



STATE OF ILLINOIS

OFFICE OF THE AUDITOR GENERAL

STATE ACTUARY'S REPORT

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

DECEMBER 2016

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 2016 report on the actuarial assumptions and valuations of the five 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. 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 2016

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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. This 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 difference between the actuarial accrued 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.

Cheiron reviewed the actuarial assumptions used in each of the five systems' actuarial valuations for the year ended June 30, 2016 and **concluded that they generally were reasonable. Cheiron did not recommend any changes to the assumptions used in the June 30, 2016 actuarial valuations.**

Cheiron made recommendations for additional disclosures for the 2016 valuations and recommended changes for future valuations. Recommendations included the following:

- The Boards 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. Two of the systems (TRS and SURS) implemented this recommendation.
- 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.
- For one of the systems (SURS), Cheiron recommended the Board consider lowering the interest rate assumption next year and develop the rate taking into account the negative cash flow of the system. The other four systems lowered the interest rate assumption for this year's actuarial valuation.

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.

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 acceptable 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' 2016 actuarial valuation reports, the funded ratio of the retirement systems ranged from 43.3 percent (SURS) to 14.0 percent (GARS), based on the actuarial value of assets as a ratio over 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. This would 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.

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 five State-funded retirement systems. The five State-funded retirement systems are:

- 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.

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 five systems' actuarial valuations for the year ended June 30, 2016 and **concluded that they generally were reasonable. Cheiron did not recommend any changes to the assumptions used in the June 30, 2016 actuarial valuations.**

Cheiron did recommend additional disclosures for the 2016 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 2015 report. This year's report contains 25 recommendations compared to 46 recommendations made in last year's report.

| Exhibit 1-1 RECOMMENDATIONS TO THE RETIREMENT SYSTEMS | | | | | |
|--|-----|------|------|-----|------|
| Recommendations | TRS | SURS | SERS | JRS | GARS |
| Recommended Changes to Actuarial Assumptions used in the 2016 Actuarial Valuations: | | | | | |
| Cheiron reviewed the actuarial assumptions and concluded that they were reasonable. Consequently, Cheiron did not have any recommended changes to assumptions this year. | | | | | |
| Recommended Additional Disclosures for the 2016 Actuarial Valuations: | | | | | |
| • Expand/include stress testing of the System within the valuation report | X | X | X | X | 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 |
| • Evaluate the implications of the one year delay in data used for the valuation to substantiate if it is immaterial | X | | | | |
| • Consider lowering the interest rate next year and develop the rate taking into account negative cash flow | | X | | | |
| • For the Boards of the three systems whose assets are commingled, consider whether different interest rate assumptions for these systems are appropriate | | | X | X | X |
| • Include an additional disclosure on how the 10% load on inactive vested liabilities was developed | | | | X | 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 at least fully fund future plan benefit accruals to avoid continued systematic underfunding of the system | X | X | X | X | X |
| Source: OAG summary of Cheiron's preliminary reports to the five State-funded 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 five systems, found in Chapters Two through Six of this report.

Economic Assumptions

Cheiron reviewed the economic assumptions utilized in the actuarial valuations for each of the five State-funded 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 five State-funded retirement systems. As can be seen in the exhibit, the interest rate assumption was **lowered by four of the five systems in this year’s actuarial valuations**. 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 2016 actuarial valuations.

| Exhibit 1-2 INTEREST RATE ASSUMPTIONS FOR THE FIVE STATE-FUNDED RETIREMENT SYSTEMS June 30, 2016 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 |
| Source: Retirement system actuarial reports. | | |

