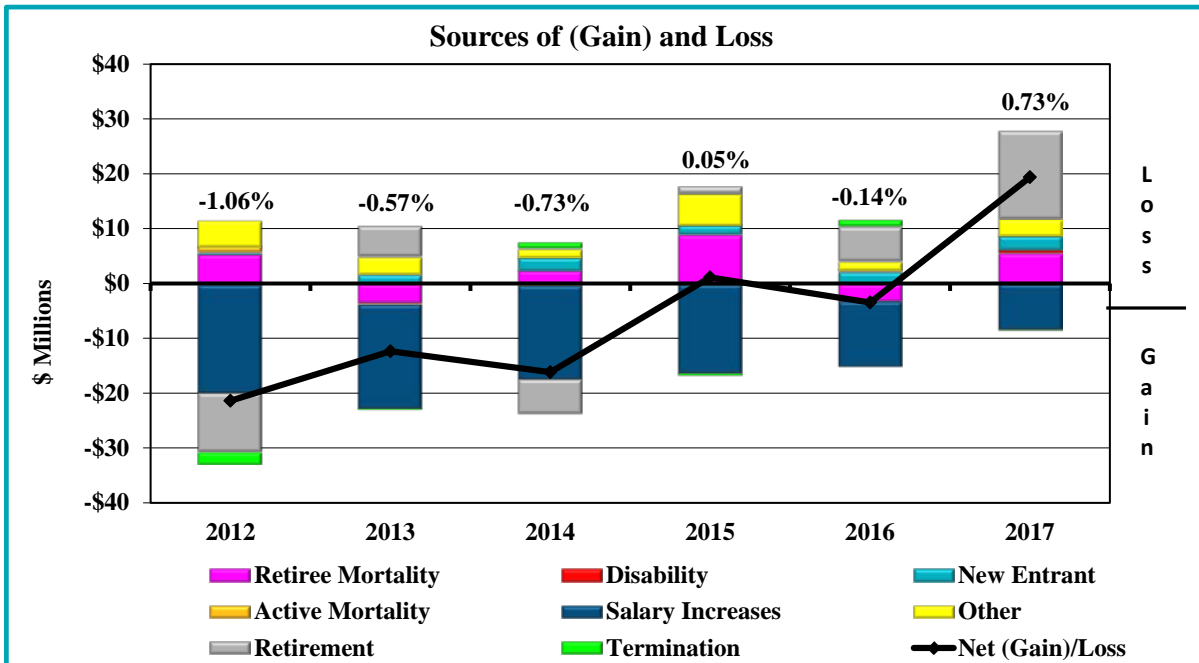
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B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2017 Actuarial Valuation, these are shown on page 19. In the chart below, we have collected similar data from past valuation reports dating back to 2012 and use these to present a historical review of past demographic and salary increase experience gains and losses. Note that GRS became the actuary effective with the 2012 valuation, and the results prior to 2012 were provided by the prior actuary, Goldstein and Associates.

The chart that follows shows the pattern of annual gains and losses attributable to eight different sources as shown in the legend. When the colored bar slices appear above zero on the Y-axis, that represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, that represents an experience gain for that year with liabilities less than expected. The net liability (gains)/losses are shown by the black line. This net (gain)/loss as a percent of liability is shown above the bars.



The percentages shown above the bars refer to net (gain)/loss as a percentage of liability.

Since the prior actuary did not examine many of these experience sources, observations prior to 2012 are limited.

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Key observations from this chart are as follows:

1. In 2017, there was a net loss on the valuation after primarily having gains in the last few years. This was primarily due to losses on retirements and retiree mortality. This does not indicate a need to update assumptions at this time, but supports continued attention to these assumptions, especially retirement given there have been losses from this item the previous two years as well.
2. There has been a gain due to salary for each of the last six years. However, as we discussed in the salary assumption section, this is likely to be a reflection of the general economic environment rather than a problem with the long-term assumption.
3. Active mortality and termination have both been volatile over recent years, not showing any trend that would indicate these assumptions should be revised.

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Below we summarize the demographic assumptions that we reviewed, and we have concluded all are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. Mortality

Post-Retirement Mortality

The mortality basis was updated with the June 30, 2016 Actuarial Valuation and is based on the RP-2014 White Collar Total Healthy Annuitant mortality table, sex distinct, with rates set-forward one year for males and set-back one year for females, with generational mortality improvement using the MP-2014 two-dimensional mortality improvement scales recently released by the Society of Actuaries. This assumption provides a margin for mortality improvements.

The combination of a conservative mortality table and projection tables that are more conservative than the most recently released MP-2017 tables may mean there is an overestimate of life expectancy within the valuation. However, given the nature of the statutory funding method, conservative assumptions will help support a stable contribution as a percentage of pay.

Pre-Retirement Mortality

The mortality basis was updated with the June 30, 2016 Actuarial Valuation and is based on the RP-2014 White Collar Total Employee mortality table, sex distinct, with generational mortality improvement using the MP-2014 two-dimensional mortality improvement scales recently released by the Society of Actuaries, to reflect that experience shows active members having lower mortality rates than retirees of the same age.

2. Termination

Illustrative rates of withdrawal from the plan are as follows:

Termination Rates		
	Males	Females
30	1.750%	1.75%
35	1.70%	1.60%
40	1.54%	1.44%
45	1.36%	1.26%
50	1.18%	1.08%
55	1.02%	0.92%
60	0.84%	0.74%
65	0.67%	0.57%

For Tier 2 members with less than five years of service, the termination rate is 1.75%.

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3. Retirement

Overall retirement rates were decreased based on the April 2016 Experience Review for valuations beginning with the June 30, 2016 Actuarial Valuation.

Illustrative retirement rates are as follows:

Retirement Rates – Tier 1		
	Males	Females
55-59	6.50%	7.50%
60	15.00%	15.00%
61-65	10.00%	10.00%
66-71	11.00%	11.00%
72	12.00%	12.00%
73	13.00%	13.00%
74	14.00%	14.00%
75-79	15.00%	15.00%
80+	100.00%	100.00%

Retirement Rates – Tier 2	
Age	Male & Female
62	11.00%
63	12.00%
64	13.00%
65	14.00%
66	15.00%
67	30.00%
68-70	13.00%
71	11.00%
72	12.00%
73	13.00%
74	14.00%
75-79	15.00%
80	100.00%

4. Disability

No assumption for disability.

5. Spouse's Age

The female spouse is assumed to be four years younger than the male spouse.

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6. New Entrants

The new entrant profile includes uncapped and capped salary information. New entrants are assumed to enter with an average age of 47.29, average uncapped pay of \$191,223, average capped pay of \$117,213, and with 67.89% male. The size of the active group is assumed to remain level at the number of actives as of the valuation date. The average increase in uncapped payroll for the projection period is 3.00% per annum.

7. Decrement Timing

All decrements are assumed to occur beginning of year.

8. Decrement Relativity

Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.

9. Decrement Operation

Turnover decrements do not operate after member reaches retirement eligibility.

10. Eligibility Testing

Eligibility for benefits is determined based upon the age nearest birthday and service on the date the decrement is assumed to occur.

11. Marriage Assumption

75.0 percent of active and retired participants are assumed to be married.

12. Employee Contribution Election

All judges are assumed to elect to contribute only on increases in salary when eligible for this provision.

13. 415(b) and 401(a)(17) Limits

No explicit assumption is made with respect to these items.

14. Other Assumptions as a result of Public Act 96-0889

Members hired after December 31, 2010 are assumed to make contributions on salary up to the final average compensation cap in a given year until this plan provision or administrative procedure is clarified. State contributions, expressed as a percentage of pay, are calculated based upon capped pay.

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C. Actuarial Methods

Actuarial methods consist of three components: (1) the funding method, which is the attribution of total costs to past, current, and future years; (2) the method of calculating the actuarial value of assets (i.e., asset smoothing); and (3) the amortization basis of the Unfunded Actuarial Liability (UAL). Since the amortization basis is governed by State law, we do not comment on it here.

1. Cost Method

The System uses the projected unit credit (PUC) cost method to assign costs to years of service, as required under the Pension Code (40 ILCS 5/18). **We have no objections with respect to using the PUC method, although we would prefer the Entry Age Normal (EAN) funding method, as it is more consistent with the requirement in 40 ILCS 5/18-131 for level percentage of pay funding.**

Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date, but not beyond) is taken into account. This cost of providing benefits based on past service and future compensation is the actuarial accrued liability for a given active participant. Under the PUC cost method, the value of an active participant's benefits tends to increase more sharply over his or her later years of service than over his or her earlier ones. The PUC method is not an unreasonable method because of this pattern of benefit values increasing, but more plans use the EAN funding method to mitigate this effect. It should also be noted that the EAN method is the required method to calculate liabilities for GASB 67 & GASB 68.

2. Asset Smoothing Method

The actuarial value of assets for the System is a smoothed market value with unanticipated changes in market value being recognized over five years in the actuarial value of assets. The primary purpose for smoothing out gains and losses over multiple years is so fluctuations in the actuarial value of assets will be less volatile over time than fluctuations in the market value of assets.

The December 2016 NCPERS study previously referenced found that the majority of plans responding to the survey have a 5-year smoothing period.

Smoothing the market gains and losses over a period of five years to determine the actuarial value of assets is a generally accepted approach in determining actuarial cost, and we concur with its use.

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Another aspect of asset smoothing methods is whether or not to limit the maximum spread between the actuarial value of assets and the market value of assets. Many public sector pension plans limit the actuarial value of assets to be in any year no more than 120% of market value and no less than 80% of market value. In fact, the Internal Revenue Service (26 USC 430(g)(3)(B)(iii)) mandates this "corridor" for private sector pension plans (a 90-110% corridor is mandated). Even though this is not mandated for public plans, we believe that the use of this type of corridor is a sounder actuarial practice, and according to ASOP No. 44 in Section 3.3 b. 1, the actuarial value of assets should "...fall within a reasonable range around the corresponding market values."

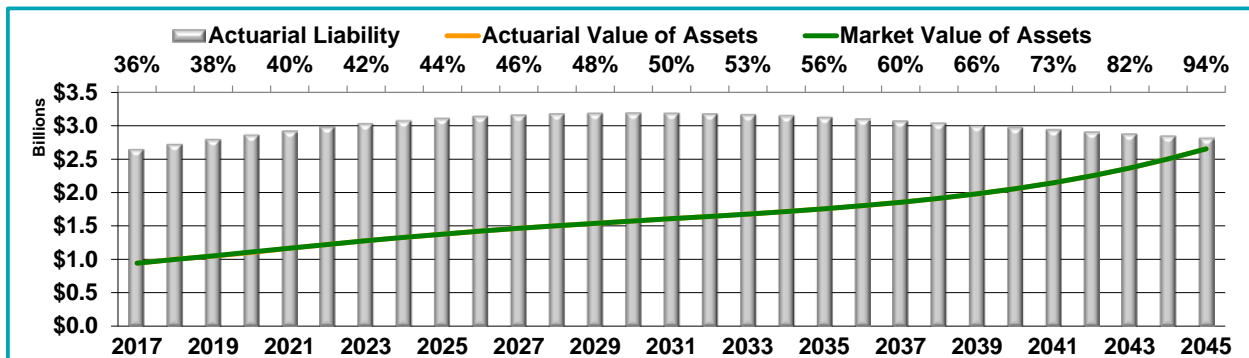
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SECTION IV – PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2017 Actuarial Valuation of JRS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

The graphs shown below are independent approximations based on the System Actuary's work performed by the State Actuary to verify that the System's published projections are reasonable. They do not reflect all the precision of the projections applied by the System's actuary, but instead they are intended to verify the reasonableness of the modeling done by the System's actuary.

The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As pointed out on page 13 of the draft June 30, 2017 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projections. The lines show the projected assets (market value and actuarial value), and the bars show the projected liabilities of the System. The funded ratio for each year is shown at the top of the graph. For example, in 2029, the funded ratio is approximately 48% with assets being approximately \$1.5 billion and liabilities being approximately \$3.2 billion.

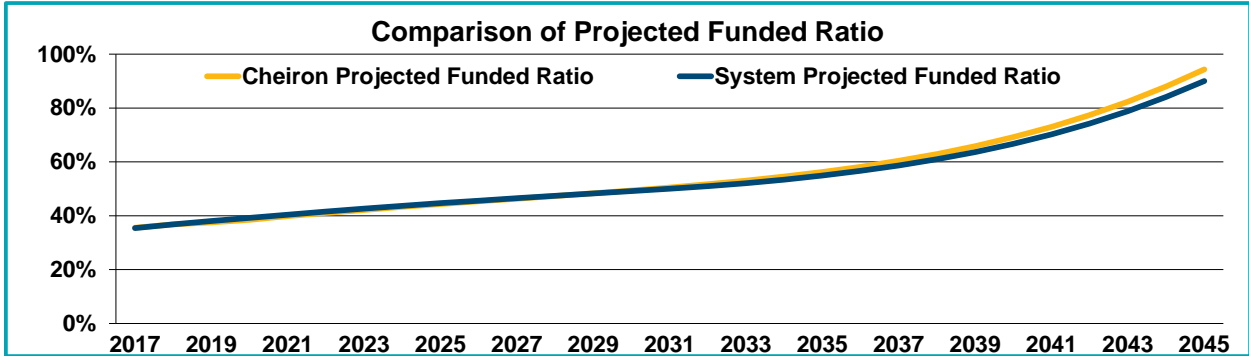


Source: Cheiron projection analysis.

When we compare our projected funded ratio against the results shown in the draft June 30, 2017 Actuarial Valuation, **we find a close match in expected funded ratio.** This close match of the funded ratio indicates that the projections done by the System's actuary reasonable and the fact we slightly higher funded ratios is a function of Cheiron's approximation.

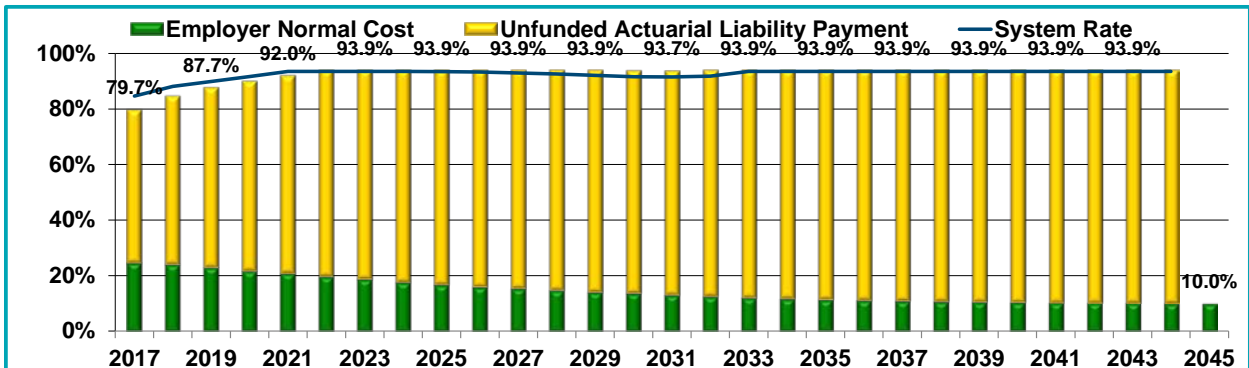
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Source: Cheiron projection analysis.

The following graph shows the expected contribution projections calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for the 2017 year was set based on the June 30, 2016 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2018 (Fiscal Year Ending June 30, 2019). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by participants not covered by employee contributions based on the statutory funding method; and 2) an amortization of the unfunded liability. The normal cost amounts are shown by the green bars and the amortization of the UAL amounts by the yellow bars. The percentages shown are the total contribution rates calculated by Cheiron, which are equal to the sum of the bars. The graph shows that a larger percentage of the total contribution is being made toward the UAL payment later in the period. The blue line shows the projected contribution rates as percentages of payroll from the draft June 30, 2017 Actuarial Valuation. The difference between Cheiron's approximation and the System's projections is the difference between the top of the bars and the line. The contributions are being limited by the maximum contribution described in the General Obligation Bond Act prior to 2033, which is why the rate increases after 2033.



Source: Cheiron projection analysis.

Our conclusion is that **the projections performed by the System's actuary are reasonable.**

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

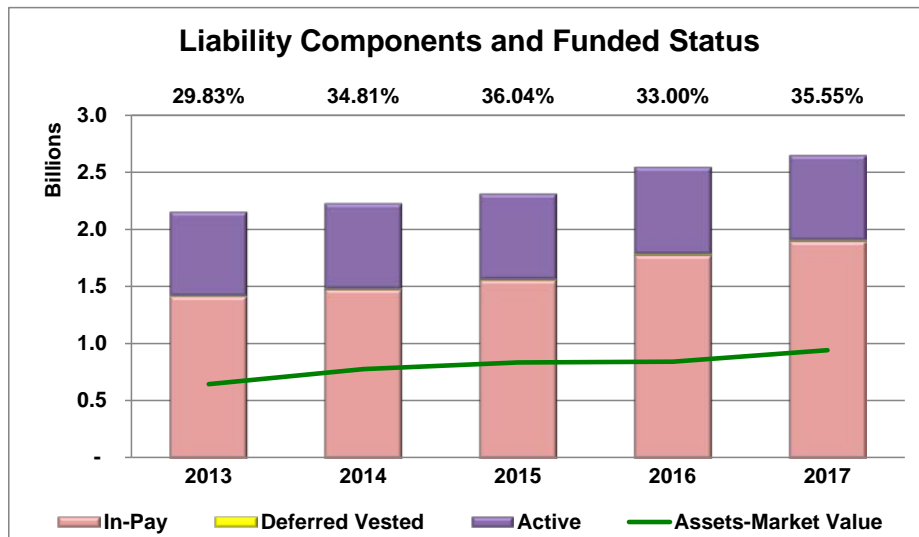
We have added a new section in this year's report focusing on various measures of funding adequacy. We will examine the System's funded status, the statutory funding requirements compared to contributions needed to pay down the Unfunded Actuarial Liability (UAL), the sources of change in UAL, and net cash flow. The actuarial valuation report prepared by GRS includes traditional actuarial measurements, which should be enhanced by the additional stress testing and projection analysis. Given the unique and substantial funding challenges faced by the Illinois pension systems, we created this new section on funding adequacy measures and trends to supplement that information from the GRS report and better inform plan trustees and other stakeholders about the funding shortfall.

1. Plan Funded Status

The first funding adequacy measure we present is a historical funded status trend for the past five years. Funded status for this measure is defined as the ratio of the market value of assets to the actuarial liability. The chart below shows JRS' funded status since 2013 has gone from 29.83% funded to 35.55% funded in 2017, an increase in funded status of 5.72%. In addition to showing the funded status, this chart also shows the breakdown of the plan's liabilities by membership status:

- Active status – this is the liability (present value of benefits already earned) for future payments to members who are currently working in the System,
- Deferred Vested status – this is the liability for members who are no longer working in the system, and
- In-Pay status – this is the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown demonstrates the increasing maturity of the System, as the in-pay status liabilities are becoming a larger portion of the total plan liabilities. In addition, this chart shows that plan assets only cover around half of the liabilities for just those members currently in-pay status.



Source: Cheiron analysis of funding adequacy.

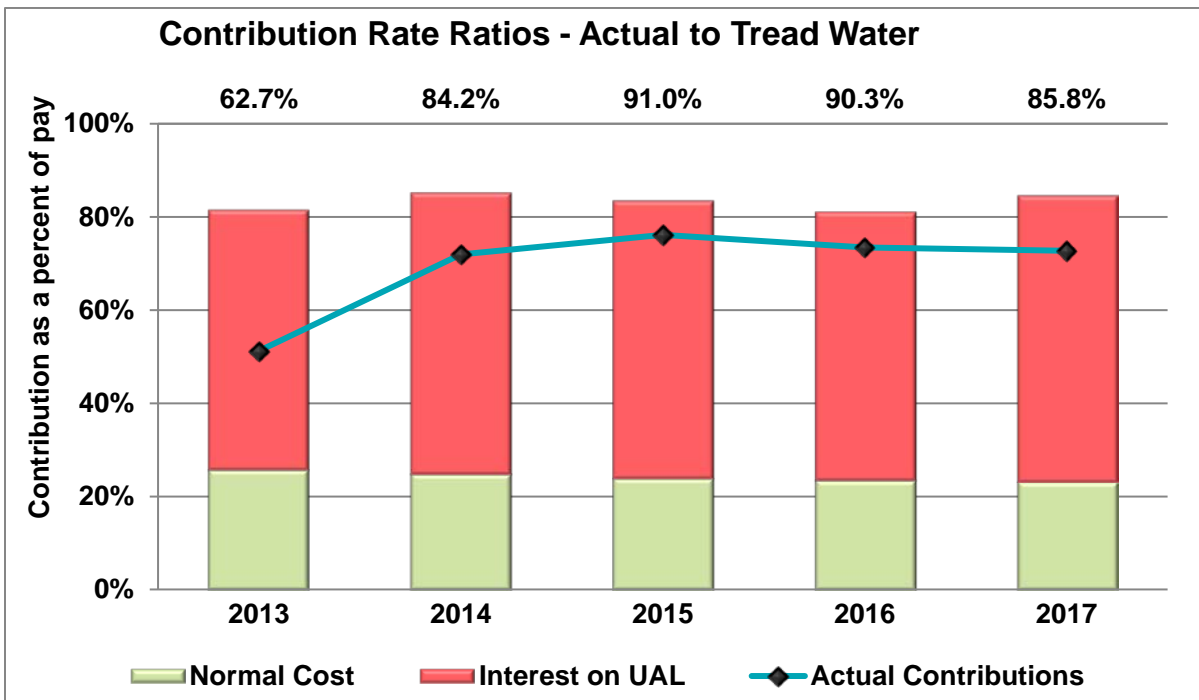
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SECTION V – ANALYSIS OF FUNDING ADEQUACY

2. Contributions as a Percentage of Payroll Compared to Tread Water Contribution

The next funding adequacy measure compares the JRS historical statutory contribution rates to tread water contribution rates. The tread water contribution rates consist of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability (UAL). The reason that this sum is referred to as the tread water contribution rate is that it is the contribution required so that the UAL will remain constant, or “tread water” (absent experience gains or losses). This tread water concept may be better understood with a credit card analogy. If a credit card holder fails to pay each month the amount of purchases made in that month (i.e., normal cost) and the monthly finance charge on the unpaid purchases from prior months (i.e., the interest on the UAL), his or her credit card debt will grow.

As the chart below shows, over the past five years, the statutory contribution rate was significantly less than the tread water rate. **The statutory contribution as a percentage of the tread water rate is shown at the top of the graph for each year.** The deficiency between the actual contribution rate and the tread water rate has decreased as of 2017 compared to 2013, but based on current projections the deficiencies are expected to continue to exist for many more years under the current statutory funding requirements, which indicates the dollar value of the UAL will continue to grow.



Source: Cheiron analysis of funding adequacy.

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

3. Sources of Changes in the UAL

Our third funding adequacy metric identifies the factors that have contributed to the changes in the UAL from year to year between 2012 and 2017. Except for gains due to investment returns in 2014 and 2015 and liability experience gains in 2012, 2013, 2014, and 2016, all other factors have resulted in increases in the UAL in every year. The components for change to UAL shown in the chart below are:

- **Contribution Deficiencies**, which are based on comparisons to the tread water contribution, have increased the UAL by \$198 million over this period.
- **Assumption Changes** are changes to actuarial assumptions as the System updated expectations on future investment returns, life expectancy, and other assumptions. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations. Over this period, assumption changes have increased the UAL by \$217 million.
- **AVA (Actuarial Value of Assets) Investment (G)/L** is the net investment gain or loss due to assets earning more or less than assumed. These have increased the UAL over this period by \$37 million.
- **Plan Changes** are any modifications of the design of the plan that have affected benefits already accrued. Since most of the changes to the System's plan affect only future benefits, the impact has been negligible during this period.
- **Liability (G)/Ls** are the changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.). During this period, these changes had a net effect of decreasing the UAL by \$33 million.

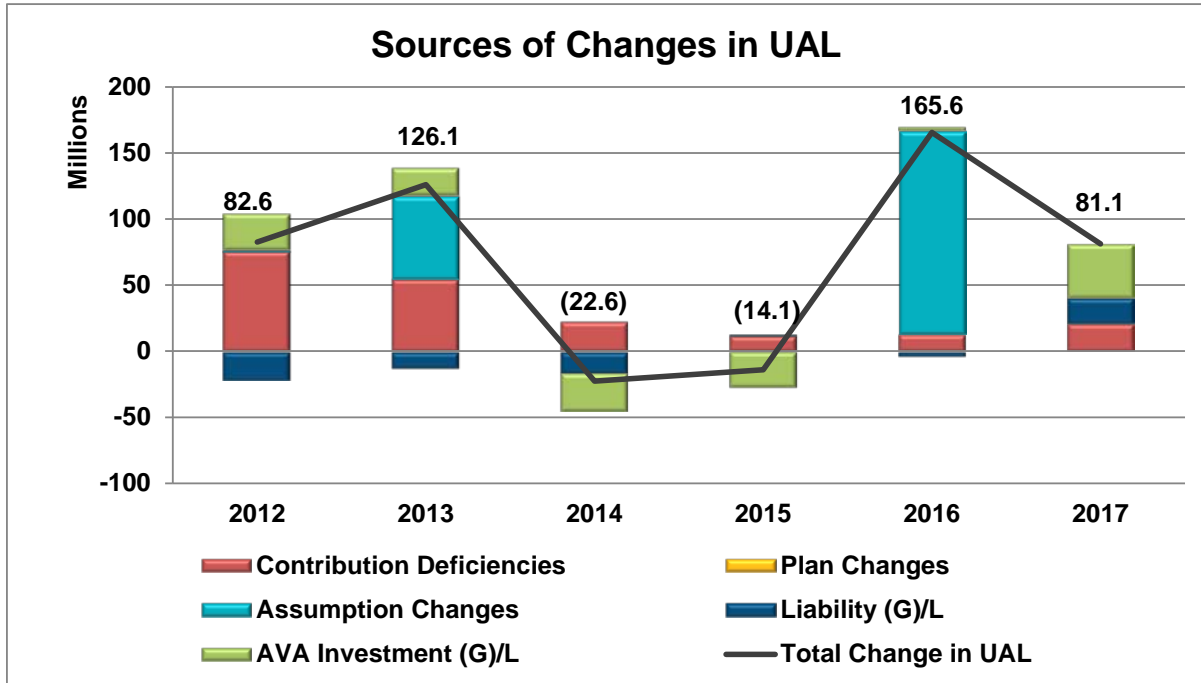
The sum of the total change in UAL from all the components for each year is shown as the black line with the labeled values in the chart.

We expect that this chart will help stakeholders understand the sources of growth in the UAL over recent years and inform discussions about the current funding requirements and adequacy.

Note that for JRS, the graph related to the sources of change in UAL goes back to only 2012. This is due to the necessary information not being available from the prior System Actuary's reports.

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SECTION V – ANALYSIS OF FUNDING ADEQUACY



Source: Cheiron analysis of funding adequacy.

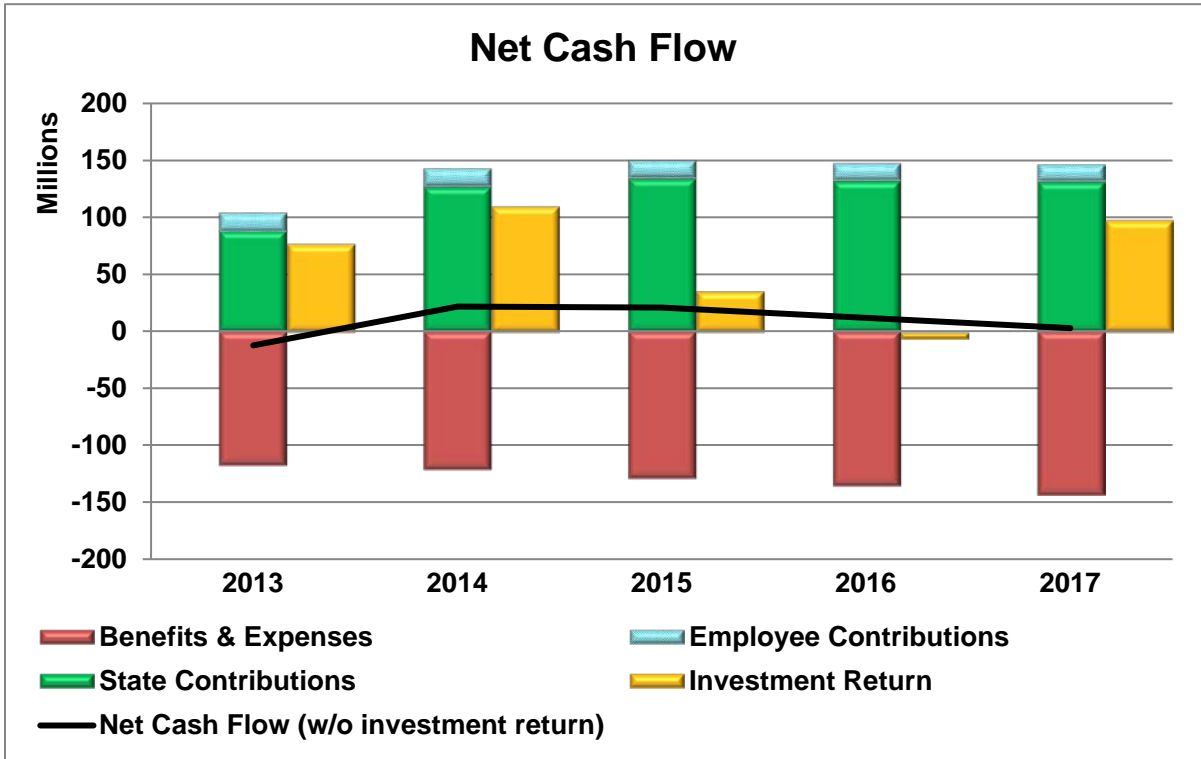
4. Net Cash Flow Analysis

The last funding adequacy measure we present is an analysis of the System’s net cash flow before taking into account investment return, which is defined as State and Member contributions less benefit payments and administrative expenses. This measure is an indication of a pension plan’s maturity level in terms of its net cash flow. In a very mature plan, it is expected that net cash flows will be negative as the benefits and administrative expenses far exceed contributions. In a very immature plan, the contributions typically are more than the payouts, so the net cash flow is positive. The more negative net cash flow is, the more vulnerable the System is to market downturns. This is because when a pension plan has more payouts than contributions, plan assets are needed to pay some portion of the payouts. So, with a market downturn not only does the plan suffer a loss in investment income, but also some portion of its principal, leaving fewer assets left to invest and recapture the prior losses.

Looking at the chart on the following page, JRS is neither mature nor immature on a net cash flow basis (black line), as the net cash flow has been close to zero relative to the size of the System’s assets. This measure should continue to be monitored as negative cash flow increases the System’s vulnerability to market downturns.

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Source: Cheiron analysis of funding adequacy.

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STATUS OF RECOMMENDATIONS FROM THE 2016 STATE ACTUARY'S REPORT

Response to Recommendations in 2016

In the State Actuary's Preliminary Report on the Judges' Retirement System of Illinois presented December 15, 2016, Cheiron made several recommendations. Below we summarize how these recommendations were reflected in either the System's comments last year or in this year's draft June 30, 2017 Actuarial Valuation.

Recommendations to Retirement System from 2016 State Actuary Report	Status	Comments
1. We recommend that the JRS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary.	Not Implemented	In response, JRS stated they were preparing an RFP for a full-scope Audit. The January 13, 2017 Board minutes state this RFP is going to be done, but we do not see any evidence of further progress in the available minutes and agendas. Recommendation repeated.
2. We continue to recommend that the funding method be changed to at least fully fund future plan benefit accruals to avoid continued systematic underfunding of JRS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.	Partially Implemented	GRS continues to include strong language throughout their report recommending the use of an actuarially sound method and stating clearly that the statutory method is not actuarially sound. We find these statements to be appropriate and support their continuation. Recommendation repeated.
3. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs.	Partially Implemented	Stress Testing was added to Final AVR (Section I, beginning Page 52) for 2016, but is not included in the draft report for 2017 that we received. We recommend that this be added to the final 2017 report. Recommendation modified.

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STATUS OF RECOMMENDATIONS FROM THE 2016 STATE ACTUARY'S REPORT

Recommendations to Retirement System from 2016 State Actuary Report	Status	Comments
4. We recommend the JRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work, and adjust assumptions accordingly, as they did for this valuation.	Implemented	GRS has continued to do this, most recently providing an Economic Assumption Update Review dated June 30, 2017.
5. We further recommend that the Boards of the three systems whose assets are commingled, State Employees' Retirement System (SERS), JRS, and the General Assembly Retirement System (GARS), consider whether different interest rate assumptions for these systems are appropriate.	Implemented	The Systems have explained why different assumptions are appropriate. Recommendation removed.
6. The draft June 30, 2016 Actuarial Valuation reflects a 10% load on inactive vested liabilities to reflect increases in inactive members' pay due to current participation in a reciprocal retirement system. We recommend that GRS include an additional disclosure as to how this assumption was developed.	Item Removed	Per GRS, this assumption was incorrectly included in the "Assumptions" section of the report, but was not used in the valuation. This language was deleted from the final report and does not appear in the 2017 report. Recommendation removed.

Chapter Six

**PRELIMINARY REPORT ON THE
GENERAL ASSEMBLY
RETIREMENT SYSTEM**

In accordance with 30 ILCS 5/2-8.1, Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the General Assembly Retirement System (GARS) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to GARS on December 4, 2017. The preliminary report was based on Cheiron's review of actuarial assumptions included in GARS' 2017 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the General Assembly Retirement System. GARS' written response, provided on December 14, 2017, can be found in Appendix C.

OVERVIEW	
GENERAL ASSEMBLY RETIREMENT SYSTEM	
as of June 30, 2017	
Actuarial accrued liability	\$370,758,254
Actuarial value of assets	\$55,063,012
Unfunded liability	\$315,695,242
Funded ratio	14.9%
Employer normal cost	\$2,628,512
State contribution (FY19)	\$23,221,000
Active members	135
Inactive members	73
Current benefit recipients	<u>421</u>
Total membership	629
Interest rate assumption	6.75%
Inflation assumption	2.75%
Actuarial cost method	Projected Unit Credit
Asset valuation method	5-year Smoothing
Executive Director	Tim Blair
Actuarial Firm	Gabriel, Roeder, Smith & Company
Source: June 30, 2017 GARS actuarial valuation report.	

December 20, 2017

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Board of Trustees
General Assembly Retirement System of Illinois
2101 South Veterans Parkway
P.O. Box 19255
Springfield, Illinois 62794-9255

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution to the General Assembly Retirement System of Illinois (GARS or System) for Fiscal Year 2019.

In summary, we believe that the assumptions and methods used in the draft June 30, 2017 Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the State funding requirements that do not conform to Actuarial Standards of Practice, were properly calculated in accordance with State law.

Section I of this report describes the review process undertaken by Cheiron. Section II summarizes our findings and recommendations. Section III provides the supporting analysis for those findings and presents more details on our assessment of the actuarial assumptions and methods employed in GRS's Actuarial Certification, as well as our assessment of GRS's determination of the required State contribution for Fiscal Year 2019. Section III also includes comments on other issues impacting the funding of GARS, including the implications of Article 2 of the Illinois Pension Code, which establishes the statutory funding requirements for the System. **In our opinion, the statutory mandated minimum funding requirements call for inadequate funding and do not meet Actuarial Standards of Practice (ASOP), particularly ASOP No. 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions.** Section IV reviews the projections contained in the draft June 30, 2017 Actuarial Valuation. Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information, some oral and some written, supplied by GARS and GRS. This information includes actuarial assumptions and methods adopted by the GARS Board, System provisions, the draft June 30, 2017 Actuarial Valuation, the draft 2017 GASB 67/68 Report, the 2017 Economic Assumption Update Review, and agendas of the plan year 2017 GARS Board of Trustee meetings. A detailed description of all information provided for this review is contained in Appendix B.

To the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Office of the Auditor General and the General Assembly Retirement System of Illinois for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

Coralie A Taylor, FSA, FCA, MAAA, EA
Associate Actuary

SIGNED ORIGINAL ON FILE

Michael J. Noble, FSA, FCA, MAAA, EA
Principal Consulting Actuary

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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SECTION I – REPORT SCOPE

Illinois Public Act 097-0694 (the Act) amended the Illinois State Auditing Act (30 ILCS 5/2-8.1) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the General Assembly Retirement System of Illinois (GARS or System) and to issue to the GARS Board this preliminary report on the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contributions for Fiscal Year (FY) 2019. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the GARS Board to consider before finalizing its certification of the required State contributions for FY 2019.

While the Act states that just the actuarial assumptions and valuation are to be reviewed, we have also reviewed the actuarial methodologies (funding and asset smoothing methods) employed in preparing the Actuarial Certification, as these methods can have a material effect on the amount of the State contribution being certified. Finally, we have offered our opinion on the implications of Article 2-124 of the Illinois Pension Code, which impacts the contribution amount certified by GRS.

In conducting this review, Cheiron reviewed the draft June 30, 2017 Actuarial Valuation, the draft 2017 GASB 67/68 Report, the 2017 Economic Assumption Update Review, and agendas of the plan year 2017 Board of Trustees meetings. The materials we reviewed are listed in Appendix B.

In addition to reviewing the Actuarial Certification of the required State contribution to GARS, the Act requires the State Actuary to conduct a review of the “actuarial practices” of the Board. While the term “actuarial practices” was not defined in the Act, we continue to interpret this language to mean that we review: (1) the use of a qualified actuary (as defined by the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2017 Actuarial Valuation.

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SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2017 Actuarial Valuation of GARS, as well as the “actuarial practices” of the GARS Board. Section III of this report contains detailed analysis and rationale for these recommendations.

Proposed Certification of the Required State Contribution

Gabriel, Roeder, Smith & Company (GRS) has determined that the FY 2019 required State contribution calculated under the current statutory funding plan is \$23,221,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based. As such, we have accepted GRS’s annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

1. We continue to recommend that the GARS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System’s actuary.

State Mandated Funding Method

2. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of GARS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable. We understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Conformance to Statutory Funding Changes of Public Act 100-0023

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modifies the State’s funding policy to require that the contribution impact of all assumption changes be phased-in over a 5-year period. As such, the Act delays the funding of the System. Assumption changes result from more accurately identifying the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact of these changes are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a 5-year period beginning at the date of adoption.

The Act requires that the impact of assumption changes “be implemented in equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.” This amount is then implemented “at the resulting

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SECTION II – SUMMARY OF RECOMMENDATIONS

annual rate in each of the remaining fiscal years in that 5-year period.” GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of payroll, and reflecting one-fifth of that percentage change each year over five years. The method used by GRS will result in the cost impact due to assumption changes being recognized as varying dollar amounts. This is because the recognition as an equal percentage of pay gets applied to a changing payroll over a 5-year period. The language of the Act, which indicates recognition of equal dollar amounts, would result in a different adjustment as a percentage of payroll, provided payroll changes each year.

3. We recommend that GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act.

Also as a result of P.A. 100-0023, the System Actuary is required to recertify the prior year's valuation in accordance with the Act. GRS has determined that the FY 2018 recertified required State contribution is \$21,155,000, compared to the original FY 2018 amount of \$26,679,000.

4. In this regard, the recertification provided by GRS as a stand-alone document provides insufficient information to support the revised funding amounts and should include an exhibit demonstrating how the new values, both amounts and percentages of payroll, were determined.

Assessment of Actuarial Assumptions Used in the 2017 Valuation

30 ILCS 5/2-8.1 requires the State Actuary to identify recommended changes in actuarial assumptions that the GARS Board must consider before finalizing its certification of the required State contribution. We have reviewed all the actuarial assumptions used in the draft June 30, 2017 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2017 Valuation

5. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether or not there is a potential for unsustainable costs during the statutory funding period. GRS did include stress testing in last year's final report, but did not include such stress testing in this year's draft report, just various explanations on the implications of assumptions not being met. We recommend that stress testing be added into this year's report. Because the public may only look to the valuation report for this type of information, we believe it should be contained here instead of any supplemental document to the Board that may potentially be overlooked.

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SECTION II – SUMMARY OF RECOMMENDATIONS

Recommended Changes for Future Valuations

6. We recommend the GARS Board continue to annually review the economic assumptions (primarily interest rate and inflation) prior to commencing the valuation work, and adjust assumptions accordingly, as they did for this valuation.

GASB 67 and 68

The 2017 GARS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2017 GARS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

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SECTION III – SUPPORTING ANALYSIS

In this section we provide detailed analysis and supporting rationale for the recommendations that were presented in Section II of this report.

Proposed Certification of the Required State Contribution

As stated in our summary of recommendations in Section II, we have verified the arithmetic calculations made by GRS to develop this State required contribution, reviewed the assumptions on which it is based, and accepted GRS's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

Given the size of GARS, the System's low funded ratio, the recent changes in legal requirements, and guidance issued by the Government Finance Officers Association, we are recommending again that the Board periodically undertake a full scope actuarial audit, utilizing the services of a reviewing actuary. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary. Results are compared in a detailed fashion to measure the liabilities for each benefit form and feature. A replication audit will uncover any potential problems in the processing and certification of valuation results.

We continue to recommend that the GARS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary (Recommendation #1).

State Mandated Funding Method

The Illinois Pension Code (40 ILCS 5/2-124) is deficient in terms of establishing a method that adequately funds the System. This law requires that the actuary base the required contribution using a prescribed funding method that achieves 90% funding in the year 2045. This does not meet generally accepted actuarial principles because the System is never targeted to be funded to 100% and the funding of the System is significantly deferred into the future. In addition, the ongoing benefits that will be earned in the future are also being only funded at 90%. The method defined in the Code does not conform to the guidelines in ASOP No. 4, Section 3.14 regarding the allocation procedures of costs to the expected benefit payments, which provides:

When selecting a contribution allocation procedure, the actuary should select a contribution allocation procedure that, in the actuary's professional judgment, is consistent with the plan accumulating adequate assets to make benefit payments when due, assuming that all actuarial assumptions will be realized and that the plan sponsor or other contributing entity will make actuarially determined contributions when due.

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We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of GARS (Recommendation #2). Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.

We have reviewed the adopted policy. We agree that the policy is a reasonable method that conforms to the Actuarial Standards of Practice, and we agree with its use in the GASB report as an Actuarially Determined Contribution (ADC). The funding policy calls for a funding amount equal to the normal cost plus a closed 20-year amortization as a level percentage of capped payroll of the unfunded actuarial liability. This policy defines a method that would ultimately fully fund the plan and falls within generally accepted actuarial funding methods currently in use for public plans. As of June 30, 2017, the remaining amortization period is 18 years. According to this methodology, the State's contribution amount would be \$32,650,450 for FY 2019. It is important though to recognize that this change does not affect the actual funding of the System.

Based on the draft June 30, 2017 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 14.85%. We have concerns about the solvency of the System if there is a significant market downturn. This is why we continue to recommend stress testing be done to determine whether there will be sufficient assets under the State mandated funding method to pay benefits if there is a significant market downturn.

We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether or not there is a potential for unsustainable costs during the statutory funding period (Recommendation #5).

This should include an analysis and discussion of the impact on the annual contribution requirement of the alternative scenarios tested. The reason we recommend such stress testing be included in the valuation report is because that is the report that most stakeholders of the System look to for assessing the System's financial conditions. Supplemental reports, such as the stress testing report GRS provided under separate cover for the prior valuation, may not be publicly identified, and therefore not readily accessible.

Conformance to Statutory Funding Changes of Public Act 100-0023

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modifies the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a 5-year period. As such, the Act further erodes the potential funded status of the System. Assumption changes result from more accurately identifying the obligations

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for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact resulting from more accurately identifying the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a 5-year period beginning at the date of adoption.

Public Act 100-0023 states:

A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applies in State fiscal year 2018 or thereafter shall be implemented in equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.

A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applied to the State contribution in fiscal year 2014, 2015, 2016, or 2017 shall be implemented:

- (i) as already applied in State fiscal years before 2018; and*
- (ii) in the portion of the 5-year period beginning in the State fiscal year in which the actuarial change first applied that occurs in State fiscal year 2018 or thereafter, by calculating the change in equal annual amounts over that 5-year period and then implementing it at the resulting annual rate in each of the remaining fiscal years in that 5-year period.*

We recommend that GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act. (Recommendation #3).

While GRS in their certification letters demonstrates that the present value of future contributions through 2045 are equivalent after the implementation of the phase-in of the impact of assumption changes over five years, it is unclear that their phase-in method conforms to the law.

As calculated, GRS starts with determining the difference in the contribution rates before and after the assumption changes as percentages of payroll, divides this percentage by five to get one-fifth of the change, and then recognizes an additional one-fifth for each year of the phase-in period. The method used by GRS will result in the cost impact due to assumption changes being recognized as varying dollar amounts. This is because the recognition as an equal percentage of pay gets applied to a changing payroll over a 5-year period. The language of the Act, which indicates recognition of equal dollar amounts, would result in a different adjustment as a percentage of payroll, provided payroll changes each year.

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Also as a result of P.A. 100-0023, the System Actuary is required to recertify to the prior year's valuation in accordance with the Act.

In this regard, the recertification provided by GRS as a stand-alone document provides insufficient information to support the revised funding amounts and should include an exhibit demonstrating how the new values, both amounts and percentages of payroll, were determined (Recommendation #4).

In the recertification letter, there should either be clear reference to the dollar amounts in question as a result of the assumption changes as disclosed in the 2016 Actuarial Valuation Report or an added disclosure as part of the recertification that documents the dollar impact of the assumption changes in support of the balance of the recertification amounts. Otherwise this recertification may not be considered a complete actuarial communication as the information in the document as a stand-alone communication is insufficient.

Assessment of Actuarial Assumptions Used in the 2017 Valuation

A. Economic Assumptions

1. Interest Rate

The interest rate assumption (also called the investment return or discount rate) is the most significant assumption affecting the required State contribution amount. This assumption, which is used to value liabilities for funding purposes, was maintained at 6.75% for the draft June 30, 2017 Actuarial Valuation.

After reviewing all the materials (see Appendix B of this report) that were made available, Cheiron concludes that maintaining the interest rate at 6.75% for this valuation is reasonable.

We recommend that the GARS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly (Recommendation #6).

Our rationale for this recommendation:

- A review of the interest and inflation rates does not involve the collection of significant data and can be updated annually. In addition, it keeps the Board focused more closely on these critical assumptions.
- In GRS's April 19, 2017 Economic Assumption Update Review, they presented the opinions of eight independent investment consultants on the future expected earnings of the System and concluded that, adjusting for GRS's assumed rate of inflation, the

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expected geometric mean of the GARS portfolio is 7.01% (See Exhibit B of the GRS April 19, 2017 Economic Assumption Update Review). They also presented the distribution of the 20-year average geometric net nominal return for these eight consultants. This showed that GARS has a 53.35% chance of meeting or exceeding the current 6.75% assumption (see the seventh column, bottom row). This supports the Board maintaining this assumption for the current valuation.

Distribution of 20-year Average Geometric Net Nominal Return

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return					Probability of exceeding	Probability of exceeding
	25 th	40 th	50 th	60 th	75 th	6.75%	7.00%
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	4.39%	5.54%	6.24%	6.94%	8.11%	42.64%	39.14%
2	5.00%	6.01%	6.63%	7.24%	8.28%	47.99%	43.92%
3	4.94%	6.05%	6.73%	7.41%	8.55%	49.70%	45.99%
4	5.01%	6.16%	6.86%	7.56%	8.74%	51.56%	47.96%
5	5.36%	6.47%	7.14%	7.81%	8.94%	55.83%	52.09%
6	5.46%	6.54%	7.20%	7.85%	8.96%	56.84%	53.01%
7	5.62%	6.66%	7.28%	7.91%	8.97%	58.52%	54.53%
8	5.84%	7.02%	7.74%	8.47%	9.68%	63.68%	60.32%
Average	5.20%	6.31%	6.98%	7.65%	8.78%	53.35%	49.62%

The 20-year geometric average return is 7.01%.

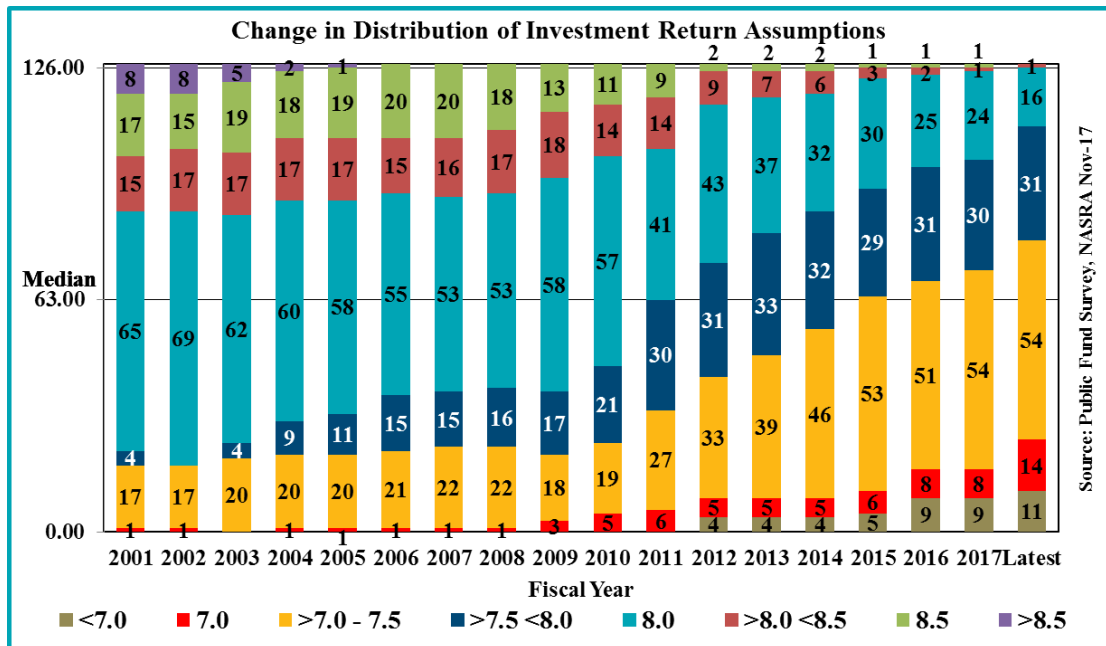
- GRS’s April 19, 2017 Economic Assumption Update Review also presented the expectation of the Illinois State Board of Investment’s investment consultant Meketa Investment Group. After adjusting for GRS’s assumed rate of inflation, Meketa’s expected 20-year geometric average return of the GARS portfolio is 7.65% (See Exhibit A of the GRS April 19, 2017 Economic Assumption Update Review). Based on the capital market assumptions provided by Meketa, GARS has a 61.7% chance of meeting or exceeding the current assumption of 6.75%. This supports the reasonableness of assuming a 6.75% interest rate for the current year.
- There has been emerging actuarial practice throughout the country of reducing the discount rates even below the level that the investment consultants believe is achievable. This is because of the very low interest rate environment we are in currently. The lower the interest rate environment, the greater the investment risk that must be taken to achieve an assumed rate of return. For example, in 1995 the yield on ten-year Treasury bonds (a proxy for a risk free investment) was 6.21%. As of November 2, 2017, these yields are now 1.87%. This means that back in 1995, a system only had to earn 0.54% more than the ten-year treasury yields (“risk free” rates) to achieve 6.75%, whereas today a system would have to earn 4.88% above the “risk-free” rate. By reducing the investment return assumption, plans are

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more likely to meet their funding goals without requiring investment performance so much in excess of the risk free rate.