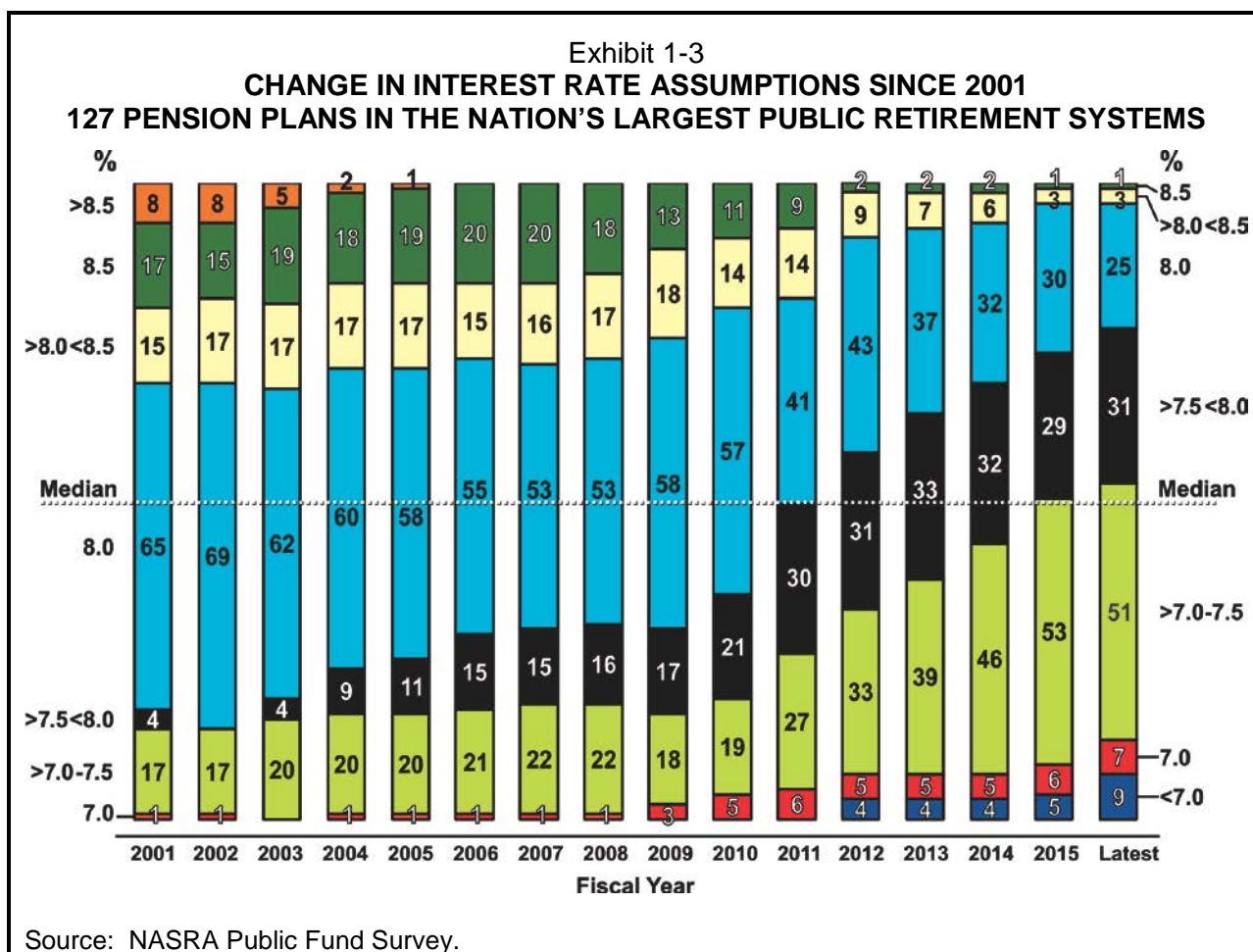
After reviewing all of the materials that were made available, Cheiron concluded that the interest rate assumptions were reasonable. However, for SURS, Cheiron recommended the Board consider lowering the interest rate next year and develop the rate taking into account the negative cash flow at SURS and the anticipated future interest rate environment.

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 GARS are experiencing negative cash flows while SERS and JRS 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 percent or higher. The most recent data, which includes results collected through September 2016, shows that this number has dropped to only 29 of 127 plans (23%) that use an interest rate of 8.0 percent or higher. The median assumption has fallen to 7.5 percent. Since Fiscal Year 2011, 83 of the 127 plans have reduced the interest rate assumption with an average reduction of 0.42 percent. In addition, 16 plans have adopted a rate of 7.0 percent or lower.

Inflation Assumption

The inflation assumption primarily impacts the salary increase assumption. The five State-funded retirement systems use inflation assumptions ranging from 2.50 percent to 2.75 percent. Exhibit 1-4 shows the inflation assumptions for each of the five systems. As with the interest rate assumption, four of the five systems lowered the inflation assumption for this year's valuation.

| Exhibit 1-4 INFLATION ASSUMPTIONS FOR THE FIVE STATE-FUNDED RETIREMENT SYSTEMS June 30, 2016 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 |
| Source: Retirement system actuarial reports and experience studies. | | |

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

- The June 2016 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%.
- Cheiron’s comparison of other public sector retirement systems’ inflation assumptions as shown by a study published by the National Conference on Public Employee Retirement Systems (NCPERS). The study shows that the 2.50% assumption used by TRS and the 2.75% assumption used by four of the State-funded systems is on the lower end of inflation assumptions. The average rate amongst the 179 systems who responded to the study was 3.2%.