- In addition to taking pressure off the investment process, there is a growing concern that long-term interest rates will eventually rise. A pattern of rising interest rates generally results in declining bond returns. This in turn will result in even greater levels of investment risks being taken on by the System on the equity side of the assets in order to compensate for both the declining bond returns and the need to earn 4.88% above the risk free rates of return.
- GARS has experienced a very slight positive cash flow for FY 2017 (contribution income less benefit and expense payouts). The positive cash flow of GARS is currently 0.3% of assets. This positive cash flow is expected to revert to a negative cash flow in the coming years as shown in the graph on page 16 and table 4d of the draft 2017 Actuarial Valuation. When short-term returns are expected to be lower than the long-term expectations, which is the current case with GARS, a plan with negative cash flows will have actuarial returns (i.e., dollar-weighted returns) that are less than their “time-weighted” returns.
- The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 127 large retirement plans. The following chart shows the distribution of investment return assumptions for the survey since 2001. The latest data includes results collected through November 2017.



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Over the period shown in the latest survey, there continues to be a pattern of reducing investment return assumptions. Of the 127 plans shown, 105, including the Illinois Retirement Systems, have reduced their interest rate assumption since Fiscal Year 2011. For these 105 plans, the average reduction is 0.49%. The survey is consistent with the experience of other Cheiron clients, which have generally shown a significant trend of reducing their investment return assumptions over the last several years. Note that the 2018 values are forecasts by NASRA based on announcements by the systems and subject to change.

- GASB Nos. 67 and 68 pronouncements may subject many public pension plans to use a lower interest rate for accounting disclosures and pension expense determinations. For example, GARS had to use 6.60% as of June 30, 2016, and 6.66% as of June 30, 2017 for accounting purposes as compared 6.75% rate assumed for the funding valuations as of these dates. This means that on a closed plan basis with no new entrants, the assets are projected to be insufficient to pay all benefits for current members based on the current and projected contribution levels. It is important to note, however, that these standards do not define funding requirements for plans.
- The federal government, which promulgates minimum funding standards for corporate pension plans, requires corporate pension plans to utilize interest rate assumptions based on short-term and mid-term bond rates, which are very low (26 USC 430(h)(2)(B)).

2. *Inflation Assumption*

We find the 2.75% inflation assumption to be reasonable.

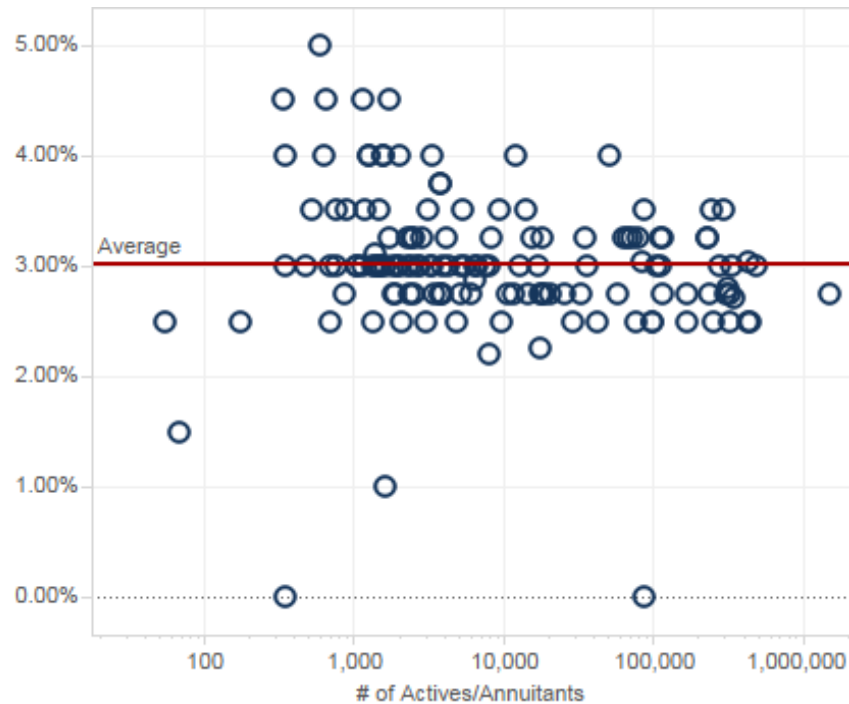
Our rationale for concurring with the 2.75% assumption:

- GRS's April 19, 2017 Economic Assumption Update Review included a survey of the inflation assumptions of eight independent investment consultants and found they ranged from 1.56% to 2.50%, with an average of 2.15%.
- The July 2017 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (next 75 years), inflation will average somewhere between 2.0% and 3.2% (<https://www.ssa.gov/oact/tr/2017/tr2017.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.6%.
- As shown on page two of the GRS April 19, 2017 Economic Assumption Update Review, there continues to be support for this assumption as a long-term rate even though the historic short-term averages are being lowered by the current historically low rates.

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- The *National Conference on Public Employee Retirement Systems* (NCPERS) December 2016 Public Retirement Systems Study includes the following graphic of respondents' inflation assumptions:



This shows that the current 2.75% GARS assumption is lower than the average inflation assumptions used among the 159 systems that responded to this study, with 3.0% as the average. However, we note that 40% of the systems in the two most recent studies reduced their inflation assumption between the 2015 and 2016 studies with an average reduction of 0.39%. The downward trend in this assumption is further supported by the 3.0% average for the 2016 study being a 0.2% reduction from the prior year.

3. *Salary (Annual Compensation) Increase Assumption*

The salary increase assumption for uncapped payroll is 3.00% per year, compounded annually for all active members, regardless of age or service. It includes components of 2.75% per annum for inflation and 0.25% per annum for productivity. In addition, salaries are assumed to remain at their current levels for fiscal year 2018.

We find the assumption and the basis for setting the assumption reasonable and consistent with the inflation assumption.

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Our rationale for concurring with GRS's recommended salary increase assumption:

- The July 2017 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (between 2027 and 2091) real wage differential will average somewhere between 0.58% and 1.82%.
- This assumption is comprised of inflation and productivity, which is employer-specific, and is supported by credible data as shown on pages 12 and 13 of the April 2016 Experience Review performed by GRS. Further, while the April 2017 Economic Assumption Update Review notes that the average increase of active members during the plan year ending June 30, 2016 was virtually flat and other recent years were also low, it further notes that the wage inflation and salary increase assumptions are long-term assumptions. As such, GRS continues to recommend maintaining the three percent assumptions for both wage inflation and future salary growth.
- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a continued trend of lower salary increases for public sector employees.

4. Cost of Living Adjustment Assumption

While Tier 1 members receive an annual automatic three percent COLA, Tier 2 members receive an annual increase equal to the lesser of the three percent received by Tier 1 and the annual change in the Consumer Price Index for all Urban Consumers.

We find the assumption and the basis for setting it reasonable.

5. Capped Pay Assumption

The Tier 2 capped payroll growth is 2.75% per year, compounded annually, which is the inflation assumption.

We find the assumption reasonable.

6. Expenses

Expenses are expected to increase with the projected capped payroll at 2.75% and are included in the service cost.

We find the assumption reasonable.

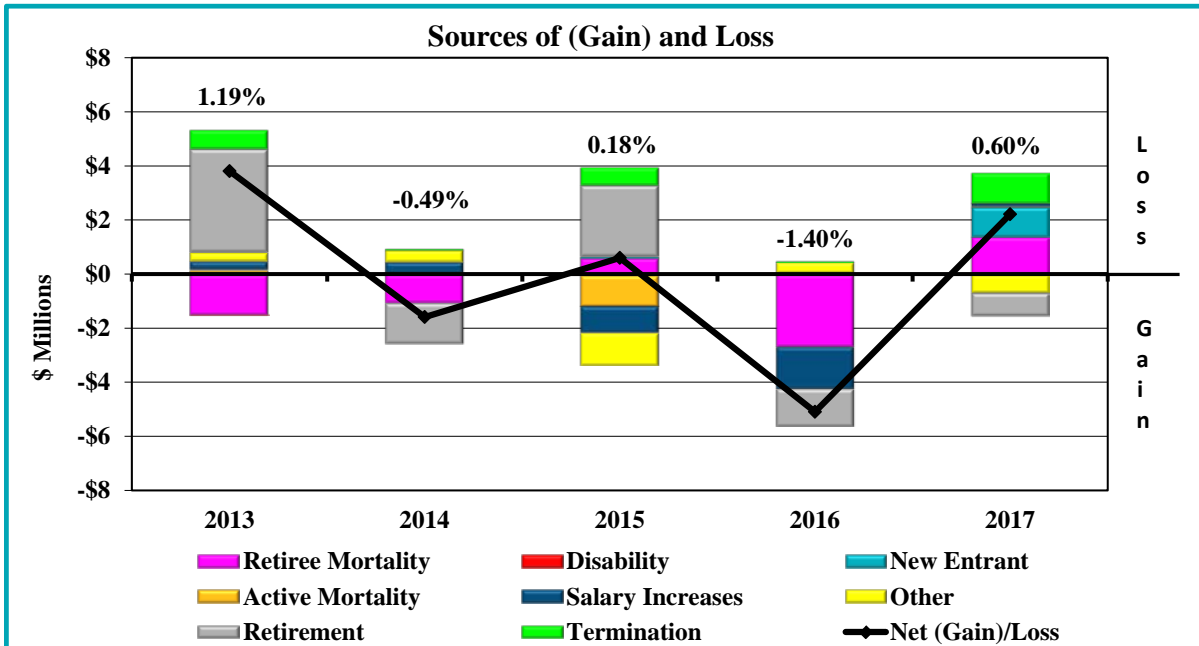
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B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2017 Actuarial Valuation, these are shown on page 21. In the chart below, we have collected similar data from past valuation reports dating back to 2013 and use these to present a historical review of past demographic and salary increase experience gains and losses. Note that GRS became the actuary effective with the 2012 valuation, and the results prior to 2012 were provided by the prior actuary, Goldstein and Associates.

The chart that follows shows the pattern of annual gains and losses attributable to eight different sources as shown in the legend. When the colored bar slices appear above zero on the Y-axis, that represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, it represents an experience gain for that year with liabilities less than expected. The net liability (gains)/losses are shown by the black line. This net (gain)/loss as a percent of liability is shown above the bars.



The percentages shown above the bars refer to net (gain)/loss as a percentage of liability.

Since the prior actuary did not examine many of these experience sources, observations prior to 2012 are excluded.

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Key observations from this chart are as follows:

1. Retirement experience has been volatile over the last several years and has not shown any particular trend.
2. Mortality experience has also been volatile over the last several years. In years where there were losses, it means fewer deaths were observed than anticipated. Another way to express this is retirees are living longer than the current mortality assumption predicts. In contrast, in years where there were gains, it means there were more deaths than anticipated.
3. There have been termination losses in each of the last five years.
4. While there have been both salary gains and losses over the last five years, total payroll has decreased significantly over the period and the average pay has been relatively stable.

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Below we summarize the demographic assumptions that we reviewed, and we have concluded all are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. Mortality

Post-Retirement Mortality

The mortality basis was updated with the June 30, 2016 Actuarial Valuation and is based on the RP-2014 White Collar Total Healthy Annuitant mortality table, sex distinct, with rates set forward one year for males and set back one year for females, with generational mortality improvement using the MP-2014 two-dimensional mortality improvement scales recently released by the Society of Actuaries. This assumption provides a margin for mortality improvements.

The combination of a conservative mortality table and projection tables that are more conservative than the most recently released MP-2017 tables may mean there is an overestimate of life expectancy within the valuation. However, given the nature of the statutory funding method, conservative assumptions will help support a stable contribution as a percentage of pay.

Pre-Retirement Mortality

The mortality basis was updated with the June 30, 2016 Actuarial Valuation and is based on the RP-2014 White Collar Total Employee mortality table, sex distinct, with generational mortality improvement using the MP-2014 two-dimensional mortality improvement scales recently released by the Society of Actuaries, to reflect that experience shows active members having lower mortality rates than retirees of the same age.

2. Termination

Rates of withdrawal are assumed to be equal to five percent for all ages 20 through 65 for both Tier 1 and Tier 2 members. For Tier 2 members with less than five years of service, rates of withdrawal are assumed to be equal to ten percent for all ages 20 to 65.

It is assumed that terminated employees will not be rehired. The rates apply only to employees who have not fulfilled the service requirement necessary for retirement at any given age.

3. Retirement

The overall retirement rates were increased based on the April 2016 Experience Review for valuations beginning with the June 30, 2016 Actuarial Valuation.

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Rates of retirement for Tier 1 members are as follows:

Retirement Rates	
Age	Male and Female
55	5.00%
56-59	15.00%
60-74	20.00%
75	100.00%

Rates of retirement for Tier 2 members are as follows:

Retirement Rates	
Age	Male and Female
62	25.00%
63	12.00%
64	14.00%
65	16.00%
66	18.00%
67	40.00%
68-70	30.00%
71-74	20.00%
75	100.00%

4. Marriage Assumption

75.0% of active and retired participants are assumed to be married.

5. Disability

No assumption for disability was assumed.

6. New Entrants

The new entrant profile includes uncapped and capped salary information. New entrants are assumed to enter with an average age (41.61), average uncapped pay of \$82,461, and average capped pay of \$81,536. Based on the assumption that 50 percent of future members elect to opt out of the pension system, the population is projected to decrease from 145 members as of the valuation date, to 69 members in 2045 and ultimately reach 68 members in 2048. The average increase in uncapped payroll for the projection period is 3.00% per annum.

7. Spouse's Age

The female spouse is assumed to be four years younger than the male spouse.

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8. Decrement Timing

All decrements are assumed to occur beginning of year.

9. Decrement Relativity

Decrement rates are used directly from the experience study without adjustment for multiple decrement table effects.

10. Decrement Operation

Turnover decrements do not operate after member reaches retirement eligibility.

11. Eligibility Testing

Eligibility for benefits is determined based upon the age nearest birthday and service on the date the decrement is assumed to occur.

12. 415(b) and 401(a)(17) Limits

No explicit assumption is made with respect to these items.

13. Other Assumptions as a result of Public Act 96-0889

Members hired after December 31, 2010 are assumed to make contributions on salary up to the final average compensation cap in a given year until this plan provision or administrative procedure is clarified.

State contributions, expressed as a percentage of pay, are calculated based upon capped pay.

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C. Actuarial Methods

Actuarial methods consist of three components: (1) the funding method, which is the attribution of total costs to past, current, and future years; (2) the method of calculating the actuarial value of assets (i.e., asset smoothing); and (3) the amortization basis of the Unfunded Actuarial Liability (UAL). Since the amortization basis is governed by State law, we do not comment on it here.

1. Cost Method

The System uses the Projected Unit Credit (PUC) Actuarial Cost Method to assign costs to years of service, as required under the Pension Code (40 ILCS 5/2). **We have no objections with respect to using the PUC method, although we would prefer the Entry Age Normal (EAN) funding method, as it is more consistent with the requirement in 40 ILCS 5/2-124 for level percentage of pay funding.**

Under the PUC method, which is used by some public sector pension funds, the benefits of active members are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. In calculating these benefits, only past service (through the valuation date but not beyond) is reflected. The present value of these benefits based on past service and future compensation is the actuarial liability for a given active participant. Under the PUC cost method, the value of an active participant's benefits tends to increase more sharply over his or her later years of service than during his or her earlier years. The PUC method is not an unreasonable method as a result of this pattern of benefit values increasing, but more plans use the EAN funding method to mitigate this effect. It should also be noted that the EAN method is the required method to calculate liabilities for GASB 67 & 68.

2. Asset Smoothing Method

The actuarial value of assets for the System is a smoothed market value with unanticipated changes in market value being recognized over five years in the actuarial value of assets. The primary purpose for smoothing out gains and losses over multiple years is so fluctuations in the actuarial value of assets will be less volatile over time than fluctuations in the market value of assets.

The December 2016 NCPERS study previously referenced found that the majority of plans responding to the survey have a five-year smoothing period.

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Smoothing the market gains and losses over a period of five years to determine the actuarial value of assets is a generally accepted approach in determining actuarial cost, and we find its use reasonable.

Another aspect of asset smoothing methods is whether or not to limit the maximum spread between the actuarial value of assets and the market value of assets. Many public sector pension plans limit the actuarial value of assets to be in any year no more than 120% of market value and no less than 80% of market value. In fact, the Internal Revenue Service (26 USC 430(g)(3)(B)(iii)) mandates this "corridor" for private sector pension plans (a 90-110% corridor is mandated). Even though this is not mandated for public plans, we believe that the use of this type of corridor is a sounder actuarial practice, and according to ASOP No. 44 in Section 3.3 b. 1, the actuarial value of assets should "...fall within a reasonable range around the corresponding market values."

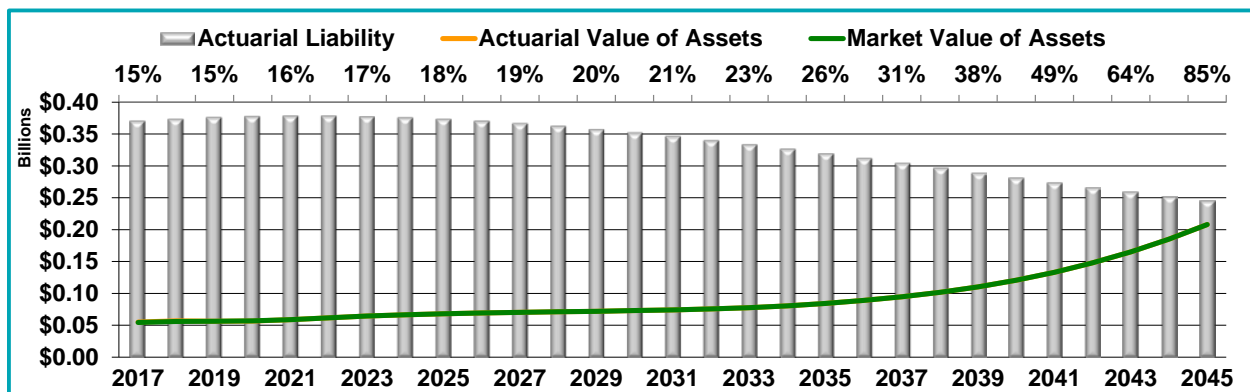
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SECTION IV– PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2017 Actuarial Valuation of GARS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

The graphs shown below are independent approximations based on the System Actuary's work performed by the State Actuary to verify that the System's published projections are reasonable. They do not reflect all the precision of the projections applied by the System's actuary, but instead they are intended to verify the reasonableness of the modeling done by the System's actuary.

The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As pointed out on page 15 of the draft June 30, 2017 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projections. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio for each year is shown at the top of the graph. For example, in 2031, the funded ratio is approximately 21% with assets being approximately \$74 million and liabilities being approximately \$347 million.

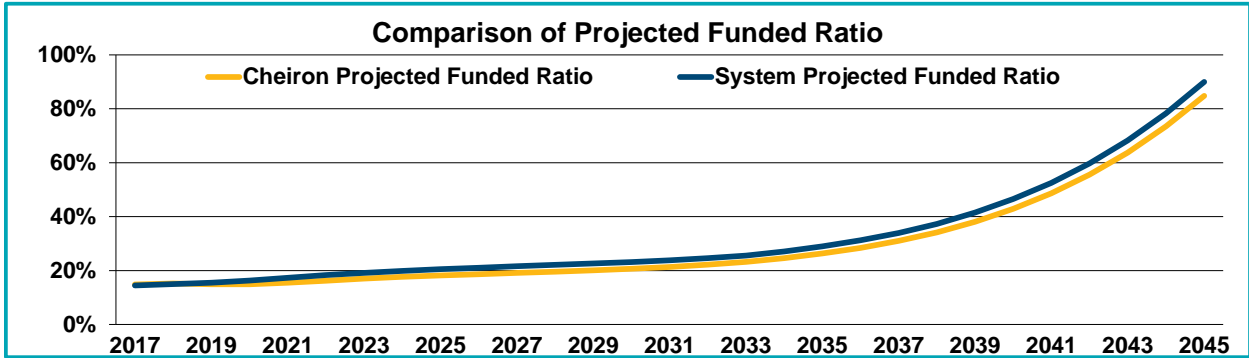


Source: Cheiron projection analysis.

When we compare our projected funded ratio against the results shown in the draft June 30, 2017 Actuarial Valuation, **we find a relatively close match in expected funded ratio.** This close match of the funded ratio indicates that the projections done by the System's actuary are reasonable and the fact we show slightly lower funded is a function of Cheiron's approximation.

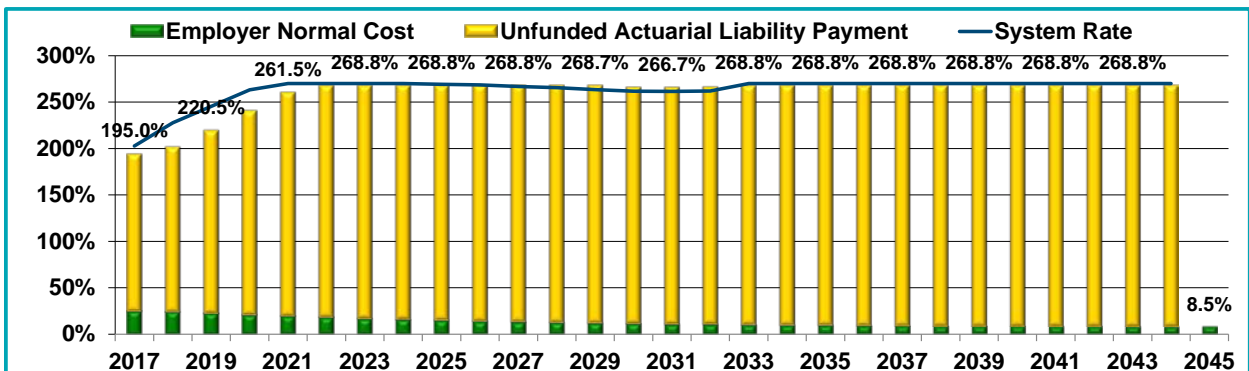
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Source: Cheiron projection analysis.

The following graph shows the expected contribution projections calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for the 2017 year was set based on the June 30, 2016 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2018 (Fiscal Year Ending June 30, 2019). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by members not covered by employee contributions based on the statutory funding method; and 2) an amortization of the unfunded liability. The normal cost amounts are shown by the green bars and the amortization of the UAL amounts by the yellow bars. The percentages shown are the total contribution rates calculated by Cheiron, which are equal to the sum of the bars. The graph shows that a larger percentage of the total contribution is being made toward the UAL payment later in the period. The blue line shows the projected contribution rates as percentages of payroll from the draft June 30, 2017 Actuarial Valuation. The difference between Cheiron’s approximation and the System’s projections is the difference between the top of the bars and the line. The contributions are being limited by the maximum contribution described in the General Obligation Bond Act prior to 2033, which is why the rate increases after 2033.



Source: Cheiron projection analysis.

Our conclusion is that **the projections performed by the System’s actuary are reasonable.**

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

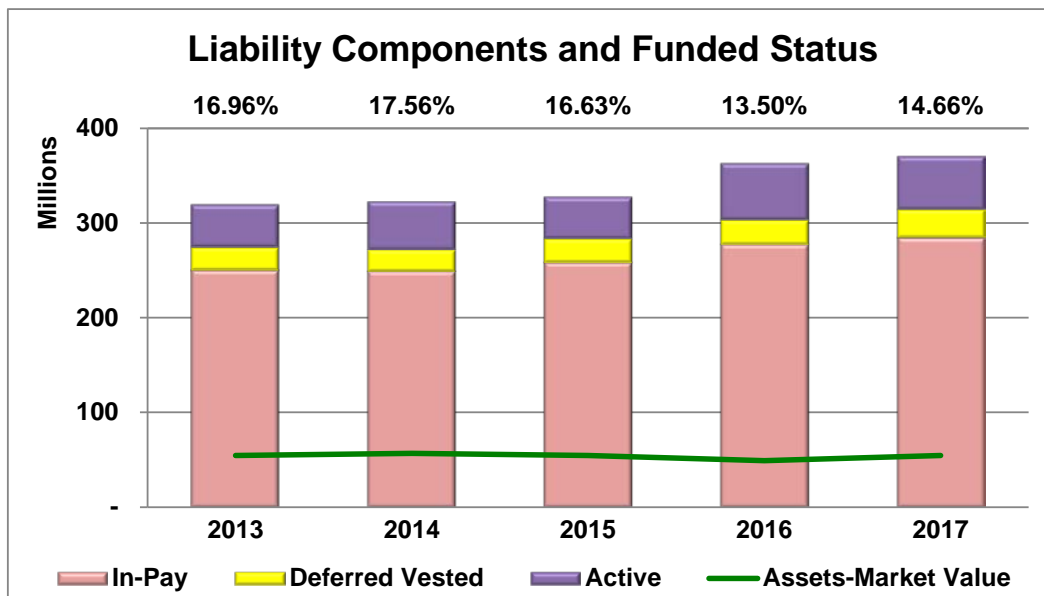
We have added a new section in this year’s report focusing on various measures of funding adequacy. We will examine the System’s funded status, the statutory funding requirements compared to contributions needed to pay down the Unfunded Actuarial Liability (UAL), the sources of change in UAL, and net cash flow. The actuarial valuation report prepared by GRS includes traditional actuarial measurements, which should be enhanced by the additional stress testing and projection analysis. Given the unique and substantial funding challenges faced by the Illinois pension systems, we created this new section on funding adequacy measures and trends to supplement that information from the GRS report and better inform plan trustees and other stakeholders about the funding shortfall.

1. Plan Funded Status

The first funding adequacy measure we present is a historical funded status trend for the past five years. Funded status for this measure is defined as the ratio of the market value of assets to the actuarial liability. The chart below shows GARS’ funded status since 2013 has gone from 16.96% funded to 14.66% funded in 2017, a decline in funded status of 2.30%. In addition to showing the funded status, this chart also shows the breakdown of the plan’s liabilities by membership status:

- Active status – this is the liability (present value of benefits already earned) for future payments to members who are currently working in the System,
- Deferred Vested status – this is the liability for members who are no longer working in the system, and
- In-Pay status – this is the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown demonstrates the increasing maturity of the System, as the in-pay status liabilities are becoming a larger portion of the total plan liabilities. In addition, this chart shows that plan assets only cover around 21% of the liabilities for just those members currently in-pay status.



Source: Cheiron analysis of funding adequacy.

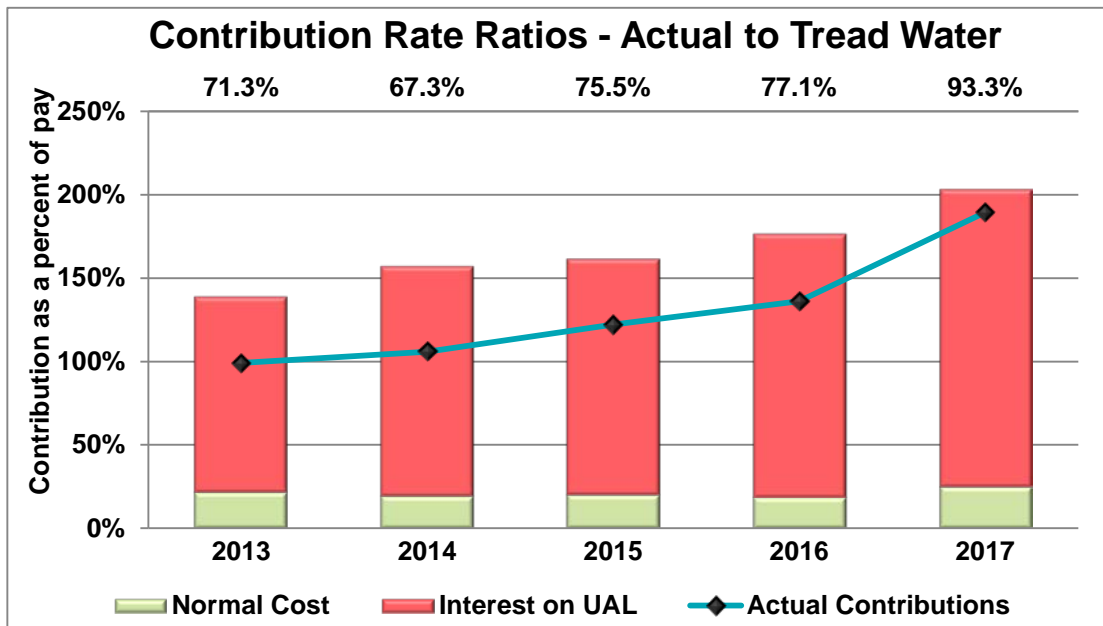
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2. Contributions as a Percent of Payroll Compared to Tread Water Contribution

The next funding adequacy measure compares the GARS historical statutory contribution rates to tread water contribution rates. The tread water contribution rates consist of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability (UAL). The reason that this sum is referred to as the tread water contribution rate is because it is the contribution required so that the UAL will remain constant, or “tread water” (absent experience gains or losses). This tread water concept may be better understood with a credit card analogy. If a credit card holder fails to pay each month the amount of purchases made in that month (i.e., normal cost) and the monthly finance charge on the unpaid purchases from prior months (i.e., the interest on the UAL), his or her credit card debt will grow.

As the chart below shows, over the past five years, the statutory contribution rate was significantly less than the tread water rate. **The statutory contribution as a percentage of the tread water rate is shown at the top of the graph for each year.** The deficiency between the actual contribution rate and the tread water rate has decreased as of 2017 compared to 2014, but based on current projections is expected to continue to exist for many more years under the current statutory funding requirements, which indicates the dollar value of the UAL will continue to grow.



Source: Cheiron analysis of funding adequacy.

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3. Sources of Changes in the UAL

Our third funding adequacy metric identifies the factors that have contributed to the changes in the UAL from year to year between 2012 and 2017. Except for gains due to investment returns in 2014, 2015, and 2017, assumption change gains in 2012, and liability experience gains in 2015 and 2016, all other factors have resulted in increases in the UAL in every year. The components for change to UAL shown in the chart below are:

- **Contribution Deficiencies**, which are based on comparisons to the tread water contribution, have increased the UAL by \$33.6 million over this period.
- **Assumption Changes** are changes to actuarial assumptions as the System updated expectations on future investment returns, life expectancy, and other assumptions. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations. Over this period assumption changes have increased the UAL by \$43.7 million.
- **AVA (Actuarial Value of Assets) Investment (G)/L** is the net investment gain or loss due to assets earning more or less than assumed. These have increased the UAL over this period by \$2.1 million.
- **Plan Changes** are any modifications of the design of the plan that have affected benefits already accrued. Since most of the changes to the System's plan affect only future benefits the impact has been negligible during this period.
- **Liability (G)/L** are the changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.). These were generally small and had a net effect of increasing the UAL by \$0.6 million during this period.

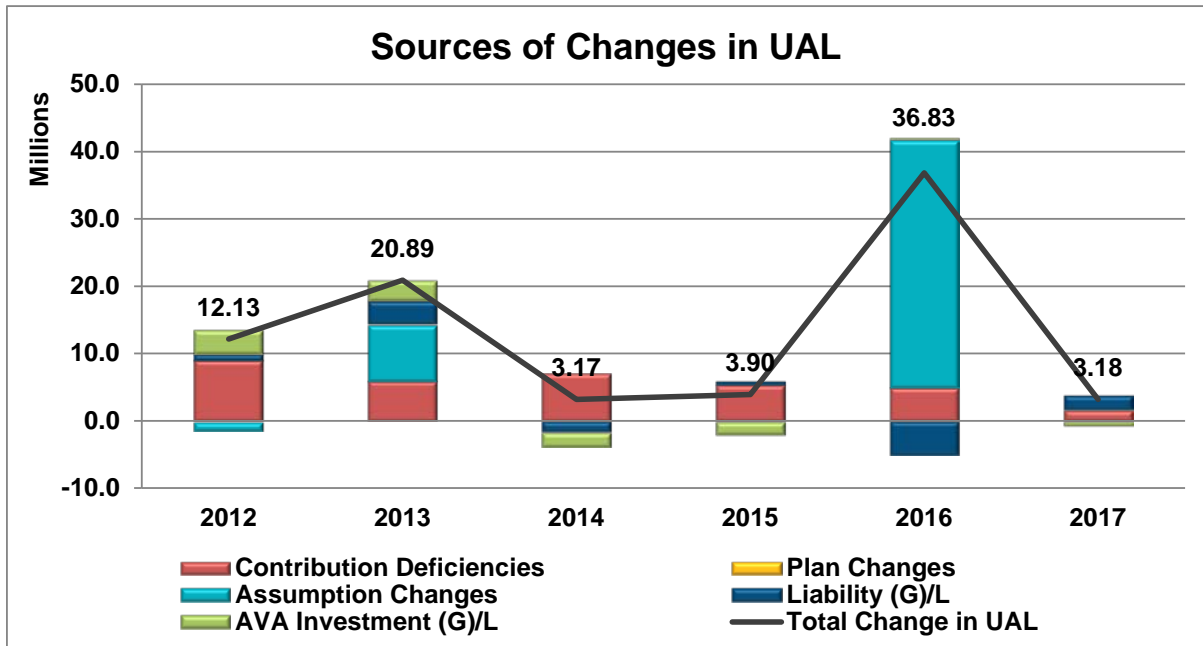
The sum of the total change in UAL from all the components of each year is shown as the black line with the labeled values in the chart.

We expect that this chart will help stakeholders understand the sources of growth in the UAL over recent years and inform discussions about the current funding requirements and adequacy.

Note that for GARS, the graph related to the sources of change in UAL goes back to only 2012. This is due to the necessary information not being available from the prior System Actuary's reports.

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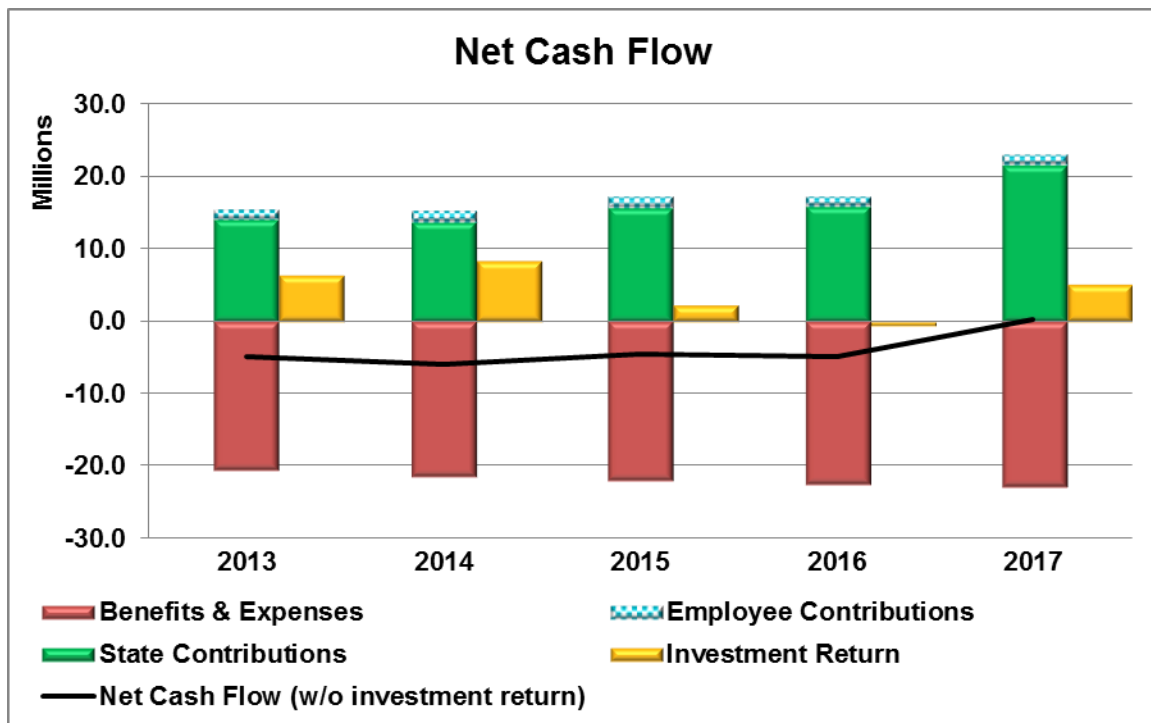
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4. Net Cash Flow Analysis

The last funding adequacy measure we present is an analysis of the System's net cash flow before taking into account investment return, which is defined as State and Member contributions less benefit payments and administrative expenses. This measure is an indication of a pension plan's maturity level in terms of its net cash flow. In a very mature plan, it is expected that cash flows will be negative as the benefits and administrative expenses far exceed contributions. In a very immature plan, the contributions typically are more than the payouts so the net cash flow is positive. The more negative net cash flow is, the more vulnerable the System is to market downturns. This is because when a pension plan has more payouts than contributions, plan assets are needed to pay some portion of the payouts. So, with a market downturn not only does the plan suffer a loss in investment income, but also some portion of its principal, leaving fewer assets left to invest and recapture the prior losses.

Looking at the following chart, GARS is neither mature nor immature on a net cash flow basis (black line), as the net cash flow has been close to zero relative to the size of the System's assets. This measure should continue to be monitored as negative cash flow increases the System's vulnerability to market downturns.



Source: Cheiron analysis of funding adequacy.

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STATUS OF RECOMMENDATIONS FROM THE 2016 STATE ACTUARY'S REPORT

Response to Recommendations in 2016

In the State Actuary's Preliminary Report on the General Assembly Retirement System of Illinois presented December 15, 2016, Cheiron made several recommendations. Below we summarize how these recommendations were reflected in either the System's comments last year or in this year's draft June 30, 2017 Actuarial Valuation.

Recommendations to Retirement System from 2016 State Actuary Report	Status	Comments
1. We recommend that the GARS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary.	Not Implemented	We are unable to determine if an RFP has been issued to perform such an actuarial audit because the minutes for 2017 have not been posted. Recommendation repeated.
2. We continue to recommend that the funding method be changed to at least fully fund future plan benefit accruals to avoid continued systematic underfunding of GARS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.	Partially Implemented	GRS continues to include strong language throughout their report recommending the use of an actuarially sound method and stating clearly that the statutory method is not actuarially sound. We find these statements to be appropriate and support their continuation. Recommendation repeated.
3. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g.,	Partially Implemented	Stress Testing was added to Final AVR (Section I, beginning Page 51) for 2016, but is not included in the draft report for 2017 that we received. We recommend that this be added to the final 2017 report. Recommendation modified.

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
GENERAL ASSEMBLY RETIREMENT SYSTEM OF ILLINOIS
PURSUANT TO 30 ILCS 5/2-8.1**

STATUS OF RECOMMENDATIONS FROM THE 2016 STATE ACTUARY'S REPORT

Recommendations to Retirement System from 2016 State Actuary Report	Status	Comments
membership declines, lower salary growth) can have on future State costs.		
4. We recommend the GARS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work, and adjust assumptions accordingly.	Implemented	GRS has continued to do this, most recently providing an Economic Assumption Update Review dated April 19, 2017.
5. We further recommend that the Boards of the three systems whose assets are commingled, State Employees' Retirement System (SERS), the Judges' Retirement System (JRS), and GARS, consider whether different interest rate assumptions for these systems are appropriate.	Implemented	The Systems have explained why different assumptions are appropriate. Recommendation removed.
6. The draft June 30, 2016 Actuarial Valuation reflects a 10% load on inactive vested liabilities to reflect increases in inactive members' pay due to current participation in a reciprocal retirement system. We recommend that GRS include an additional disclosure as to how this assumption was developed.	Implemented	GRS has included additional disclosure in the "Assumptions" section (Page 38) of the report on how this assumption was developed. Recommendation removed.

Chapter Seven

PRELIMINARY REPORT ON THE CHICAGO TEACHERS' PENSION FUND

In accordance with 40 ILCS 5/17-127(e), Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the Chicago Teachers' Pension Fund (CTPF) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to CTPF on December 1, 2017. The preliminary report was based on Cheiron's review of actuarial assumptions included in CTPF's 2017 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the Chicago Teachers' Pension Fund. CTPF's written response, provided on December 19, 2017, can be found in Appendix C.

OVERVIEW CHICAGO TEACHERS' PENSION FUND as of June 30, 2017	
Actuarial accrued liability	\$21,325,059,847
Actuarial value of assets	<u>\$10,933,031,685</u>
Unfunded liability	\$10,392,028,162
Funded ratio	51.3%
State contribution (FY19)	\$227,992,000
Active members	28,855
Inactive members	6,062
Current benefit recipients	28,439
Non-vested eligible for refunds	<u>22,570</u>
Total membership	85,926
Interest rate assumption	7.50%
Inflation assumption	2.50%
Actuarial cost method	Projected Unit Credit
Asset valuation method	4-year Smoothing
Executive Director	Charles Burbridge
Actuarial Firm	Gabriel, Roeder, Smith & Company
Source: June 30, 2017 CTPF actuarial valuation report.	

December 19, 2017

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Board of Trustees
Public School Teachers' Pension and Retirement Fund of Chicago
203 N. LaSalle Street
Suite 2600
Chicago, Illinois 60601

Dear Trustees and Auditor General:

In accordance with Illinois Public Act 100-0465, Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution to the Public School Teachers' Pension and Retirement Fund of Chicago (CTPF or System) for Fiscal Year 2019.

In summary, with two exceptions, we believe that the assumptions and methods used in the draft June 30, 2017 Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable. The exceptions relate to the use of a 7.50% interest rate assumption, in conjunction with a 2.50% inflation assumption, resulting in a “real return” of 5.0%, which we find to be overly aggressive, and maintaining the 3.50% salary scale assumption despite a reduction in the inflation assumption. We also find that the certified portion of the contribution which the State is responsible for was properly calculated.

We are recommending two changes in actuarial assumptions that the Board must consider before finalizing its certification of the required State contribution. As required by the Illinois Pension Code, when making its final certification to the Governor and General Assembly, the Board's certification must note any deviations from the State Actuary's recommended changes, the reason or reasons for not following the State Actuary's recommended changes, and the fiscal impact of not following the State Actuary's recommended changes on the required State contribution.

Since our draft report was issued, the CTPF Board accepted the recommendations and adopted an interest rate assumption of 7.25% and a wage inflation assumption of 3.25% at its December 14, 2017 Board meeting.

Section I of this report describes the review process undertaken by Cheiron. Section II summarizes our findings and recommendations. Section III provides the supporting analysis for those findings and presents more details on our assessment of the actuarial assumptions and methods employed in GRS's Actuarial Certification, as well as our assessment of GRS's determination of the required State contribution for Fiscal Year 2019. Section III also includes

additional comments relating to our findings and recommendations. Finally, section IV provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by CTPF and GRS. This information includes actuarial assumptions and methods adopted by the CTPF Board, plan provisions, the draft June 30, 2017 Actuarial Valuation, minutes of the 2017 CTPF Board of Trustee meetings, and GRS's September 21, 2017 presentation on the economic actuarial assumptions. A detailed description of all information provided for this review is contained in Appendix B.

To the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Office of the Auditor General and the Public School Teachers' Pension and Retirement Fund of Chicago for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

Gene Kalwarski, FSA, FCA, MAAA, EA
Principal Consulting Actuary

SIGNED ORIGINAL ON FILE

Michael J. Noble, FSA, FCA, MAAA, EA
Principal Consulting Actuary

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
PUBLIC SCHOOL TEACHERS' PENSION AND RETIREMENT FUND OF CHICAGO
PURSUANT TO 40 ILCS 5/17-127(e)**

SECTION I – REPORT SCOPE

Illinois Public Act 100-0465 (the Act) amended the Illinois Pension Code (40 ILCS 5/17-127) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the Public School Teachers' Pension and Retirement Fund of Chicago (CTPF or System) and to issue to the CTPF Board this preliminary report on the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution for Fiscal Year (FY) 2019. Under the Act, the required State contribution consists of 0.544% of Teacher Payroll, plus the employer normal cost, plus an amount pursuant to paragraph (3) of Section 17-142.1 to defray health insurance costs. The purpose of this review is to identify any recommended changes to the actuarial assumptions and methods for the CTPF Board to consider before finalizing its certification of the required State contribution for FY 2019.

While the Act states that just the actuarial assumptions and valuation are to be reviewed, we have also reviewed the actuarial funding method employed in preparing the Actuarial Certification, as the funding method can have a material effect on the amount of the State contribution being certified.

In addition to reviewing the Actuarial Certification of the required State contribution to CTPF, we have reviewed the “actuarial practices” of the Board. We have reviewed: (1) the use of a qualified actuary (as defined in the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2017 Actuarial Valuation.

Finally, this report is more limited in scope than the State Actuary reviews for the other Illinois Retirement Systems. This is because the State’s responsibility is limited to the 0.544% of Teacher payroll, the employer Normal Cost, and the amount to defray health insurance costs. The State is responsible for the funding of the other Illinois Systems, which requires the State Actuary to review and analyze the long-term projections and the State mandated funding method.

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SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2017 Actuarial Valuation of CTPF as well as the “actuarial practices” of the CTPF Board. Section III of this report provides detailed analysis and rationale for these recommendations.

Proposed Certification of the Required State Contribution

GRS has determined that the FY 2019 required State contribution calculated under the current statutory funding plan is \$227,992,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based.

Assessment of Actuarial Assumptions Used in the 2017 Valuation

40 ILCS 5/17-127(e) requires the State Actuary to identify recommended changes in actuarial assumptions that the CTPF Board must consider before finalizing its certification of the required State contribution. At CTPF's October 19, 2017 Board meeting, CTPF's new actuary, GRS, recommended that CTPF lower its investment assumption from 7.75% to 7.25%. Instead, the Board of Trustees adopted a reduction of the investment assumption to 7.50% and the general inflation assumption from 2.75% to 2.50%. These assumption changes were adopted by the Board following GRS's September 2017 presentation on the economic actuarial assumptions.

CTPF officials indicated that, as reflected in the Board's records of the October meeting, the CTPF Board supported a reduction in the investment assumption but noted its belief that a one-step 0.5% reduction in the year before the Fund's scheduled 2018 experience study and economic review was premature. Officials noted, after consideration of various economic, investment return, and actuarial factors, the Board accepted GRS's recommendation, in part, reducing the investment assumption from 7.75% to 7.50% but pledged to make an additional reduction in the investment assumption in 2019. GRS found this assumption and approach reasonable.

We conclude that these assumption changes still leave the System with an overly aggressive set of economic assumptions, with the real rate of return being 5.0% (i.e., 7.50% - 2.50%).

1. We recommend that the investment assumption be lowered to a rate no higher than 7.25% for this June 30, 2017 valuation.
2. Since the general inflation assumption was lowered to 2.50%, we recommend that the wage inflation assumption be lowered from 3.50% to 3.25%.

CTPF Response: The Board adopted a 7.25% actuarial rate of return at its December 14, 2017 Regular Board Meeting. While CTPF's Board stands by the reasonableness of its original rate reduction, CTPF's Board accepts the State Actuary's draft recommendation as amongst the other, reasonable actuarial options and will continue to annually review the economic assumptions that are unique to CTPF and that differentiate CTPF from the statewide pension systems.

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SECTION II – SUMMARY OF RECOMMENDATIONS

Recommended Additional Disclosures for the 2017 Valuation

3. We recommend that GRS disclose why in the September 2017 Economic Assumption Review, GRS relied on the capital market forecasts of the four specific investment consultants identified in their September 2017 report to the Board. Those consultants had higher future return expectations than the eight investment consultants that they included in similar reviews for three of the other four Illinois Systems for which GRS serves as actuary. Those eight investment consultants, as well as the four investment consultants relied on by GRS, appeared to have capital market forecasts with a 20+ year outlook.

CTPF Response: The Board accepts the State Actuary's draft recommendation. See CTPF's and GRS's letter responses in the appendix (see Appendix C) for further details on GRS's reliance on the only four investment consultants providing long-term rate of return projection in 2017.

Recommended Changes for Future Valuations

4. We recommend the CTPF Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.

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SECTION III – SUPPORTING ANALYSIS

In this section we provide detailed analysis and supporting rationale for the recommendations that were presented in Section II of this report.

Proposed Certification of the Required State Contribution

As stated in our summary of recommendations in Section II, we have verified the arithmetic calculations made by GRS to develop this State required contribution and reviewed the assumptions on which it is based.

Assessment of Actuarial Assumptions Used in the 2017 Valuation

A. Economic Assumptions

1. The Interest Rate

The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the required State contribution amount. This assumption, which is used to value liabilities for funding purposes, was lowered to 7.50% for the draft June 30, 2017 Actuarial Valuation. This change was recommended by GRS and supported by their report and presentation to the Board in September of 2017. We reviewed the presentation material which contained a number of rationales for their recommendation with which we agree.

However, after reviewing all the materials (See Appendix B of the report) that were made available, Cheiron concludes that the use of 7.50% for this valuation is overly aggressive and recommends lowering the investment assumption to a rate no higher than 7.25% for this valuation (Recommendation #1).

We recommend that the CTPF Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly (Recommendation #4).

Our rationale for these recommendations:

- The September 21, 2017 Review of Economic Actuarial Assumptions report by GRS recommended an investment return of 7.25%; however, the Board did not adopt that recommendation and instead adopted an investment return assumption of 7.50%. CTPF officials noted that at its October 19, 2017 Board meeting, the CTPF Board accepted GRS's recommendation, in part, reducing the actuarial investment assumption from 7.75% to 7.50%. As further detailed in its letter response (see Appendix C), the Board considered many factors in making its rate reduction, including its belief that a one-step 0.5% reduction in the year before the Fund's scheduled experience study and economic review was premature.