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 five systems. Cheiron collected data from past valuation reports dating back to 2010 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 Six. 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 five State-funded retirement systems.

PROPOSED CERTIFICATION OF REQUIRED STATE CONTRIBUTION

As required by Public Act 097-0694, each of the five State-funded 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 2018.

| Exhibit 1-5 AMOUNTS OF STATUTORILY REQUIRED STATE CONTRIBUTIONS | |
|--|--|
| System | State Contribution (for Fiscal Year 2018) |
| Teachers’ Retirement System | \$ 4,564,952,674 |
| State Universities Retirement System | 1,753,685,000 |
| State Employees’ Retirement System | 2,327,649,000 |
| Judges’ Retirement System | 146,766,000 |
| General Assembly Retirement System | 26,679,000 |
| Total | \$8,819,731,674 |

Source: 2016 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. During the last year, two of the systems (TRS and SURS) complied with this recommendation.

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.

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 10.

Funding Method

All of the five State-funded 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 in the actuarial value of assets. 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 five 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 Code 26 U.S.C. §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

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, 2016 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, 2016 Actuarial Valuation Report, SURS’ actuary comments that the Statutory funding method generates a contribution that is less than a reasonable actuarially determined contribution. They recommend 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 28 years to attain 100 percent funding by 2045.
- In the June 30, 2016 actuarial valuations for SERS, GARS, and JRS, the actuary advises “strengthening the current statutory funding policy” and provides the following examples:
 - Increasing the 90 percent funding target to 100 percent;
 - Reducing the projection period needed to reach the funding target;
 - Separating the financing of benefits for members hired before and after December 31, 2010; and
 - Changing to an Actuarial Determined Contribution based funding approach with an appropriate amortization policy for each respective tiered benefit structure.

Cheiron concurred with recommendations of the systems’ actuaries. Cheiron concluded that the Pension Code funding method does not meet generally acceptable actuarial principles because the systems are not targeted to be funded to 100 percent and the funding of the System 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. Continuing the practice of underfunding future accruals increases the risk of the systems becoming unsustainable.

Based on the systems’ 2016 actuarial valuation reports, the funded ratio of the systems ranged from 43.3 percent (SURS) to 14.0 percent (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.

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 that is the report that most stakeholders of the plans look to for assessing the plans’ financial conditions. Supplemental reports may not be publicly identified and therefore not readily accessible.

RESPONSES TO THE RECOMMENDATIONS

Each of the five State-funded 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 2, 2016. The preliminary report was based on Cheiron's review of actuarial assumptions included in TRS' 2016 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the Teachers' Retirement System. TRS' written response, provided on December 8, 2016, can be found in Appendix C.

December 15, 2016

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 Ladies and Gentlemen:

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 2018.

In summary, we believe that the assumptions and methods used in the draft June 30, 2016 Actuarial Valuation, which are used to determine the required Fiscal Year 2018 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 2018. 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, 2016 Actuarial Valuation.

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, summarized census data, the draft June 30, 2016 Actuarial Valuation, minutes of the 2016 TRS Board of Trustee meetings, Segal's investment assumption presentation of August 2016, 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 the body of our report as 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

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

SIGNED ORIGINAL ON FILE

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

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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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) 2018. The purpose of this review is to identify any recommended changes to the actuarial assumptions and methods for the TRS Board to consider before Segal, the TRS actuary, finalizes its certification of the required State contributions to TRS for FY 2018.

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, 2016 Actuarial Valuation prepared by Segal, minutes of the 2016 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, 2016 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, 2016 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 2018 required State contribution calculated under the current statutory funding plan is \$4,564,952,674. 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 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. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Assessment of Actuarial Assumptions Used in the 2016 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 and Segal’s recommendation for the reduction of the investment assumption to 7.0% as adopted by the Board following their August 2016 presentation and believe the response to reasonably reflect the arguments demonstrated in support of the assumption change. Therefore, we conclude that all the actuarial assumptions used in the draft June 30, 2016 Actuarial Valuation are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2016 Valuation

2. 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.

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SECTION II - SUMMARY OF RECOMMENDATIONS

Recommended Changes for Future Valuations

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.
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.

GASB 67 and 68

The 2016 TRS GASB 67 and 68 information was provided in the 2016 Valuation. We find that the assumptions and methods used to prepare the 2016 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, have reviewed the assumptions on which it is based, and have 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.