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- By lowering both the interest rate assumption and inflation assumption by 0.25% the System has maintained a real rate of return of 5.0% (7.50% interest rate assumption less 2.50% inflation assumption). We find no support for maintaining a 5.0% spread between the investment assumption and the general inflation assumption in today's low interest rate environment, and note that for the three other Illinois Systems for which GRS consults the corresponding spreads are between 4.0% and 4.5%.
- GRS's recommended investment return assumption of 7.25% was based on an average expected geometric return on the System's current actual asset allocation of four selected investment consultants to be 7.14% over a 20-year period. In fact this same report shows that the average expected probability exceeding 7.25% is only 48.43%. Two of the four consultants expected returns to exceed 7.25% with more than a 50% probability, while the other two had less than a 50% probability. This would indicate that even a 7.25% expectation is slightly aggressive and does not support an assumption higher than 7.25%.
- With respect to the recommendation to annually review economic assumptions, a review of the interest and inflation rates does not involve the collection of significant data and can be updated annually. In addition, it keeps the Board focused more closely on these very important assumptions.
- As noted above, in its September 2017 Economic Assumption Review, GRS relied on the capital market forecasts of four investment consultants. GRS also conducted economic assumption reviews for four other Illinois systems. However, in those reviews, GRS relied on analysis from a group of eight investment consultants. Given that GRS recommended an investment assumption of 7.25%, which the Board ultimately did not accept, had GRS used the same investment consultants as they used for their other Illinois Systems, the analysis would have provided more support for GRS's recommended 7.25% assumption.

We recommend that GRS disclose why in the September 2017 Economic Assumption Review, GRS relied on the capital market forecasts of the four specific investment consultants identified in their September 2017 report to the Board. Those consultants had higher future return expectations than the eight investment consultants that they included in similar reviews for three of the other four Illinois Systems for which GRS serves as actuary. Those eight investment consultants, as well as the four investment consultants relied on by GRS, appeared to have capital market forecasts with a 20+ year outlook (Recommendation #3).

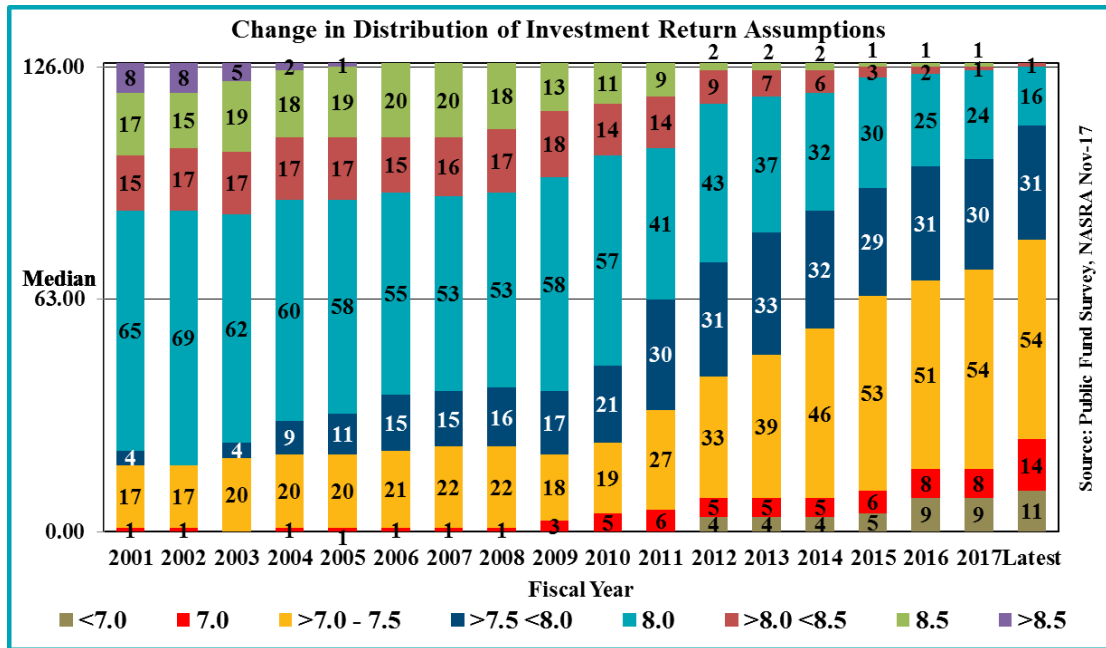
Since our draft report was issued, we had the opportunity to have a discussion with GRS on this issue. GRS informed us that the reason they selected the four investment consultants for this Fund was because those consultants provided capital market

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assumptions in 2017, whereas the analysis for the other plans that used eight consultants was provided in 2016.

- The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 127 large retirement plans. The following chart shows the distribution of investment return assumptions for the survey since 2001. The latest data includes results collected through November 2017.



Over the period shown in the latest survey, there continues to be a pattern of reducing investment return assumptions. Of the 127 plans shown, 105 have reduced their interest rate assumption since Fiscal Year 2011. For these 105 plans, the average reduction is 0.49%. The survey is consistent with the experience of other Cheiron clients with which there has been a significant trend of reducing their investment return assumptions in the last several years.

- There has been emerging actuarial practice throughout the country to reducing the discount rates even below the level that the investment consultants believe is achievable. This is because of the very low interest rate environment we are currently in. The lower the interest rate environment, the greater the investment risk that must be taken to achieve an assumed rate of return. For example, in 1995 the yield on ten-year Treasury bonds (a proxy for a risk free investment) was 6.21%. As of November 2, 2017 these yields are now 1.87%. This means, back in 1995 in order to achieve 7.50%, a system only had to earn 1.29% more than the ten-year treasury

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yields (“risk free” rates), whereas today a system would have to earn 5.63% above this “risk free” rate.

- In addition to taking pressure off of the investment process, there is a growing concern that long-term interest rates will eventually rise. A pattern of rising interest rates generally results in declining bond returns. This in turn will result in even greater investment risks on the equity side of the assets in order to compensate for both declining bond returns and the need to earn 5.63% above the risk free rates of return.
- As is the case with most maturing pension plans, CTPF is experiencing negative cash flows measured as contributions less benefits and expenses. CTPF’s negative cash flow is 5.8% of assets and growing. When short-term returns are expected to be lower than the long-term expectations, which is the case with CTPF, a plan with negative cash flows will have actuarial returns (i.e., dollar weighted returns) that are less than “time weighted” returns.
- GASB 67 and 68 pronouncements require many public pension plans, such as CTPF, to use a lower interest rate for accounting disclosures and pension expense determinations in Fiscal Years 2014 and later. It is important to note, however, that the new standards do not define funding requirements for a plan.
- The federal government, which promulgates minimum funding standards for corporate pension plans, already requires corporate pension plans to utilize interest assumptions that are based on short-term and mid-term bond rates, which are very low (26 USC 430(h)(2)(B)).

2. *Inflation Assumption*

We find the inflation assumption reduction this year from 2.75% to 2.50%, which should impact the salary increase assumption used in the draft June 30, 2017 Actuarial Valuation by GRS in certifying the required State contribution, is reasonable in conjunction with the interest rate assumption change, as long as the discount rate is lowered to a rate no higher than 7.25%.

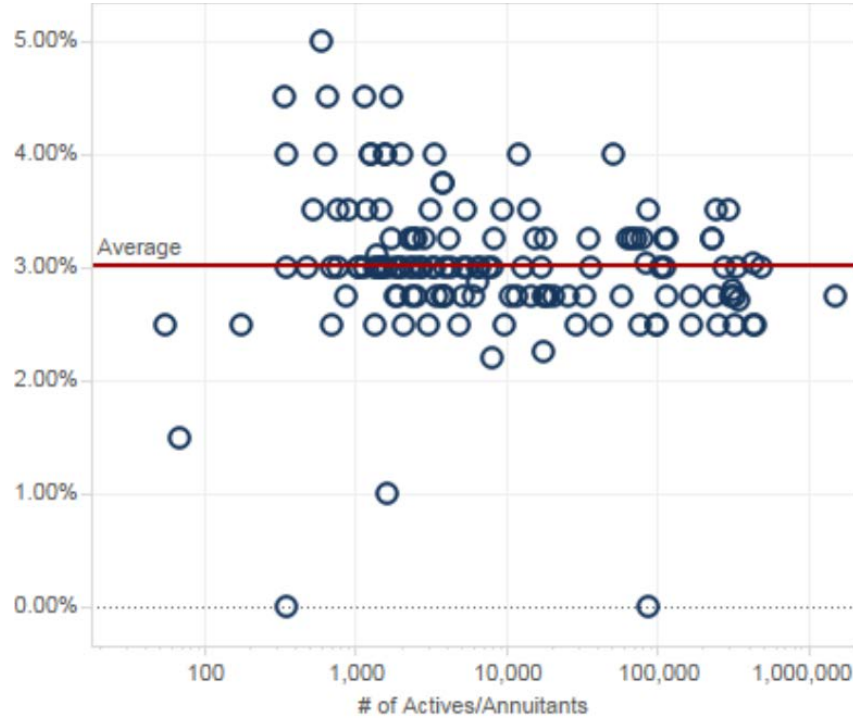
Our rationale for conditionally concurring with the 2.50% assumption:

- The July 2017 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years) inflation will average somewhere between 2.0% and 3.2% (<http://www.ssa.gov/oact/tr/2017/tr2017.pdf>). Under the intermediate cost projection the Social Security Administration uses an assumption of 2.6%.

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- As shown on page 5 of the GRS Review of Economic Actuarial Assumptions report, there is significant justification to reduce this assumption to meet expectations and 2.50% is the recommendation of GRS.
- The *National Conference on Public Employees Retirement Systems* (NCPERS) December 2016 study provides the following graphic of respondents' inflation assumptions:



This shows that the 2.50% assumption, which CTPF uses, is lower than the average inflation assumptions used among the 159 systems that responded to this study with 3.0% as the average. However, we note that 40% of the systems in the two most recent studies reduced their inflation assumption between the 2015 and 2016 studies with an average reduction of 0.39%. The downward trend in this assumption is further supported by the 3.0% average for the 2016 study being a 0.2% reduction from the prior year.

3. *Salary (Annual Compensation) Increase Assumption*

For the draft June 30, 2017 Actuarial Valuation, the individual salary increase assumption was not lowered by 0.25% as the inflation rate was reduced. We find this to be unreasonable.

We find the salary increase assumption inconsistent with the changes in the inflation assumption. Since the general inflation assumption was lowered to 2.50%, we

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recommend that the wage inflation assumption be lowered from 3.50% to 3.25% (Recommendation #2).

Below are illustrative rates of increase per individual employee per annum, compounded annually.

Age	Annual Increase
25	10.75%
30	7.25%
35	7.25%
40	5.75%
45	5.25%
50	4.75%
55	4.25%
60	4.25%
65	4.25%
70	4.25%

The underlying salary increase assumption is based on a wage inflation assumption of 3.50 percent per annum which is the same wage assumption used in the prior valuation. The effect of lowering the general inflation assumption from 2.75% to 2.50%, but leaving the wage inflation at 3.50%, implies that productivity assumption (real wage growth) has been increased from 0.75% to 1.00%.

Our rationale for recommending a change to GRS's recommended salary increase assumption:

- Unless an experience study indicates an expectation of increased productivity, we expect that the salary increase assumption should be changed in coordination with the inflation assumption. There is no clear justification in the analysis we have reviewed for an increase in the assumption for productivity for the CTPF population.
- The July 2017 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (between 2027 and 2091), real wage differential will average somewhere between 0.58% and 1.82%.
- In the current Illinois economic environment with significant budgetary challenges, to assume that real wage growth will improve is not defensible.
- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a consistent recent trend of lower salary increases for public sector employees.

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4. Cost of Living for Tier 2 Assumption

For Tier 2 participants, benefits are increased annually equal to 50% of the consumer price index urban rates with a maximum of 3.0%. With the reduction of the inflation assumption to 2.50% in 2016, the assumption for COLAs was decreased from 1.375% to 1.25%. This is reasonable based on the inflation assumption change.

We find the assumption and the basis for setting it reasonable.

5. Tier 2 Capped Pay Assumption

Benefits for members hired after January 1, 2011, are calculated using pay that is capped under 40 ILCS 5/1-160. The pay cap increase assumption was lowered from 1.375% to 1.25%.

We find the assumption and the basis for setting it reasonable.

B. Demographic Assumptions

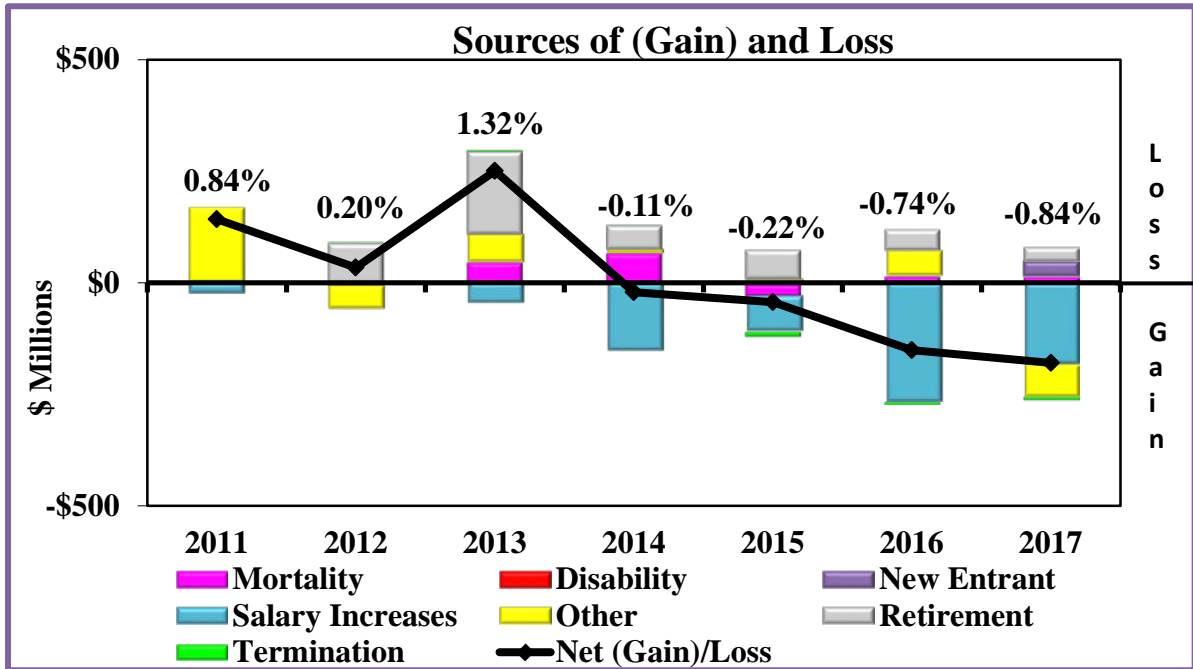
GRS has not recommended any changes to these demographic assumptions. Given that there has not been a formal experience study conducted since the last valuation, there is no additional evidence to support a change from those assumptions for this valuation.

In its annual actuarial valuation reports, CTPF regularly reports sources of liability gains and losses. In the 2017 report, these are shown on page 20. In the chart below, we have collected similar data from CTPF's past valuation reports dating back to 2011 and presented a historical review of past demographic and salary increase experience gains and losses.

The following chart shows the pattern of annual gains and losses attributable to seven different sources as shown in the legend. When the colored bar slices appear above zero on the Y-axis, that represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, that represents an experience gain for that year with liabilities less than expected. This net liability (gain)/loss is shown by the black line. This net (gain)/loss as a percent of liability is shown above the bars.

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The percentages shown above the bars refer to net (gain)/loss as a percentage of liability.

Key observations from this chart are as follows:

1. A trend of salary gains has appeared in most years. This is likely to be a reflection of the current general economic environment, but it is an indication that the salary scale assumption should be analyzed in the next experience study.
2. In every year since 2012, there have been experience losses attributable to retirement; however, except for 2013 this loss has been small as a percent of total liability.

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Below, we summarize all the demographic assumptions that we reviewed and we have concluded all are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. Mortality

Pre and Post-Retirement Healthy Mortality

The RP-2000 Healthy Annuitant mortality table, sex distinct, set back two years with generational mortality improvement from 2004 using Scale AA. This assumption provides a margin for future mortality improvements. No adjustment is made for post-disabled mortality.

Post-Retirement Disabled Mortality

The RP-2000 Disabled mortality table, sex distinct, set back three years.

2. Termination

Select and ultimate termination rates were used. Ultimate rates after the tenth year are shown in the 10+ Years of Service column in the table below. Select rates are as follows:

Termination			
Less Than 10 Year of Service		10+ Years of Service	
Service	Rate (%)	Age	Rate (%)
(Beginning of Year)			
0	25.00%		
1	15.00%		
2	10.00%		
3	9.00%		
4	8.00%		
5	7.00%		
6	6.00%		
7	5.00%		
8	4.50%		
9	4.00%		
		30	2.50%
		35	2.50%
		40	2.25%
		45	2.00%
		50	2.00%
		55	2.00%

It is assumed that terminated employees will not be rehired. The rates apply only to employees who have not fulfilled the service requirement necessary for retirement at any given age.

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SECTION III – SUPPORTING ANALYSIS

3. Disability

Disability rates, based on recent experience of the Fund, were applied to members with at least 10 years of service. All disabilities are assumed to be non-duty disabilities. Sample rates are as follows:

Age	Rate (%)
25	0.05%
30	0.06%
35	0.07%
40	0.08%
45	0.12%
50	0.16%
55	0.20%
60	0.20%

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4. Retirement

Employees are assumed to retire in accordance with the rates shown below. The rates apply only to employees who have fulfilled the service requirement necessary for retirement at any given age.

Retirement Rates for Tier 1 Employees		
Age	<34 Years of Service Rate (%)	34+ Years of Service Rate (%)
55	5.00%	20.00%
56	5.00%	20.00%
57	5.00%	20.00%
58	5.00%	20.00%
59	7.00%	20.00%
60	9.00%	22.50%
61	11.00%	22.50%
62	12.00%	22.50%
63	13.00%	22.50%
64	14.00%	22.50%
65	15.00%	25.00%
66	16.00%	25.00%
67	17.00%	25.00%
68	18.00%	27.50%
69	19.00%	27.50%
70	20.00%	30.00%
71	20.00%	30.00%
72	20.00%	30.00%
73	20.00%	30.00%
74	20.00%	30.00%
75	100.00%	100.00%

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Retirement Rates for Tier 2 Employees	
Age	Rate (%)
62	40.00%
63	25.00%
64	25.00%
65	30.00%
66	25.00%
67	30.00%
68	20.00%
69	20.00%
70	20.00%
71	20.00%
72	20.00%
73	20.00%
74	20.00%
75	100.00%

5. Population Projection

For purposes of determining annual appropriation as a percent of total covered payroll, the size of the active group is assumed to remain level at the number of actives as of the actuarial valuation date, or 28,855. New entrants are assumed to enter with an average age and an average pay as disclosed below. New entrants are assumed to have a similar demographic profile of recent new entrants to the Fund. The average increase in payroll for the projection period is 2.50 percent per annum.

New Entrant Profile		
Age Group	No.	Salary
Under 20		
20-24	204	\$ 8,575,097
25-29	359	15,368,998
30-34	161	7,080,044
35-39	93	4,247,475
40-44	63	2,758,566
45-49	45	1,640,640
50-54	26	898,688
55-59	27	764,356
60-64	16	311,954
65-69	5	143,607
70 & Over		
Total	999	\$ 41,789,425
Avg. Salary		\$ 41,831
Avg. Age		31.78
Percent Male		26%

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6. Expenses

Administrative expenses included in the normal cost are based on the previous years' administrative expenses increased by five percent. Future administrative expenses are assumed to increase at five percent per year.

7. Marriage Assumption

80 percent of active participants are assumed to be married. Actual marital status at benefit commencement is used for retirees.

8. Spouse's Age

The female spouse is assumed to be two years younger than the male spouse.

9. Total Service at Retirement

A teacher's total service credit at retirement is assumed to be 103.3 percent of the teacher's regular period of service at retirement.

10. Valuation of Inactive Members Eligible for Deferred Vested Pension Benefits

Benefits for inactive deferred vested members were determined by projecting the accumulated contribution balance to retirement (age 62) with interest at the assumed investment rate of return, converted to an annuity, and then loaded by 35 percent.

11. Contribution Timing

Projected employer contributions are assumed to occur based on the following timing:

1. Additional Board of Education Contribution (0.58 percent of pay) - June 30th (End of Year)
2. Additional State Contribution (0.544 percent of pay) - Monthly (Middle of Year)
3. State Normal Cost Contribution - Monthly (Middle of Year)
4. Board of Education Early Payment of Special Tax Levy - March 1st, annually
 - a. 55 percent of prior year's tax levy is assumed to occur each March 1st
 - (i) This amount is assumed to be \$141,625,000 in fiscal year 2018 and increased each year by three percent.
5. Remaining Board of Education Contribution - June 30th (End of Year)

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12. Decrement Timing

All decrements are assumed to occur at the beginning of the year.

13. Decrement Relativity

Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.

14. Decrement Operation

Turnover decrements do not operate after a member reaches retirement eligibility. Disability decrements do not operate after a member reaches normal retirement eligibility.

15. Eligibility Testing

Eligibility for benefits is determined based upon the age nearest birthday and service on the date the decrement is assumed to occur.

16. Assumptions as a result of Public Act 96-0889

Members hired after December 31, 2010, are assumed to make contributions on salary up to the final average compensation cap in a given year.

State contributions, expressed as a percentage of pay, are calculated based upon capped pay.

Capped (pensionable) pay was \$112,408 for fiscal year 2017 and increases at $\frac{1}{2}$ the annual increase in the Consumer Price Index-U thereafter.

The annual increase in the Consumer Price Index-U is assumed to be 2.50 percent for all years.

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C. Actuarial Methods

Actuarial methods consist of three components: (1) the funding method, which is the attribution of total costs to past, current, and future years; (2) the method of calculating the actuarial value of assets (i.e., asset smoothing); and, (3) the amortization basis of the Unfunded Actuarial Liability (UAL). Since the amortization basis is governed by State law, we do not comment on it here.

1. Cost Method

The System uses the projected unit credit cost method (PUC) to assign costs to years of service, as required under the Pension Code (40 ILCS 5/17). **We have no objections with respect to using the PUC method, although we, as GRS does, would prefer the Entry Age Normal (EAN) funding method as it is more consistent with the requirement in 40 ILCS 5/17-129 for level percent of pay funding.**

Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date but not beyond) is taken into account in calculating these benefits. The cost of providing benefits based on past service and future compensation is the actuarial accrued liability for a given active participant. Under the PUC cost method, the value of an active participant's benefits tends to increase more sharply over his or her later years of service than over his or her earlier ones. As a result of this pattern of benefit value increasing, while the PUC method is not an unreasonable method, more plans use the EAN funding method to mitigate this effect. It should also be noted that the EAN method is the required method to calculate liability for GASB 67 & GASB 68.

2. Asset Smoothing Method

The actuarial value of assets for the System is a smoothed market value. The primary purpose for smoothing out gains and losses over multiple years is that the fluctuations in the actuarial value of assets will be less volatile over time than fluctuations in the market value of assets. **The CTPF smooths the unexpected annual investment gains and losses over a period of four years to determine the actuarial value of assets.** The investment gain or loss for a year is calculated as the total investment income on the market value of assets, minus expected investment return on the prior actuarial value of assets. The final actuarial value is equal to the expected actuarial value plus (or minus) 25 percent of the calculated gain (or loss) in the prior four years. **This is a generally accepted approach in determining actuarial cost, and we concur with its use.**

Another aspect of asset smoothing methods is whether or not to limit the maximum spread between the actuarial value of assets and the market value of assets. Many public

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sector pension plans limit the actuarial value of assets to be in any year no more than 120% of market value, or no less than 80% of market value. In fact, the Internal Revenue Service (26 USC 430(g)(3)(B)(iii)) mandates this “corridor” for private sector pension plans (a 90%-110% corridor is mandated). Even though it is not mandated for public plans, we believe that the use of this type of corridor is a sounder actuarial practice, and according to ASOP No. 44 in Section 3.3 b. 1, the actuarial value of assets should “...fall within a reasonable range around the corresponding market values.”

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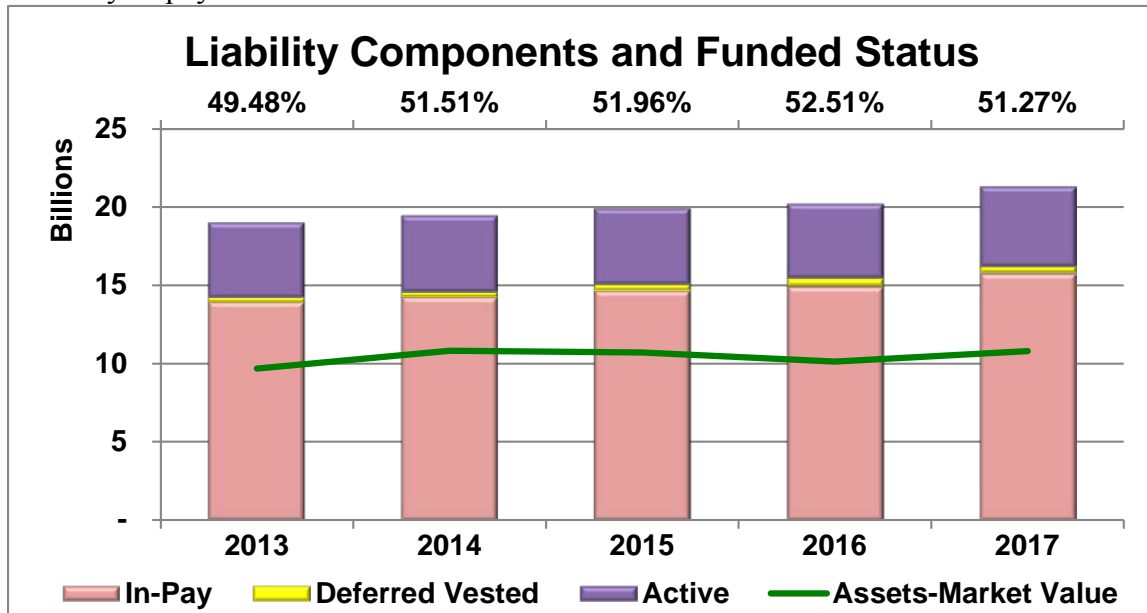
The actuarial valuation report prepared by GRS includes traditional actuarial measurements. Given the unique and substantial funding challenges faced by the Illinois pension systems, we created this section on funding adequacy measures and trends to supplement that information from the GRS report and better inform plan trustees and other stakeholders about the funding shortfall.

1. Plan Funded Status

The first funding adequacy measure we present is a historical funded status trend for the past five years. Funded status for this measure is defined as the ratio of the market value of assets to the actuarial liability. The chart below shows CTPF's funded status since 2013 has gone from 49.48% funded to 51.27% funded in 2017, an increase in funded status of 1.79%. In addition to showing the funded status, this chart also shows the breakdown of the plan's liabilities by membership status:

- Active status – this is the liability (present value of benefits already earned) for future payments to members who are currently working in the System,
- Deferred Vested status – this is the liability for members who are no longer working in the system, and
- In-Pay status – this is the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown demonstrates the increasing maturity of the plan, as the in-pay status liabilities are becoming a larger portion of the total plan liabilities. In addition, this chart shows that plan assets only cover around two-thirds of the liabilities for just those members currently in-pay status.



Source: Cheiron analysis of funding adequacy.

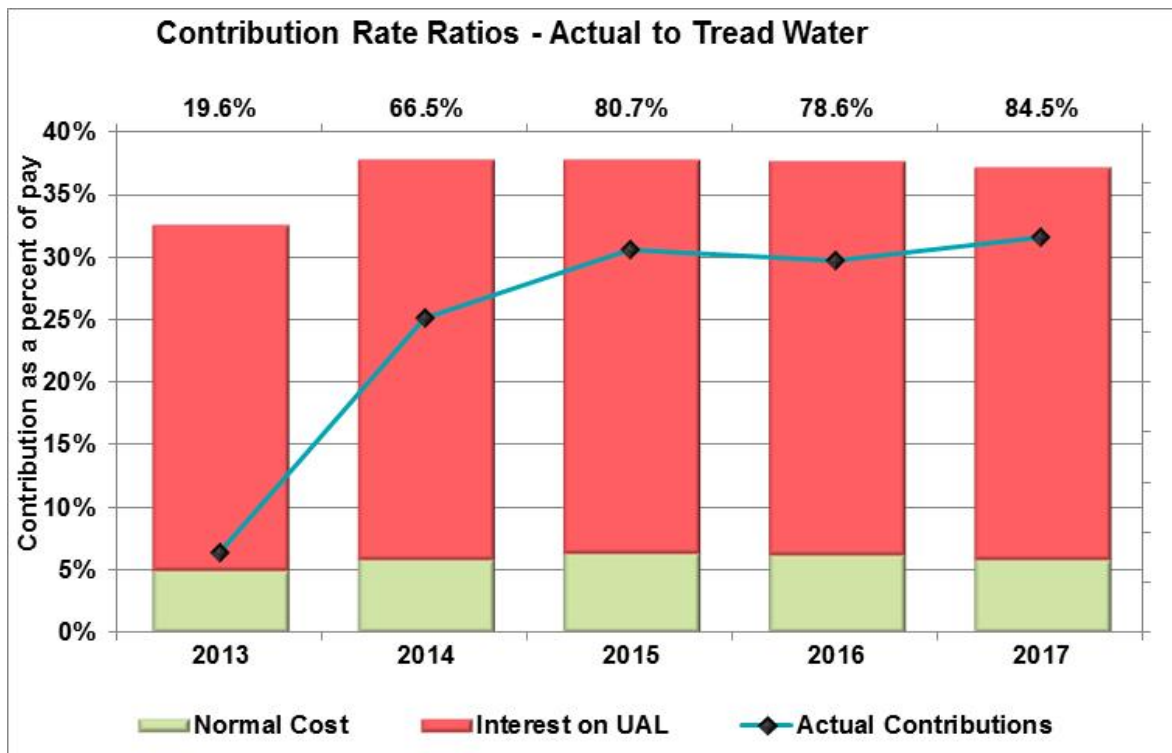
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2. Contributions as a Percent of Payroll Compared to Tread Water Contribution

The next funding adequacy measure compares the CTPF historical statutory contribution rates to tread water contribution rates. The tread water contribution rates consist of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability (UAL). The reason that this sum is referred to as the tread water contribution rate is because it is the contribution required so that the UAL will remain constant, or “tread water” (absent experience gains or losses). This tread water concept may be better understood with a credit card analogy. If a credit card holder fails to pay each month the amount of purchases made in that month (i.e., normal cost) and the monthly finance charge on the unpaid purchases from prior months (i.e., the interest on the UAL), his or her credit card debt will grow.

As the following chart shows, over the past five years, the statutory contribution rate was significantly less than the tread water rate. **The statutory contribution as a percent of the tread water rate is shown at the top of the graph for each year.** However, the deficiency between the actual contribution rate and the tread water rate has decreased significantly since 2013. Going forward, based on current projections, the deficiency is expected to continue to exist for many more years under the current statutory funding requirements, which indicates the dollar value of the UAL will continue to grow.



Source: Cheiron analysis of funding adequacy.

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3. Sources of Changes in the UAL

Our third funding adequacy metric identifies the factors that have contributed to the changes in the UAL from year to year between 2008 and 2017. Most factors have resulted in increases in the UAL in every year. The UAL was decreased by assumption changes in 2008, investment return gains in years 2013 through 2017, a small plan change in 2012, and a liability experience gain in 2016. The components for change to UAL shown in the following chart are:

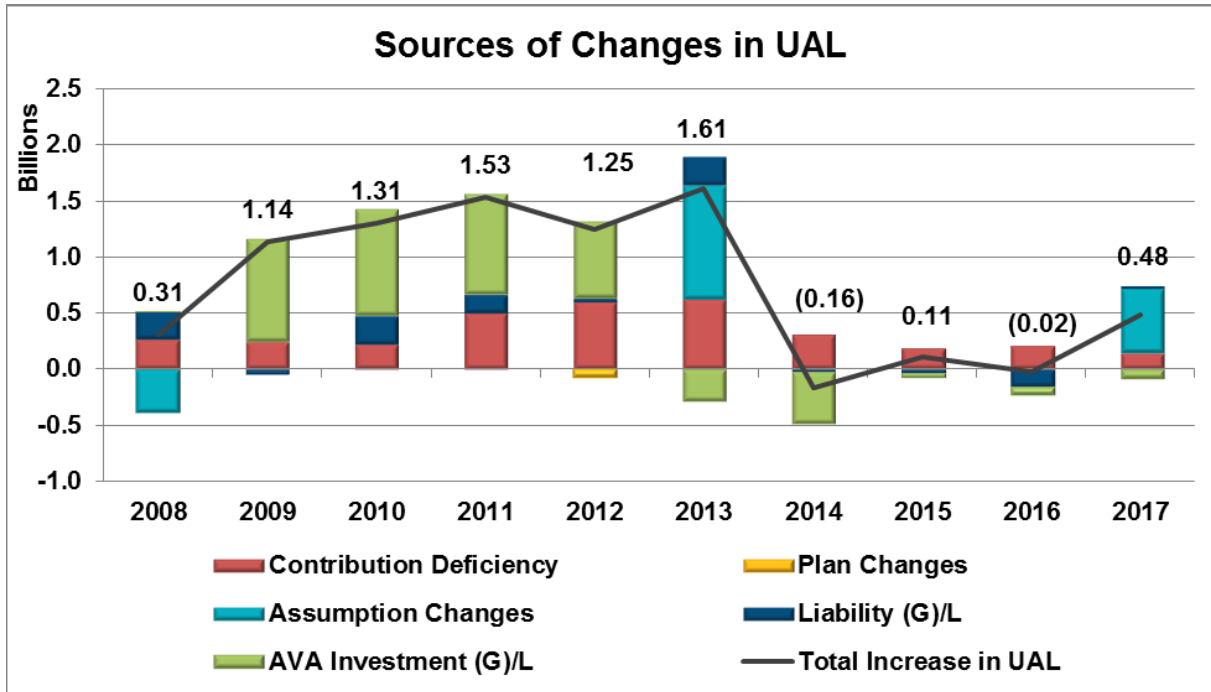
- **Contribution Deficiencies**, which are based on comparisons to the tread water contribution, have increased the UAL by \$3.3 billion over this period.
- **Assumption Changes** are changes to actuarial assumptions as the System updated expectations on future investment returns and life expectancy and asset smoothing in 2008. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations. Over this period assumption changes have increased the UAL by \$1.2 billion.
- **AVA (Actuarial Value of Assets) Investment (G)/L** is the net investment gain or loss due to assets earning more or less than assumed. These have increased the UAL over this period by \$2.5 billion.
- **Plan Changes** are any modifications of the design of the plan, which have affected benefits already accrued. Since most of the changes to the System's plan affect only future benefits the impact has been negligible during this period.
- **Liability (G)/L** are the changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.). These were generally small and had a net effect of increasing the UAL by \$0.7 billion during this period.

The sum of all the components total change in UAL is shown as the black line and values in the chart.

We expect that this chart will help stakeholders understand the sources of growth in the UAL over the past decade and inform discussions about the current funding requirements and adequacy.

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Source: Cheiron analysis of funding adequacy.

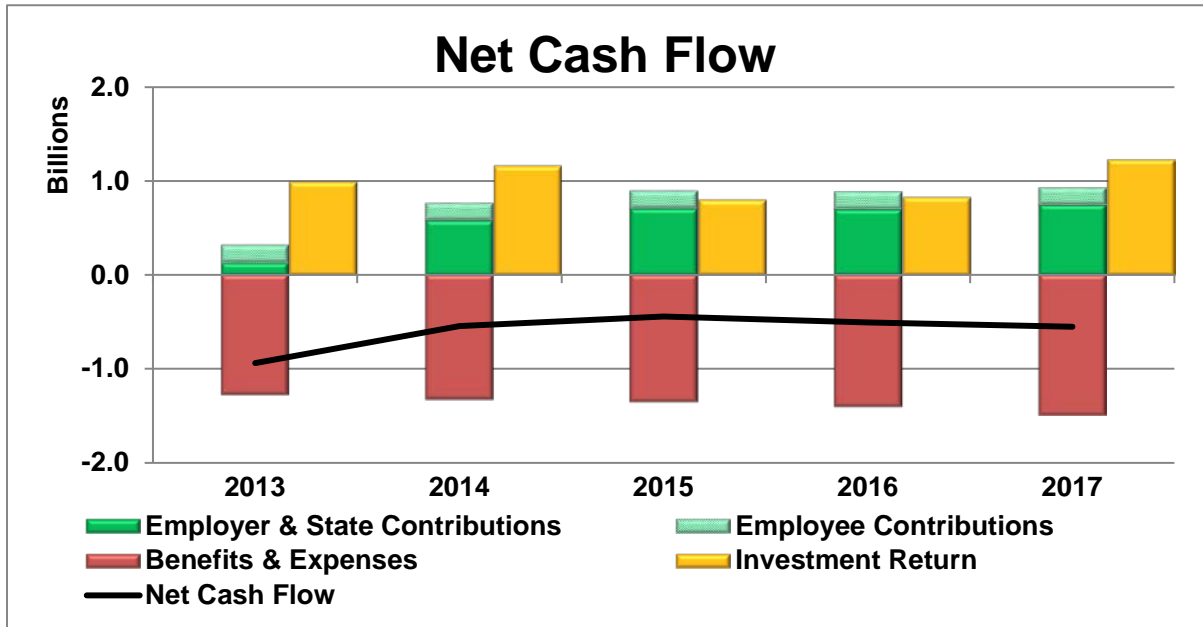
4. Net Cash Flow Analysis

The last funding adequacy measure we present is an analysis of the plan’s net cash flow relative to plan assets. Net cash flow in this analysis is defined as Employer, State, and Member contributions less benefit payments and administrative expenses. This measure is an indication of a pension plan’s maturity level in terms of its net cash flow relative to plan assets. In a very mature plan, it is expected that cash flows will be negative as the benefits and expense far exceed contributions. In a very immature plan, the contributions typically are more than the payouts so the net cash flow is positive. The more negative net cash flow is, relative to plan assets, the more vulnerable it is to market downturns. This is because when a pension plan has more payouts than contributions, then plan assets are needed to pay some portion of the payouts. So, with a market downturn not only does the plan suffer a loss in investment income, but also some portion of its principal, leaving fewer assets left to invest and recapture during a recovery.

Looking at the following chart, CTPF has significant negative net cash flow (black line). This measure should continue to be monitored as once negative cash flow exceeds 5% of plan assets the System’s vulnerability to market downturns becomes significant.

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Source: Cheiron analysis of funding adequacy.

APPENDICES

APPENDIX A
Relevant Statutory Sections
Involving the State Actuary

Illinois State Auditing Act

(30 ILCS 5/2-8.1)

Sec. 2-8.1. Actuarial Responsibilities.

- (a) The Auditor General shall contract with or hire an actuary to serve as the State Actuary. The State Actuary shall be retained by, serve at the pleasure of, and be under the supervision of the Auditor General and shall be paid from appropriations to the office of the Auditor General. The State Actuary may be selected by the Auditor General without engaging in a competitive procurement process.
- (b) The State Actuary shall:
 - (1) review assumptions and valuations prepared by actuaries retained by the boards of trustees of the State-funded retirement systems;
 - (2) issue preliminary reports to the boards of trustees of the State-funded retirement systems concerning proposed certifications of required State contributions submitted to the State Actuary by those boards;
 - (3) cooperate with the boards of trustees of the State-funded retirement systems to identify recommended changes in actuarial assumptions that the boards must consider before finalizing their certifications of the required State contributions;
 - (4) conduct reviews of the actuarial practices of the boards of trustees of the State-funded retirement systems;
 - (5) make additional reports as directed by joint resolution of the General Assembly; and
 - (6) perform any other duties assigned by the Auditor General, including, but not limited to, reviews of the actuarial practices of other entities.
- (c) On or before January 1, 2013 and each January 1 thereafter, the Auditor General shall submit a written report to the General Assembly and Governor documenting the initial assumptions and valuations prepared by actuaries retained by the boards of trustees of the State-funded retirement systems, any changes recommended by the State Actuary in the actuarial assumptions, and the responses of each board to the State Actuary's recommendations.
- (d) For the purposes of this Section, "State-funded retirement system" means a retirement system established pursuant to Article 2, 14, 15, 16, or 18 of the Illinois Pension Code.

(Source: P.A. 97-694, eff. 6-18-12.)

Illinois Pension Code (Chicago Teachers' Pension Fund)

(40 ILCS 5/17-127)

Sec. 17-127. Financing; revenues for the Fund.

(d) The Board shall determine the amount of State contributions required for each fiscal year on the basis of the actuarial tables and other assumptions adopted by the Board and the recommendations of the actuary. On or before November 1 of each year, beginning November 1, 2017, the Board shall submit to the State Actuary, the Governor, and the General Assembly a proposed certification of the amount of the required State contribution to the Fund for the next fiscal year, along with all of the actuarial assumptions, calculations, and data upon which that proposed certification is based.

On or before January 1 of each year, beginning January 1, 2018, the State Actuary shall issue a preliminary report concerning the proposed certification and identifying, if necessary, recommended changes in actuarial assumptions that the Board must consider before finalizing its certification of the required State contributions.

(e) On or before January 15, 2018 and each January 15 thereafter, the Board shall certify to the Governor and the General Assembly the amount of the required State contribution for the next fiscal year. The certification shall include a copy of the actuarial recommendations upon which it is based and shall specifically identify the Fund's projected employer normal cost for that fiscal year. The Board's certification must note any deviations from the State Actuary's recommended changes, the reason or reasons for not following the State Actuary's recommended changes, and the fiscal impact of not following the State Actuary's recommended changes on the required State contribution.

For the purposes of this Article, including issuing vouchers, and for the purposes of subsection (h) of Section 1.1 of the State Pension Funds Continuing Appropriation Act, the State contribution specified for State fiscal year 2018 shall be deemed to have been certified, by operation of law and without official action by the Board or the State Actuary, in the amount provided in subsection (c) and subsection (d) of this Section.

Additions to the Illinois Pension Code from Public Act 100-0023

Public Act 100-0023 added the same language to five Pension Code sections. One section involved the systems' responsibilities related to phasing in assumption changes. The second section included the State Actuary's duties.

Sections:

(40 ILCS 5/2-124) – General Assembly Retirement System

(40 ILCS 5/14-131) – State Employees' Retirement System

(40 ILCS 5/15-155) – State Universities Retirement System

(40 ILCS 5/16-158) – Teachers' Retirement System

(40 ILCS 5/18-131) – Judges Retirement System

Added language:

A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applies in State fiscal year 2018 or thereafter shall be implemented in equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.

A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applied to the State contribution in fiscal year 2014, 2015, 2016, or 2017 shall be implemented:

- (i) as already applied in State fiscal years before 2018; and
- (ii) in the portion of the 5-year period beginning in the State fiscal year in which the actuarial change first applied that occurs in State fiscal year 2018 or thereafter, by calculating the change in equal annual amounts over that 5-year period and then implementing it at the resulting annual rate in each of the remaining fiscal years in that 5-year period.

Sections:

(40 ILCS 5/2-134) – General Assembly Retirement System

(40 ILCS 5/14-135.08) – State Employees’ Retirement System

(40 ILCS 5/15-165) – State Universities Retirement System

(40 ILCS 5/16-158) – Teachers’ Retirement System

(40 ILCS 5/18-140) – Judges Retirement System

Added language:

By November 1, 2017, the Board shall recalculate and recertify to the State Actuary, the Governor, and the General Assembly the amount of the State contribution to the System for State fiscal year 2018, taking into account the changes in required State contributions made by this amendatory Act of the 100th General Assembly. The State Actuary shall review the assumptions and valuations underlying the Board's revised certification and issue a preliminary report concerning the proposed recertification and identifying, if necessary, recommended changes in actuarial assumptions that the Board must consider before finalizing its certification of the required State contributions. The Board's final certification must note any deviations from the State Actuary's recommended changes, the reason or reasons for not following the State Actuary's recommended changes, and the fiscal impact of not following the State Actuary's recommended changes on the required State contribution.

APPENDIX B
Materials Reviewed by Cheiron

Appendix B

MATERIALS REVIEWED BY CHEIRON

Following is a listing of information reviewed by Cheiron for each of the retirement systems. This is the information Cheiron relied upon in preparing the preliminary reports of the retirement systems.

Teachers' Retirement System:

- Illinois Law:
 - Illinois Pension Code (40 ILCS 5/) Article 16: Teachers' Retirement System of the State of Illinois
 - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023, P.A. 100-0340

- Files received from the Teachers' Retirement System:
 - RVK 2011-2015 Asset Allocation/Investment Performance Presentations
 - Buck IL TRS 2012-2015 Board Meeting Presentations and Memos
 - Segal IL TRS 2016-2017 Board Meeting Presentations
 - Board Meeting Minutes and Agendas from 2013-2017
 - Buck IL TRS 2007-2015 Valuation Reports
 - Segal IL TRS 2016-2017 Valuation Reports
 - Buck IL TRS 2012-2015 Certifications of Required State Contribution
 - Segal IL TRS 2016-2017 Certifications of Required State Contribution
 - Buck IL TRS Experience Analysis Reports for 2007, 2012, 2015
 - Segal IL TRS Experience Analysis 2016, 2017
 - Buck IL TRS spreadsheet with additional details on Section 4 of 2013-2015 AVRs
 - TRS Economic Impact Study of Benefits – May 2015
 - Buck IL TRS DRAFT 2014-2015 GASB 67/68 Reports
 - TRS Stress Testing Scenarios

- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - December 2016 *National Conference on Public Employee Retirement Systems* (NCPERS) Public Retirement Systems Study
 - November 2017 Survey published by the National Association of State Retirement Agencies (NASRA)
 - June 2017 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)

State Universities Retirement System

- Illinois Law:
 - Illinois Pension Code (40 ILCS 5/) Article 15 : State Universities Retirement System of Illinois
 - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023

- Files received from the State Universities Retirement System:
 - Board Meeting Minutes and Agendas from 2013-2017
 - GRS IL SURS 2008-2017 Valuation Reports
 - GRS IL SURS 2012 - 2017 Certifications of Required State Contribution
 - GRS IL SURS DRAFT 2014-2017 GASB 67/68 Reports
 - GRS SURS 2015 Economic Assumptions Review Presentation & Report
 - GRS SURS Experience Review Report – January 16, 2015
 - SURS Asset Liability Study, Economic Assumption Review and Recommendation Memos
 - Segal IL SURS Full Scope Audit of the June 30, 2015 Actuarial Valuation
 - GRS IL SURS spreadsheet with additional details for annual Stress Testing
 - GRS IL SURS spreadsheet with additional details on Tables 13-16, 18-21 from AVRs
 - NEPC IL SURS Asset Class Assumptions and Actions annual presentations
 - SURS Investment Plan Update FY 2012 - FY 2017
 - GRS IL SURS GASB 67 Plan Reporting and Accounting Schedules
 - GRS IL SURS Stress Testing Scenarios

- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - December 2016 *National Conference on Public Employee Retirement Systems* (NCPERS) Public Retirement Systems Study
 - November 2017 Survey published by the National Association of State Retirement Agencies (NASRA)
 - June 2017 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)

State Employees' Retirement System

- Illinois Law:
 - Illinois Pension Code (40 ILCS 5/) Article 14: State Employees' Retirement System of Illinois
 - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023

- Files received from the State Employees' Retirement System:
 - SERS Experience Review for the Years July 1, 2009 to June 30, 2013
 - SERS Experience Review for the Years July 1, 2012 to June 30, 2015
 - Board Meeting Minutes and Agendas from 2013-2017

- GRS IL SERS 2007-2017 Valuation Reports
- GRS IL SERS 2012-2017 Certifications of Required State Contribution
- GRS IL SERS 2017 Economic Assumption Update Review
- GRS IL SERS spreadsheet with additional details on Tables 4 and 7-10 from 2014 & 2015 Valuation Reports
- GRS IL SERS DRAFT 2014-2017 GASB 67/68 Reports
- ISBI Fund Evaluation Reports 2015-2017
- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - December 2016 *National Conference on Public Employee Retirement Systems* (NCPERS) Public Retirement Systems Study
 - November 2017 Survey published by the National Association of State Retirement Agencies (NASRA)
 - June 2017 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)

Judges' Retirement System

- Illinois Law:
 - Illinois Pension Code (40 ILCS 5/) Article 18: Judges' Retirement System of Illinois
 - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023
- Files received from the Judges' Retirement System:
 - JRS Experience Review for July 1, 2012 to June 30, 2015
 - Board Meeting Minutes and Agendas from 2013-2017
 - Goldstein & Associates JRS 2006 – 2011 Valuation Reports
 - GRS IL JRS 2012 – 2017 Valuation Reports
 - GRS IL JRS 2012 – 2017 Certifications of Required State Contributions
 - GRS IL JRS 2017 Economic Assumption Update Review
 - GRS IL JRS spreadsheet with additional details on Tables 4 and 7-10 from 2014 and 2015 Valuation Reports
 - GRS IL JRS DRAFT 2015 – 2017 GASB 67/68 Reports
- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - December 2016 *National Conference on Public Employee Retirement Systems* (NCPERS) Public Retirement Systems Study
 - November 2017 Survey published by the National Association of State Retirement Agencies (NASRA)
 - June 2017 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)

General Assembly Retirement System

- Illinois Law:
 - Illinois Pension Code (40 ILCS 5/) Article 2: General Assembly Retirement System of Illinois
 - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023
- Files received from the General Assembly Retirement System:
 - GARS Experience Review for July 1, 2012 to June 30, 2015
 - Board Meeting Minutes and Agendas from 2013 – 2017
 - Goldstein & Associates GARS 2006 – 2011 Valuation Reports
 - GRS IL GARS 2012 – 2017 Valuation Reports
 - GRS IL GARS 2012 – 2017 Certifications of Required State Contributions
 - GRS IL GARS 2017 Economic Assumption Update Review
 - GRS IL GARS spreadsheet with additional details on Tables 4 and 7-10 from 2014 – 2016 Valuation Reports
 - GRS IL GARS DRAFT 2015 – 2017 GASB 67/68 Reports
- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - December 2016 *National Conference on Public Employee Retirement Systems (NCPERS) Public Retirement Systems Study*
 - November 2017 Survey published by the National Association of State Retirement Agencies (NASRA)
 - June 2017 *Old-Age, Survivors and Disability Insurance Trustees Report (OASDI)*

Chicago Teachers' Pension Fund

- Illinois Law:
 - Illinois Pension Code (40 ILCS 5/) Article 17: Public School Teachers' Pension and Retirement Fund – Cities of Over 500,000 Inhabitants
 - Public Act (P.A.) 090-0566, P.A. 090-0582, P.A. 091-0357, P.A. 100-0465
- Files received from the Chicago Teachers' Pension Fund:
 - Goldstein & Associates CTPF 2007-2011 Valuation Reports
 - Segal CTPF 2012-2016 Valuation Reports
 - GRS 2017 Valuation Report
 - Review of Economic Actuarial Assumptions report presented by GRS September 21, 2017
- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association

- December 2016 *National Conference on Public Employee Retirement Systems* (NCPERS) Public Retirement Systems Study
- November 2017 Survey published by the National Association of State Retirement Agencies (NASRA)
- June 2017 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)

APPENDIX C
Responses from the Retirement Systems



December 12, 2017

VIA ELECTRONIC MAIL
Mr. Joe Butcher
Office of the Auditor General
740 East Ash Street, First Floor
Springfield, IL 62703

Dear Mr. Butcher:

We have reviewed the preliminary report prepared by the state actuary on the preliminary 2017 actuarial valuation prepared by Segal Consulting. TRS and Segal offer the following joint response to Cheiron's recommendations.

The TRS board will meet on December 14 to provide final certification to the FY 2018 and FY 2019 state funding requirements.

State Mandated Funding Method

- 1. Cheiron continues to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of TRS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable. Cheiron understands that the funding method is under the jurisdiction of state law, not TRS.**

We agree that the statutory funding methodology that we are required to follow does not follow Actuarial Standards of Practice. That is why the TRS board adopted a policy to certify actuarially determined contributions in March 2012. Adopting this policy contributed to the General Assembly adopting the legislation that created the office of State Actuary. The actuarial funding amount required by the board adopted policy has been certified along with the statutory amount since that time. The policy was updated and revised in 2014 to reflect recent changes in actuarial practice. We appreciate that Cheiron supports this policy and confirms that it conforms to a goal of full funding within a reasonable period.

Conformance to Statutory Funding Changes of Public Act 100-0023

Recognition of Changes in Assumptions

- 2. The recertification provided by Segal as a stand-alone document [for the FY 2018 recertification] provides insufficient information to support the revised funding amounts and should include an exhibit demonstrating how the new amounts were determined.**

The recertification amount is supported by the schedule detailing the impact of the change that is included in the Valuation Report on page 52.

Optional Hybrid Plan

- 3. Cheiron recommends that Segal reflect Tier III (the optional hybrid plan) in the June 30, 2017 valuation since the state mandated funding method requires projecting the liabilities of the system to 2045. Assumptions for unknown issues should be made and disclosed in the valuation report.**

TRS appreciates Cheiron's point of view but we stand by our decision to not include Tier III projections for the reasons listed on page 8 of Cheiron's preliminary report. Significant questions remain about the details of the plan and projections made on its implementation and impact would be mere speculation.

These issues must be addressed before the TRS board will be able to set the expected implementation date for Tier III. The open issues include a particularly serious question about whether the provisions of the bill as originally enacted would be approved by the Internal Revenue Service as allowable for a qualified plan such as TRS. While those issues may be addressed in January 2018 by subsequent legislation, that legislation has not been acted upon and there has been no clear indication as to when it will be.

Further, even once the final form of the legislation is in place, we expect the impact on liabilities and contributions to be minimal relative to the plan as a whole since the defined benefit is significantly less than even a Tier II benefit and the member fully pays for it.

Recommended Additional Disclosures for the 2017 Valuation

- 4. Cheiron recommends that Segal expand the stress testing of the System in the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of stressors (e.g., membership declines, lower salary growth) can have on future state costs. Cheiron states that in particular, the tests should demonstrate whether or not there is a potential for unsustainable costs during the statutory funding period.**

TRS and Segal still believe that the actuarial valuation report is not the appropriate place for extensive insolvency analysis. During board presentations that focus on this topic, the trustees can engage in robust discussions with the actuaries and investment professionals. Most recently in depth analysis and discussions took place during the Board's annual retreat in April and at the August board meeting. Further, the results of the stress tests have been regularly discussed in legislative hearings and other public forums.

The preliminary 2017 valuation report does contain some stress testing that was added in response to Cheiron's comments in prior years. Cheiron suggests showing more details about those scenarios, such as projected state contributions and funded ratios, to demonstrate the potential magnitude of the unfunded liability change over time. Segal will consider including such charts in the 2018 report.

We note that determining whether the required contributions are sustainable is not a judgment TRS or its consultants can make. We are keenly aware of the state's fiscal problems, caused in part by years of underfunding its retirement systems. However, the board's fiduciary duty is to plan participants and only to plan participants. This is why the board has devoted so much attention to proper funding. The longer it is delayed, the more difficult it becomes.

Recommended Changes for Future Valuations

- 5. Cheiron recommends the TRS board continue to review annually the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.**

The TRS actuaries have been reviewing the interest and inflation assumptions each year since 2013 and will continue to do so.

- 6. Cheiron continues to recommend evaluating the implications of the one year delay in data used for the valuation to substantiate if it is immaterial. [Member information as of June 30, 2016 was used for the June 30, 2017 valuation.]**

This point is addressed in item 12 on page 3 of the preliminary 2017 valuation report. Segal estimates that the June 30, 2016 actuarial accrued liability would have been \$400 million higher if they had used June 30, 2016 participant data. In our view, this calculation substantiates that the difference is immaterial.

We appreciate Cheiron's timely and thoughtful review of Segal's work and their attention to the risks to the retirement systems caused by persistent inadequate funding. We would be happy to discuss any of these matters with you and Cheiron.

Sincerely,

SIGNED ORIGINAL ON FILE

Richard W. Ingram
Executive Director

cc: Jana Bergschneider, TRS
Ameen Dada, OAG
Kathleen Farney, TRS
Jake Libauskas, Segal Consulting
Kim Nicholl, Segal Consulting
Matt Strom, Segal Consulting

December 12, 2017

Mr. Frank J. Mautino
Auditor General
740 East Ash Street
Springfield, IL 62703

Re: Response to the State Actuary Report of 2017

Dear General Mautino:

This is the official response from the State Universities Retirement System of Illinois (SURS) regarding the December 2017 preliminary report issued by Cheiron – The State Actuary’s Preliminary Report on the State Universities Retirement System of Illinois under Public Act 097-694.

What follows is a summary response which also includes a detailed response for each of the recommendations from our actuary, Gabriel Roeder Smith & Company (GRS).

Proposed Certification of the Required State Contribution

The State Actuary accepts the proposed certification of \$1,655,543,000 (\$1,655,154,000 revised) for the Fiscal Year 2019 SURS required state contribution.

Assessment of Actuarial Assumptions Used in the 2017 Valuation

The December 2017 report issued by the State Actuary, Cheiron, indicates that they believe that the assumptions used in the June 30, 2017, Actuarial Valuation, are reasonable. They also noted SURS accepting the 2015 recommendation to retain the services of an independent actuary to conduct a full scope actuarial audit. The audit was performed by Segal Consulting.

Recommendations

1. State Mandated Funding Method

The State Actuary recommends that the funding method be changed to at least fully fund future plan benefit accruals to avoid systematic underfunding of SURS.

Response: The funding policy is established by the legislature and is not under the control of the Board. Please note that prior annual valuation reports and the certification letters sent to the State have addressed this concern and we plan to do so again in this year’s communication.

Recommended Additional Disclosure for the 2017 Valuation

2. Conformance to Statutory Funding Changes of Public Act 100-0023.

Cheiron recommends that GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act.

Response: Upon receipt of the preliminary report, SURS and GRS staff reviewed the statute and discussed. GRS has reviewed the method used to phase-in the prior assumption changes and provided disclosures of their interpretation and the State Actuary's recommendation. The SURS Board was presented this information. The recommended method and the method used by GRS are both reasonable.

3. The State Actuary also recommends additional stress testing within the valuation report.

They further recommend that GRS include stress testing of the System within the valuation report and include an explanation of the implications that volatile investment returns and a variety of other stressors will have on the potential unsustainable cost impact that could occur during the statutory funding period. Cheiron believes the stress test report should be contained within the valuation instead of as a supplemental document.

Response: We agree that stress testing can be a good way to assess risk and to develop strategies for the long term management of the risk. SURS submitted three scenario stress tests to the State Actuary. The results of the stress test will be forwarded with our certification letter. Since the Board does not set the funding policy or the benefit provisions, and the State bears the contribution risk from the stressors, we recommend that additional stress testing be conducted at the request of and reviewed by the State.

4. Recommend additional disclosure of the components of the additional contributions

Cheiron recommends disclosure of the components of additional contributions for participants with pay in excess of the Governor's salary within the valuation report.

Response: As mentioned, SURS calculated the estimated additional contribution for participants that exceed or are projected to exceed the Governor's salary. The additional contribution is equal to the employer normal cost multiplied by the salary in excess of the Governor's salary,

For the Fiscal Year 2018 calculation, the Fiscal Year 2016 earnings were used. The Fiscal Year 2017 earnings were used for the Fiscal Year 2019 State Contribution calculation.

Recommended Changes for Future Valuations

5. Cheiron recommends that the Board annually review the economic assumptions (interest rate and inflation) each year prior to commencing the valuation work and adjust assumptions accordingly.

Response: An economic study was completed by GRS and presented to the SURS Board June 2017. The board approved the current assumptions at that meeting. The board will review the economic assumption again at the March 2018 meeting.

Please do not hesitate to contact me with any questions or concerns about our response.

Sincerely yours,

SIGNED ORIGINAL ON FILE

Martin Noven
Executive Director

Encl: Gabriel Roeder Smith & Company Response to State Actuary Report of 2017
Gabriel Roeder Smith & Company Additional Disclosure Response Calculation

cc: Michael Nobel, Cheiron
Joseph Butcher, Office of the Auditor General
Jim Schlouch, Office of the Auditor General
Heather Powell, BKD, LLP

December 5, 2017

Board of Trustees
State Universities Retirement System of Illinois
1901 Fox Drive
Champaign, Illinois 61820

Re: Response to State Actuary Report of 2017

Dear Members of the Board:

At your request we have reviewed the report issued by Cheiron dated December 1, 2017 – The State Actuary’s Preliminary Report on the State Universities Retirement System of Illinois (“SURS”) Pursuant to 30 ILCS 5/2-8.1. This report was a review of the June 30, 2017, actuarial valuation prepared by GRS Retirement Consulting (“GRS”).

Assessment of Actuarial Assumptions and Methods Used in the 2017 Valuation

This report issued by the State Actuary, Cheiron, indicates that **“In summary, we believe that the assumptions and methods used in the draft June 30, 2017, Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the State funding requirements that do not conform to Actuarial Standards of Practice, were properly calculated in accordance with State law.”**

Proposed Certification of the Required State Contribution

In this section, the State Actuary notes that 1) the Board accepted the State Actuary’s recommendation that the Board have an independent full replication actuarial audit performed and 2) that the audit fully replicated and validated the results of the June 30, 2015, actuarial valuation.

State Mandated Funding Method

In this section the State Actuary opines on their concern regarding the Statutory funding method and recommends that the Statutory funding method be changed to at least fully fund future plan benefit accruals. **(Recommendation #1)**

The funding policy used in the June 30, 2017, actuarial valuation is prescribed in accordance with Article 15 of the Illinois Pension Code (and noted by Cheiron) and is not under the actuary or the Board’s control; therefore, no action is required. We note that GRS’ annual actuarial valuation reports, and the Board, have communicated similar concerns to the State consistently over the years. Therefore, we encourage Cheiron, in their role as the State Actuary, to address this issue directly with the State of Illinois and recommend a statutory change.

Conformance to Statutory Funding Changes of Public Act 100-0023

Cheiron states “We recommend that GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act.” **(Recommendation #2)**

On page 7 of Cheiron’s report, they state “This rate adjustment is then recognized over a five-year period as an adjustment to the contribution rate that would otherwise be required from the State. A similar calculation is shown in the draft 2017 Actuarial Valuation. However, we do not see this direct adjustment in the projections that develop the State Contribution. As such, we cannot confirm the updated values match the adjustment as described by the law.”

Documentation of the development and direct adjustment on the projected Statutory contribution amounts can be found in Table 15 and page 47 of the June 30, 2017, actuarial valuation report. (The ultimate contribution rate minus the portion unrecognized for the applicable fiscal year equals the Statutory contribution rate.)

The initial assumption change impact is the level percentage of payroll increase in the contribution rate, converted to a dollar amount (as shown in previous years’ actuarial valuation presentations). As shown on page 47 of the June 30, 2017, actuarial valuation report, the dollar amount from the previous years’ valuations was converted to a level percentage of payroll based on the current valuation payroll at the date of implementation of the legislation requiring this retroactive change in the recognition of assumption changes in the contribution requirement. The level percentage of payroll adjustment was applied to the fiscal year 2019 contribution rate and the subsequent applicable contribution rates. For purposes of the certification of the Statutory contribution, the level percentage of payroll contribution is converted to a dollar amount.

GRS believes the method used is a reasonable interpretation of the language contained in Public Act 100-0023; however, other interpretations could also be reasonable.

Assessment of Actuarial Assumptions Used in the 2017 Valuation

Cheiron states “We have reviewed all the actuarial assumptions used in the State Universities Retirement System’s draft June 30, 2017 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.”

Recommended Additional Disclosures for the 2017 Valuation

Recommendation #3 is to include stress testing within the actuarial valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors can have on future State costs.

GRS included language in the actuarial valuation report of the implications of assumptions not being met. In addition, as Cheiron noted, GRS did provide alternative stress testing scenarios to SURS in a separate letter last year (i.e., not in the actuarial valuation report). GRS also provided stress testing scenarios to SURS in a separate letter this year.

At the Board’s request and with their concurrence, we can include the stress testing analysis that we have been performing each year as an additional section in the actuarial valuation report to the extent that the Board’s timing requirements for finalizing the report permit. However, given the extreme volume of information and number of exhibits that are already included in the actuarial valuation report, we are concerned that adding an additional section to what is already a very complex report is likely to confuse the users of the actuarial valuation report. Further, it is not clear what additional information the public would gain by reviewing specific stress testing scenarios that are not covered in the commentary on risks already included in the actuarial valuation reports.

Recommendation #4 is that “We recommend that GRS disclose in the June 30, 2017, valuation the components of the additional contributions for participants with pay in excess of the Governor’s salary.”

This information is already included in Table 24 and on page 48 of the June 30, 2017, valuation report. The Tier 1 employer normal cost contributions on Table 24 are for pay in excess of the Governor’s pay. GRS is open to suggestions on additional language for added clarity.

Recommended Changes for Future Valuations

Recommendation #5 is that the Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.

Although not noted by Cheiron, the Board reviewed the economic assumptions at the June 2017 Board meeting and voted to keep the same economic assumptions for the actuarial valuation as of June 30, 2017, that were used for the actuarial valuation as of June 30, 2016. GRS and the Board will continue to annually review the economic assumptions prior to commencing the actuarial valuation work.

Sincerely,

SIGNED ORIGINAL ON FILE

Lance J. Weiss, EA, MAAA, FCA
Senior Consultant and Team Leader

SIGNED ORIGINAL ON FILE

Amy Williams, ASA, MAAA, FCA
Consultant

AW:kb

cc: David Kausch, Gabriel, Roeder, Smith & Company
Kristen Brundirks, Gabriel, Roeder, Smith & Company





December 14, 2017

Mr. Joe Butcher
Office of the Auditor General
740 East Ash Street, First Floor
Springfield, IL 62703

Dear Mr. Butcher,

The management of the State Employees' Retirement System (SERS) has reviewed the State Actuary's preliminary report on the draft SERS June 30, 2017 Actuarial Valuation, prepared by Gabriel, Roeder, Smith and Company (GRS). The report notes the State Actuary (Cheiron) believes **"the assumptions and methods used in the draft June 30, 2017 Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable."** In addition, Cheiron found **"the certified contributions, notwithstanding the State funding requirements that do not conform to Actuarial Standards of Practice, were properly calculated in accordance with State law."**

Listed are Cheiron's recommendations and SERS management's responses to those recommendations. In addition, attached are the GRS responses to the recommendations.

Proposed Certification of the Required State Contribution

- 1. Cheiron continues to recommend that the SERS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary.**

Response: The SERS Board of Trustees and management will continue to discuss the need for a full scope actuarial audit. The SERS valuations are reviewed annually by the State Actuary, and the Commission on Government Forecasting and Accountability (CoGFA) prepares a parallel valuation annually using the SERS membership data, assumptions and methodology. Given the annual reviews and parallel valuations, the SERS Board and management will revisit the need for a full scope actuarial audit as part of the development of the FY 19 SERS operations budget.

State Mandated Funding Method

- 2. Cheiron recommends the funding method be changed to at least fully fund future plan benefit accruals to avoid continued systematic underfunding of SRS. Continuing the practice of underfunding future accruals increases the risk of the system becoming**

unsustainable. However, we understand that changing the funding method is under the jurisdiction of State law and not the retirement systems.

Response: The SERS Board of Trustees agrees with Cheiron and has adopted a funding policy that would provide for annual State contributions equal to the projected normal cost of benefits earned in the year plus an amount to amortize the unfunded liabilities over 25 years as a level percent of payroll. This amount is considered the “Actuarially Determined Contribution (ADC) and for informational purposes is included in the annual certifications of the required statutory State contribution.

Conformance to Statutory Funding Changes of Public Act 100-0023

- 3. Cheiron recommends the GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act.**

Response: SERS and GRS will add a disclosure noting the methodology used in the smoothing of assumption changes is based on a level percentage of payroll. For future assumption changes, the smoothing methodology will be discussed. The next review of all actuarial assumptions will occur after the completion of the FY 2018 valuation.

- 4. The recertification provided by GRS as a stand-alone document provides insufficient information to support the revised funding amounts and should include an exhibit demonstrating how the new values, both amounts and percentages of payroll, were determined.**

Response: SERS and GRS have provided additional documentation showing the methodology used in the calculation of the statutorily required FY 2018 recertification.

Optional Hybrid Plan

- 5. We also recommend that GRS include the stress testing they referenced in their determination that Tier 3 benefits will have an immaterial impact on funding both now and in the future based on the relatively small portion of the active population eligible for electing this plan. While the 0.0085% impact they report is small, it would be valuable to have the demonstration included in the report in the event that this assumption needs to be revisited or in the event there are further changes to Tier 3 benefits in the future, as well as simply to provide documentation and disclosure of the work.**

Response: SERS and GRS will add this information in future valuation reports.

Recommended Additional Disclosures for 2017 Valuation

- 6. Cheiron recommends that SERS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g. membership declines, lower salary growth)**

can have on future State costs. In particular, the tests should demonstrate whether there is a potential for unsustainable cost during the statutory funding period. GRS did include stress testing in last year's final report, but did not include such stress testing in this year's draft report, just various explanations of the implications of the assumptions not being met. Cheiron recommends that stress testing be added into this year's report. Because the public may only look to the valuation report for this type of information, they believe it should be contained here instead of any supplemental document to the Board that may potentially be overlooked.

Response: SERS and GRS will make the recommended changes to the FY 2017 valuation report.

Recommended Changes for Future Valuations

- 7. Cheiron recommends the SERS Board continue to annually review the economic assumptions (primarily interest rate and inflation) prior to commencing the valuation work, and adjust assumptions accordingly, as they did for this valuation.**

Response: The Board of Trustees will continue to annually review the economic assumptions in a manner (April or July Board meetings) that will allow adjustments to the assumptions to be included in the next valuation.

Please let me know if you would like to further discuss your recommendations or our responses.

Sincerely,

SIGNED ORIGINAL ON FILE

Timothy B. Blair, Executive Secretary
State Employees' Retirement System

December 14, 2017

Board of Trustees
State Employees' Retirement System of Illinois
2101 South Veterans Parkway
P.O. Box 19255
Springfield, IL 62794-9255

Re: Response to State Actuary Report of 2017 — SERS

Dear Members of the Board:

At your request we have reviewed the report issued by Cheiron – The State Actuary’s Preliminary Report on the State Employees’ Retirement System of Illinois (“SERS”) Pursuant to 30 ILCS 5/2-8. This report was a review of the June 30, 2017, actuarial valuation for SERS.

Assessment of Actuarial Assumptions and Methods Used in the 2017 Valuation

This report issued by the State Actuary, Cheiron, indicates that **“In summary, we believe that the assumptions and methods used in the draft June 30, 2017, Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the State funding requirements that do not conform to Actuarial Standards of Practice, were properly calculated in accordance with State law.”**

Page 1 of the transmittal letter of the draft GRS Actuarial Valuation report states:

The System’s current contribution rate determined under the statutory funding policy may not conform to the Actuarial Standards of Practice. Therefore, the Board adopted an actuarial funding policy to be used to calculate the Actuarially Determined Contribution (“ADC”) under GASB Statement Nos. 67 and 68 for financial reporting purposes.

Although the statutory contribution requirements were met, the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution. Meeting the statutory requirement does not mean that the undersigned agree that adequate actuarial funding has been achieved. We recommend the adherence to a funding policy, such as the Board policy used to calculate the ADC under GASB Statements Nos. 67 and 68, that funds the normal cost of the plan as well as an amortization payment that seeks to pay off any unfunded accrued liability over a closed-period of 25 years.

Proposed Certification of the Required State Contribution

In **item 1**, the State Actuary recommends that the Board have an independent full replication actuarial audit performed.

The type and timing of actuarial audits is a matter of Board policy, and we will leave the response to the Board. For reference, the Government Finance Officers Association (GFOA) recently updated their Best Practice on Actuarial Audits (<http://www.gfoa.org/actuarial-audits>).

State Mandated Funding Method

In **item 2**, the State Actuary recommends that: "the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SERS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable."

We agree with the State Actuary's comment on strengthening SERS funding policy. As stated above, a funding policy that finances the normal cost plus the unfunded actuarial liability over a 25-year closed-period would, in our opinion, strengthen the funded status of SERS. However, a change in the funding method and funding policy would require a statutory change.

Conformance to Statutory Funding Changes on Public Act 100-0023

In **item 3**, the State Actuary recommends that "GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result defined in the Act."

Our interpretation of the statutory funding changes provided in Public Act 100-0023, is to determine the cost impact on the State contribution rate due to the changes in actuarial assumptions as a percentage of payroll and phase-in this amount in equal annual increments over a five-year period. We believe this method is a reasonable interpretation of the language contained in Public Act 100-0023; however, other interpretations could also be reasonable. The smoothing methodology will be reviewed prior to the implementation of future assumption changes. The next review of all actuarial assumptions and methods for SERS is scheduled to occur after the June 30, 2018, actuarial valuation.

In **item 4**, the State Actuary comments that "the recertification provided by GRS as a stand-alone document provides insufficient information to support the revised funding amount and should include an exhibit demonstrating how the new values, both amount and percentages of payroll were determined."

In our letter dated July 21, 2017, with subject Actuarial Recertification of Fiscal Year 2018 State Contribution, we comment on page 2, "Also, please see our cost impact statement letter dated July 21, 2017, for additional details on the five year smoothing of contribution rates due to recent changes in actuarial assumptions." We believe this impact statement provides sufficient information to support the revised funding amount and phase-in schedule.

In **item 5**, the State Actuary recommends that "GRS include the stress testing they referenced in their determination that Tier 3 benefits will have an immaterial impact on funding both now and in the future based on the relatively small portion of the active population eligible for electing this plan."

We agree with the State Actuary's recommendation and will provide more documentation and disclosure in future actuarial valuations as experience relating to Tier 3 benefits emerges in subsequent actuarial valuations.



Recommended Additional Disclosures for the 2017 Valuation

In **item 6**, the State Actuary recommends that the actuarial valuation report include a section with stress testing information. Stress testing for SERS is currently being performed. The stress testing analysis includes scenarios with significant market downturn or significant volatility in investment returns, volatility in future active population and volatility in salary growth. Stress testing, if done completely and properly, can provide useful information on the level of statutory contributions and funded position of the System under adverse economic conditions. For example, stochastic modeling could be used to project the funded status and statutory contributions, over 5,000 random investment trials, in order to evaluate the likelihood that the funded ratio or contributions will exceed certain limits.

Our Stress test letter will show the impact to the funded ratio and contributions under the following scenarios:

- Assets earn the 5th percentile return of 2.70 percent on a static basis and alternatively a volatile basis.
- Assets earn the 25th percentile return of 5.20 percent on a static basis and alternatively a volatile basis.
- Wage inflation increases by one percentage point and alternatively wage inflation decreases by one percentage point.
- Active plan membership increases by 1,000 members per year for five years and then remains static.
- Active plan membership decreases by 1,000 members per year for five years and then remains static.

The volatile investment return scenario is based on one random trial that produces the targeted geometric average return over a 28-year period.

The stress test letter will be included in the Appendix of the updated June 30, 2017, actuarial valuation report.

Recommended Changes for Future Valuations

In **item 7**, the State Actuary recommends that SERS annually review the economic assumptions prior to commencing the valuation work, and adjust assumptions accordingly.

We agree with the State Actuary's recommendation and will continue to provide the SERS Board, on an annual basis, with information necessary to evaluate all economic assumptions, prior to commencing the valuation process.

Respectfully submitted,

Gabriel, Roeder, Smith & Company

SIGNED ORIGINAL ON FILE

Alex Rivera, FSA, EA, MAAA, FCA
Senior Consultant

SIGNED ORIGINAL ON FILE

Lance J. Weiss, EA, MAAA, FCA
Senior Consultant

cc: Mr. Ryan Gundersen, Gabriel, Roeder, Smith & Company





December 14, 2017

Mr. Joe Butcher
Office of the Auditor General
740 East Ash Street, First Floor
Springfield, IL 62703

Dear Mr. Butcher,

The management of the Judges' Retirement System (JRS) has reviewed the State Actuary's preliminary report on the draft JRS June 30, 2017 Actuarial Valuation, prepared by Gabriel, Roeder, Smith and Company (GRS). The report notes the State Actuary (Cheiron) believes **"the assumptions and methods used in the draft June 30, 2017 Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable."** In addition, Cheiron found **"the certified contributions, notwithstanding the State funding requirements that do not conform to Actuarial Standards of Practice, were properly calculated in accordance with State law."**

Listed are Cheiron's recommendations and JRS management's responses to those recommendations. In addition, attached are the GRS responses to the recommendations.

Proposed Certification of the Required State Contribution

- 1. Cheiron continues to recommend that the JRS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary.**

Response: The JRS Board of Trustees and management will continue to discuss the need for a full scope actuarial audit. The JRS valuations are reviewed annually by the State Actuary, and the Commission on Government Forecasting and Accountability (CoGFA) prepares a parallel valuation annually using the JRS membership data, assumptions and methodology. Given the annual reviews and parallel valuations, the JRS Board and management will revisit the need for a full scope actuarial audit as part of the development of the FY 19 JRS operations budget.

State Mandated Funding Method

- 2. Cheiron recommends the funding method be changed to at least fully fund future plan benefit accruals to avoid continued systematic underfunding of JRS. Continuing the practice of underfunding future accruals increases the risk of the system becoming**

unsustainable. However, we understand that changing the funding method is under the jurisdiction of State law and not the retirement systems.

Response: The JRS Board of Trustees agrees with Cheiron and has adopted a funding policy that would provide for annual State contributions equal to the projected normal cost of benefits earned in the year plus an amount to amortize the unfunded liabilities over 25 years as a level percent of payroll. This amount is considered the “Actuarially Determined Contribution (ADC) and for informational purposes is included in the annual certifications of the required statutory State contribution.

Conformance to Statutory Funding Changes of Public Act 100-0023

- 3. Cheiron recommends the GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act.**

Response: JRS and GRS will add a disclosure noting the methodology used in the smoothing of assumption changes is based on a level percentage of payroll. For future assumption changes, the smoothing methodology will be discussed. The next review of all actuarial assumptions will occur after the completion of the FY 2018 valuation.

- 4. The recertification provided by GRS as a stand-alone document provides insufficient information to support the revised funding amounts and should include an exhibit demonstrating how the new values, both amounts and percentages of payroll, were determined.**

Response: JRS and GRS have provided additional documentation showing the methodology used in the calculation of the statutorily required FY 2018 recertification.

Recommended Additional Disclosures for 2017 Valuation

- 5. Cheiron recommends that JRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g. membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether there is a potential for unsustainable cost during the statutory funding period. GRS did include stress testing in last year’s final report, but did not include such stress testing in this year’s draft report, just various explanations of the implications of the assumptions not being met. Cheiron recommends that stress testing be added into this year’s report. Because the public may only look to the valuation report for this type of information, they believe it should be contained her instead of any supplemental document to the Board that may potentially be overlooked.**

Response: JRS and GRS will make the recommended changes to the FY 2017 valuation report.

Recommended Changes for Future Valuations

6. **Cheiron recommends the JRS Board continue to annually review the economic assumptions (primarily interest rate and inflation) prior to commencing the valuation work, and adjust assumptions accordingly, as they did for this valuation.**

Response: The Board of Trustees will continue to annually review the economic assumptions in a manner (April or July Board meetings) that will allow adjustments to the assumptions to be included in the next valuation.

Please let me know if you would like to further discuss your recommendations or our responses.

Sincerely,

SIGNED ORIGINAL ON FILE

Timothy B. Blair, Executive Secretary
Judges' Retirement System

December 14, 2017

Board of Trustees
Judges' Retirement System of Illinois
2101 South Veterans Parkway
P.O. Box 19255
Springfield, IL 62794-9255

Re: Response to State Actuary Report of 2017 — JRS

Dear Members of the Board:

At your request we have reviewed the report issued by Cheiron – The State Actuary's Preliminary Report on the Judges' Retirement System of Illinois ("JRS") Pursuant to 30 ILCS 5/2-8. This report was a review of the June 30, 2017, actuarial valuation for JRS.

Assessment of Actuarial Assumptions and Methods Used in the 2017 Valuation

This report issued by the State Actuary, Cheiron, indicates that **"In summary, we believe that the assumptions and methods used in the draft June 30, 2017, Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the State funding requirements that do not conform to Actuarial Standards of Practice, were properly calculated in accordance with State law."**

Page 1 of the transmittal letter of the draft GRS Actuarial Valuation report states:

The System's current contribution rate determined under the statutory funding policy may not conform to the Actuarial Standards of Practice. Therefore, the Board adopted an actuarial funding policy to be used to calculate the Actuarially Determined Contribution ("ADC") under GASB Statement Nos. 67 and 68 for financial reporting purposes.

Although the statutory contribution requirements were met, the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution. Meeting the statutory requirement does not mean that the undersigned agree that adequate actuarial funding has been achieved. We recommend the adherence to a funding policy, such as the Board policy used to calculate the ADC under GASB Statement Nos. 67 and 68, that funds the normal cost of the plan as well as an amortization payment that seeks to pay off any unfunded accrued liability over a closed-period of 25 years.

Proposed Certification of the Required State Contribution

In **item 1**, the State Actuary recommends that the Board have an independent full replication actuarial audit performed.

The type and timing of actuarial audits is a matter of Board policy, and we will leave the response to the Board. For reference, the Government Finance Officers Association (GFOA) recently updated their Best Practice on Actuarial Audits (<http://www.gfoa.org/actuarial-audits>).

State Mandated Funding Method

In **item 2**, the State Actuary recommends that: “the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of JRS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.”

We agree with the State Actuary’s comment on strengthening JRS funding policy. As stated above, a funding policy that finances the normal cost plus the unfunded actuarial liability over a 25-year closed-period would, in our opinion, strengthen the funded status of JRS. However, a change in the funding method and funding policy would require a statutory change.

Conformance to Statutory Funding Changes on Public Act 100-0023

In **item 3**, the State Actuary recommends that “GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result defined in the Act.”

Our interpretation of the statutory funding changes provided in Public Act 100-0023, is to determine the cost impact on the State contribution rate due to the changes in actuarial assumptions as a percentage of payroll and phase-in this amount in equal annual increments over a five-year period. We believe this method is a reasonable interpretation of the language contained in Public Act 100-0023; however, other interpretations could also be reasonable. The smoothing methodology will be reviewed prior to the implementation of future assumption changes. The next review of all actuarial assumptions and methods for JRS is scheduled to occur after the June 30, 2018, actuarial valuation.

In **item 4**, the State Actuary comments that “the recertification provided by GRS as a stand-alone document provides insufficient information to support the revised funding amount and should include an exhibit demonstrating how the new values, both amount and percentages of payroll were determined.”

In our letter dated July 21, 2017, with subject Actuarial Recertification of Fiscal Year 2018 State Contribution, we comment on page 2, “Also, please see our cost impact statement letter dated July 21, 2017, for additional details on the five year smoothing of contribution rates due to recent changes in actuarial assumptions.” We believe this impact statement provides sufficient information to support the revised funding amount and phase-in schedule.

Recommended Additional Disclosures for the 2017 Valuation

In **item 5**, the State Actuary recommends that the actuarial valuation report include a section with stress testing information. Stress testing for JRS is currently being performed. The stress testing analysis includes scenarios with significant market downturn or significant volatility in investment returns and volatility in future System participation. Stress testing, if done completely and properly, can provide useful information on the



level of statutory contributions and funded position of the System under adverse economic conditions. For example, stochastic modeling could be used to project the funded status and statutory contributions, over 5,000 random investment trials, in order to evaluate the likelihood that the funded ratio or contributions will exceed certain limits.

Our Stress test letter will show the impact to the funded ratio and contributions under the following scenarios:

- Assets earn the 5th percentile return of 2.70 percent on a static basis and alternatively a volatile basis.
- Assets earn the 25th percentile return of 5.20 percent on a static basis and alternatively a volatile basis.
- Wage inflation increases by one percentage point and alternatively, wage inflation decreases by one percentage point.

The volatile investment return scenario is based on one random trial that produces the targeted geometric average return over a 28-year period.

The stress test letter will be included in the Appendix of the updated June 30, 2017, actuarial valuation report.

Recommended Changes for Future Valuations

In **item 6**, the State Actuary recommends that JRS annually review the economic assumptions prior to commencing the valuation work, and adjust assumptions accordingly.

We agree with the State Actuary's recommendation and will continue to provide the JRS Board, on an annual basis, with information necessary to evaluate all economic assumptions, prior to commencing the valuation process.

Respectfully submitted,

Gabriel, Roeder, Smith & Company

SIGNED ORIGINAL ON FILE

Alex Rivera, FSA, EA, MAAA, FCA
Senior Consultant

SIGNED ORIGINAL ON FILE

Lance J. Weiss, EA, MAAA, FCA
Senior Consultant

cc: Mr. Ryan Gundersen, Gabriel, Roeder, Smith & Company





December 14, 2017

Mr. Joe Butcher
Office of the Auditor General
740 East Ash Street, First Floor
Springfield, IL 62703

Dear Mr. Butcher,

The management of the General Assembly Retirement System (GARS) has reviewed the State Actuary's preliminary report on the draft GARS June 30, 2017 Actuarial Valuation, prepared by Gabriel, Roeder, Smith and Company (GRS). The report notes the State Actuary (Cheiron) believes **"the assumptions and methods used in the draft June 30, 2017 Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable."** In addition, Cheiron found **"the certified contributions, notwithstanding the State funding requirements that do not conform to Actuarial Standards of Practice, were properly calculated in accordance with State law."**

Listed are Cheiron's recommendations and GARS management's responses to those recommendations. In addition, attached are the GRS responses to the recommendations.

Proposed Certification of the Required State Contribution

- 1. Cheiron continues to recommend that the GARS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary.**

Response: The GARS Board of Trustees and management will continue to discuss the need for a full scope actuarial audit. The GARS valuations are reviewed annually by the State Actuary, and the Commission on Government Forecasting and Accountability (CoGFA) prepares a parallel valuation annually using the GARS membership data, assumptions and methodology. Given the annual reviews and parallel valuations, the GRS Board and management will revisit the need for a full scope actuarial audit as part of the development of the FY 19 GARS operations budget.

State Mandated Funding Method

- 2. Cheiron recommends the funding method be changed to at least fully fund future plan benefit accruals to avoid continued systematic underfunding of GARS. Continuing the practice of underfunding future accruals increases the risk of the system becoming**

unsustainable. However, we understand that changing the funding method is under the jurisdiction of State law and not the retirement systems.

Response: The GARS Board of Trustees agrees with Cheiron and has adopted a funding policy that would provide for annual State contributions equal to the projected normal cost of benefits earned in the year plus an amount to amortize the unfunded liabilities over 20 years as a level percent of payroll. This amount is considered the “Actuarially Determined Contribution (ADC) and for informational purposes is included in the annual certifications of the required statutory State contribution.

Conformance to Statutory Funding Changes of Public Act 100-0023

- 3. Cheiron recommends the GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result as defined in the Act.**

Response: GARS and GRS will add a disclosure noting the methodology used in the smoothing of assumption changes is based on a level percentage of payroll. For future assumption changes, the smoothing methodology will be discussed. The next review of all actuarial assumptions will occur after the completion of the FY 2018 valuation.

- 4. The recertification provided by GRS as a stand-alone document provides insufficient information to support the revised funding amounts and should include an exhibit demonstrating how the new values, both amounts and percentages of payroll, were determined.**

Response: GARS and GRS have provided additional documentation showing the methodology used in the calculation of the statutorily required FY 2018 recertification.

Recommended Additional Disclosures for 2017 Valuation

- 5. Cheiron recommends that GARS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g. membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether there is a potential for unsustainable cost during the statutory funding period. GRS did include stress testing in last year’s final report, but did not include such stress testing in this year’s draft report, just various explanations of the implications of the assumptions not being met. Cheiron recommends that stress testing be added into this year’s report. Because the public may only look to the valuation report for this type of information, they believe it should be contained her instead of any supplemental document to the Board that may potentially be overlooked.**

Response: GARS and GRS will make the recommended changes to the FY 2017 valuation report.

Recommended Changes for Future Valuations

6. **Cheiron recommends the GARS Board continue to annually review the economic assumptions (primarily interest rate and inflation) prior to commencing the valuation work, and adjust assumptions accordingly, as they did for this valuation.**

Response: The Board of Trustees will continue to annually review the economic assumptions in a manner (April or July Board meetings) that will allow adjustments to the assumptions to be included in the next valuation.

Please let me know if you would like to further discuss your recommendations or our responses.

Sincerely,

SIGNED ORIGINAL ON FILE

Timothy B. Blair, Executive Secretary
General Assembly Retirement System



December 14, 2017

Board of Trustees
General Assembly Retirement System of Illinois
2101 South Veterans Parkway
P.O. Box 19255
Springfield, IL 62794-9255

Re: Response to State Actuary Report of 2017 — GARS

Dear Members of the Board:

At your request we have reviewed the report issued by Cheiron – The State Actuary’s Preliminary Report on the General Assembly Retirement System of Illinois (“GARS”) Pursuant to 30 ILCS 5/2-8. This report was a review of the June 30, 2017, actuarial valuation for GARS.

Assessment of Actuarial Assumptions and Methods Used in the 2017 Valuation

This report issued by the State Actuary, Cheiron, indicates that **“In summary, we believe that the assumptions and methods used in the draft June 30, 2017, Actuarial Valuation, which are used to determine the required Fiscal Year 2019 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the State funding requirements that do not conform to Actuarial Standards of Practice, were properly calculated in accordance with State law.”**

Page 1 of the transmittal letter of the draft GRS Actuarial Valuation report states:

The System’s current contribution rate determined under the statutory funding policy may not conform to the Actuarial Standards of Practice. Therefore, the Board adopted an actuarial funding policy to be used to calculate the Actuarially Determined Contribution (“ADC”) under GASB Statement Nos. 67 and 68 for financial reporting purposes.

Although the statutory contribution requirements were met, the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution. Meeting the statutory requirement does not mean that the undersigned agree that adequate actuarial funding has been achieved. We recommend the adherence to a funding policy, such as the Board policy used to calculate the ADC under GASB Statement Nos. 67 and 68, that funds the normal cost of the plan as well as an amortization payment that seeks to pay off any unfunded accrued liability over a closed-period of 20 years.

Proposed Certification of the Required State Contribution

In **item 1**, the State Actuary recommends that the Board have an independent full replication actuarial audit performed.

The type and timing of actuarial audits is a matter of Board policy, and we will leave the response to the Board. For reference, the Government Finance Officers Association (GFOA) recently updated their Best Practice on Actuarial Audits (<http://www.gfoa.org/actuarial-audits>).

State Mandated Funding Method

In **item 2**, the State Actuary recommends that: “the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of GARS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.”

We agree with the State Actuary’s comment on strengthening GARS funding policy. As stated above, a funding policy that finances the normal cost plus the unfunded actuarial liability over a 20-year closed-period would, in our opinion, strengthen the funded status of GARS. However, a change in the funding method and funding policy would require a statutory change.

Conformance to Statutory Funding Changes on Public Act 100-0023

In **item 3**, the State Actuary recommends that “GRS review the way they have phased-in the prior assumption changes or demonstrate with additional disclosures that the method produces the appropriate result defined in the Act.”

Our interpretation of the statutory funding changes provided in Public Act 100-0023, is to determine the cost impact on the State contribution rate due to the changes in actuarial assumptions as a percentage of payroll and phase-in this amount in equal annual increments over a five-year period. We believe this method is a reasonable interpretation of the language contained in Public Act 100-0023; however, other interpretations could also be reasonable. The smoothing methodology will be reviewed prior to the implementation of future assumption changes. The next review of all actuarial assumptions and methods for GARS is scheduled to occur after the June 30, 2018, actuarial valuation.

In **item 4**, the State Actuary comments that “the recertification provided by GRS as a stand-alone document provides insufficient information to support the revised funding amount and should include an exhibit demonstrating how the new values, both amount and percentages of payroll were determined.”

In our letter dated August 1, 2017, with subject Actuarial Recertification of Fiscal Year 2018 State Contribution, we comment on page 2, “Also, please see our cost impact statement letter dated August 1, 2017, for additional details on the five year smoothing of contribution rates due to recent changes in actuarial assumptions.” We believe this impact statement provides sufficient information to support the revised funding amount and phase-in schedule.

Recommended Additional Disclosures for the 2017 Valuation

In **item 5**, the State Actuary recommends that the actuarial valuation report include a section with stress testing information. Stress testing for GARS is currently being performed. The stress testing analysis includes scenarios with significant market downturn or significant volatility in investment returns and volatility in future System participation. Stress testing, if done completely and properly, can provide useful information on the



level of statutory contributions and funded position of the System under adverse economic conditions. For example, stochastic modeling could be used to project the funded status and statutory contributions, over 5,000 random investment trials, in order to evaluate the likelihood that the funded ratio or contributions will exceed certain limits.

Our Stress test letter will show the impact to the funded ratio and contributions under the following scenarios:

- Assets earn the 5th percentile return of 2.70 percent on a static basis and alternatively a volatile basis.
- Assets earn the 25th percentile return of 5.20 percent on a static basis and alternatively a volatile basis.
- 75 percent of future active members opt-out of System participation.
- 100 percent of future active members opt-out of System participation (Closed System).

The volatile investment return scenario is based on one random trial that produces the targeted geometric average return over a 28-year period.

The stress test letter will be included in the Appendix of the updated June 30, 2017, actuarial valuation report.

Recommended Changes for Future Valuations

In **item 6**, the State Actuary recommends that GARS annually review the economic assumptions prior to commencing the valuation work, and adjust assumptions accordingly.

We agree with the State Actuary's recommendation and will continue to provide the GARS Board, on an annual basis, with information necessary to evaluate all economic assumptions, prior to commencing the valuation process.

Respectfully submitted,

Gabriel, Roeder, Smith & Company

SIGNED ORIGINAL ON FILE

Alex Rivera, FSA, EA, MAAA, FCA
Senior Consultant

SIGNED ORIGINAL ON FILE

Lance J. Weiss, EA, MAAA, FCA
Senior Consultant

cc: Mr. Ryan Gundersen, Gabriel, Roeder, Smith & Company





December 19, 2017

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Mr. Gene Kalwarski
Principal Consulting Actuary
Cheiron, Inc.
200 West Monroe Street, Suite 1800
Chicago, Illinois 60606

Mr. Mike Noble
Principal Consulting Actuary
Cheiron, Inc.
200 West Monroe Street, Suite 1800
Chicago, Illinois 60606

RE: Response to the State Actuary's Draft Preliminary Report on the Public School Teachers' Pension and Retirement Fund (the "Fund") of Chicago Pursuant to Illinois Public Act 100-0465 Regarding Gabriel, Roeder, Smith & Company's Draft June 30, 2017 Actuarial Valuation

This letter serves as the response of the Public School Teachers' Pension and Retirement Fund of Chicago ("CTPF" or the "Fund") to the State Actuary's Draft "Preliminary Report on the Public School Teachers' Pension and Retirement Fund of Chicago Pursuant to Illinois Public Act 100-0465 Regarding Gabriel, Roeder, Smith & Company's Draft June 30, 2017 Actuarial Valuation." CTPF's Board of Trustees accepted the State Actuary's four (4) draft recommendations at its December 14, 2017 Regular Board Meeting.

In further response to the State Actuary's draft recommendations, CTPF states as follows:

Recommendation #1:

That CTPF's investment assumption be lowered to a rate no higher than 7.25% for this June 30, 2017 valuation.

CTPF's Further Response to Recommendation #1:

CTPF accepts the State Actuary's recommendation as amongst the reasonable,

actuarial options. However, CTPF notes the following additional facts: At CTPF's October 19, 2017 Regular Board Meeting, CTPF's new actuary, GRS, recommended that CTPF reduce its actuarial investment assumption from 7.75% to 7.25%. As reflected in the Board's records of the October meeting, the CTPF Board supported a reduction in the investment assumption but noted that a one-step 0.5% reduction in the year before the Fund's scheduled 2018 experience study and economic review was premature. After consideration of various economic, investment return, and actuarial factors, the Board accepted GRS's recommendation, in part, reducing the actuarial investment assumption from 7.75% to 7.5%, but pledged to make an additional reduction in the investment assumption in 2019. GRS found this assumption and approach to be reasonable.

While CTPF's Board stands by the reasonableness of its original rate reduction, CTPF's Board accepts the State Actuary's recommendation as amongst the other, reasonable actuarial options and will continue to annually review the economic assumptions that are unique to CTPF and that differentiate CTPF from the statewide pension systems. The Board voted at its December 14, 2017, meeting to reduce further the assumption to 7.25% and to lower the general inflation assumption to 2.5% and the wage inflation assumption to 3.25% for the June 30, 2017 Valuation.

Recommendation #3:

We recommend that GRS formally provide more details as to why in the September 2017 Economic Assumption Review, GRS relied on the capital market forecasts of the four investment consultants identified in its September 2017 report to the Board after relying on additional consultants for earlier GRS reviews of statewide pension systems.

Further Response to Recommendation #3:

CTPF accepts the State Actuary's draft recommendation. Please see GRS's explanation in the attached December 6, 2017 letter from GRS to CTPF. As can be seen in GRS's explanation, to the extent the use of investment consultants for unrelated pension systems for previous years is germane to any independent, actuarial analysis of CTPF, GRS relied on the four investment consultants that it did for CTPF since, unlike the 2016 assumptions for other systems, the 2017 projections from the four investment consultants were the only long-term projections available. The projected actuarial rate of return is best measured in the long-term.

Please note, for your future consideration, CTPF and GRS would be happy to answer questions like those in draft recommendation #3 prior to the issuance of a draft report.

If you have any questions, please do not hesitate to contact me at 312-604-1402.

Best regards,

SIGNED ORIGINAL ON FILE

Charles A. Burbridge
Executive Director

Enclosure

Cc: (with enclosure)

Jay Rehak – CTPF, Board President
Gregory Redfeairn – CTPF, Chair, Finance & Audit Committee
Lance Weiss – GRS, CTPF Actuary
Mary Cavallaro – CTPF, Deputy Executive Director
Alise White – CTPF, Chief Financial Officer
John Schomberg – CTPF, Chief Legal Officer
Saron Tegegne – CTPF, Director of Finance

December 6, 2017

Board of Trustees
Public School Teachers' Pension and Retirement Fund of Chicago
203 North LaSalle Street, Suite 2600
Chicago, Illinois 60601

Re: Response to 2017 State Actuary Preliminary Report

Dear Members of the Board:

At your request we have reviewed the report issued by Cheiron dated December 1, 2017 – The State Actuary's Preliminary Report on the Public School Teachers' Pension and Retirement Fund of Chicago ("CTPF") Pursuant to Public Act 100-0465. This report was a review of the June 30, 2017, actuarial valuation prepared by GRS Retirement Consulting ("GRS").

Assessment of Actuarial Assumptions Used in the 2017 Valuation

Cheiron had the following two recommendations for assumption changes:

1. We recommend that the investment assumption be lowered to a rate no higher than 7.25% for this June 30, 2017 valuation. **(Recommendation #1)**
2. Since the general inflation assumption was lowered to 2.50%, we recommend that the wage inflation assumption be lowered from 3.50% to 3.25%. **(Recommendation #2)**

GRS believes that these recommendations are reasonable and, if the Board chooses to make such changes, is prepared to implement these assumption changes.

Recommended Additional Disclosures for the 2017 Valuation

Cheiron had the following recommendation for additional disclosures:

3. We recommend that GRS disclose why in the September 2017 Economic Assumption Review, GRS relied on the capital market forecasts of the four specific investment consultants identified in their September 2017 report to the Board. **(Recommendation #3)**

The economic assumption review that GRS performed for the CTPF was based on information GRS collected from investment consultants during 2017. The experience analysis we performed for the other clients Cheiron mentions were all performed based on information we collected from investment consultants during 2016. GRS annually updates our survey of investment consultants and adds or removes consultants based on the availability of their data for the current year. The difference in the underlying information we collected from investment consultants in 2017 between expected returns for longer term horizons versus those for shorter term horizons was so great that we decided to only use the data from the four investment consultants who supplied us with expected returns for longer term horizons. (The difference in expected returns based on the time horizons of the consultants was not as great in 2016.) Because the investment return used in an actuarial valuation is meant to be a long-term assumption, we believe it is appropriate to use return expectations that are consistent with the assumption we are reviewing.

Recommended Changes for Future Valuations

Cheiron had the following recommendation for future valuations:

4. We recommend the CTPF Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.
(Recommendation #4)

GRS and the Board reviewed the economic assumptions prior to the June 30, 2017, actuarial valuation. GRS and the Board will continue to annually review the economic assumptions prior to commencing the actuarial valuation work.

Sincerely,

SIGNED ORIGINAL ON FILE

Lance J. Weiss, EA, MAAA, FCA
Senior Consultant and Team Leader

SIGNED ORIGINAL ON FILE

Amy Williams, ASA, MAAA, FCA
Consultant

AW:kb

cc: David Kausch, Gabriel, Roeder, Smith & Company
Ryan Gundersen, Gabriel, Roeder, Smith & Company