Given the change in actuary this year and the representation that Segal performed a replication of the prior valuation resulting in a net difference in results of 0.8% from the prior actuary, we believe that this represents a reasonable audit of the TRS Plan and should be sufficient to meet our recommendation from last year for a full replication audit.

State Mandated Methods

State Mandated Funding Method:

The Illinois Pension Code (40 ILCS 5/16-158) is limited in meeting the risks of 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 acceptable 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, on-going benefits being 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 at least fully fund future plan benefit accruals to avoid continued 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, 2016 Actuarial Valuation on pages 2 and 3 Segal comments that the statutory funding method calls for contributions in fiscal 2016 that are insufficient to reduce the unfunded actuarial accrued liability. In the same report throughout pages 6 through 13 Segal also

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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 \$6,876,283,032 for FY 2018. We concur with Segal's recommendations 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.

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 new 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. So 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 the 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 proposed 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.

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Based on the draft June 30, 2016 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 39.8% representing a further decline from last year's value of 42.0%. 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 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 #2). 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.

Assessment of Actuarial Assumptions Used in the 2016 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 draft 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. We reviewed the presentation material 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.

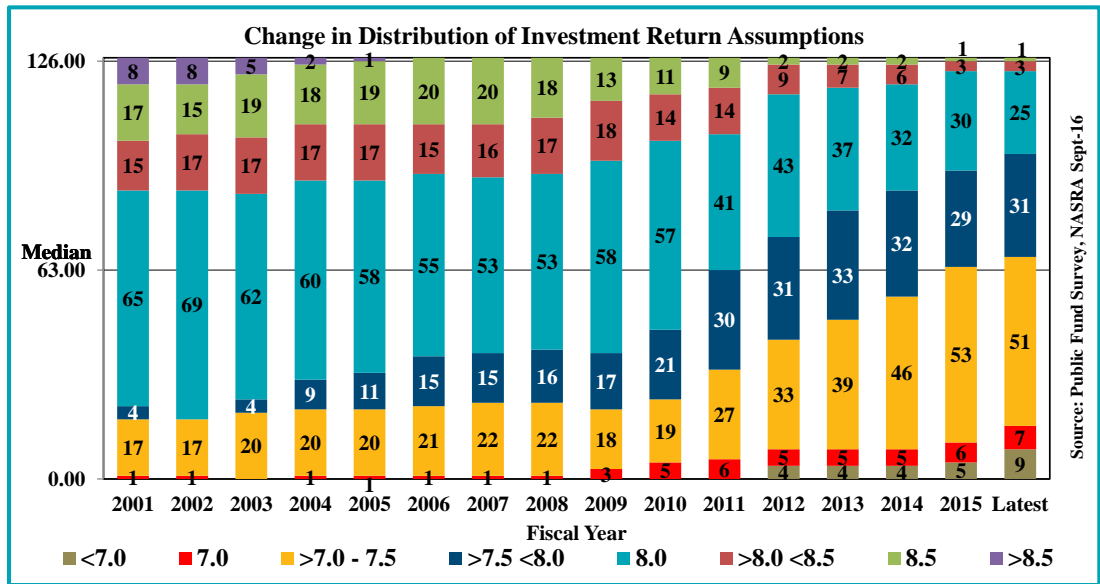
We recommend that the TRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly (Recommendation #3).

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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 last 15 years of its survey. The latest data includes results collected through September 2016.



Over the period shown in the latest survey, there continues to be a pattern of reducing investment return assumptions. Eighty-three of the 127 plans have reduced the interest rate assumption since Fiscal Year 2011. For these 83 plans, the average reduction is 0.42%. The survey is consistent with the experience of other Cheiron clients with which there has been a significant trend to reduce the 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 16, 2016 these yields are now 2.22%. 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

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yields (“risk free” rates), whereas today a system would have to earn 4.78% 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 on the equity side of the assets in order to compensate for both declining bond returns and the need to earn 4.78% above the risk free rates 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 2.6% 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 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 “time weighted” returns.
- New GASB 67 and 68 pronouncements require many public pension plans, such as TRS, 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 (Pension Protection Act of 2006 p. 14. IRC §430(h)(2)(B)).

2. *Inflation Assumption:*

We find the inflation assumption reduction this year from 3.00% to 2.50% , which primarily impacts the salary increase assumption used in the draft June 30, 2016 Actuarial Valuation by Segal in certifying the required State contribution, is reasonable in conjunction with the interest rate assumption change.

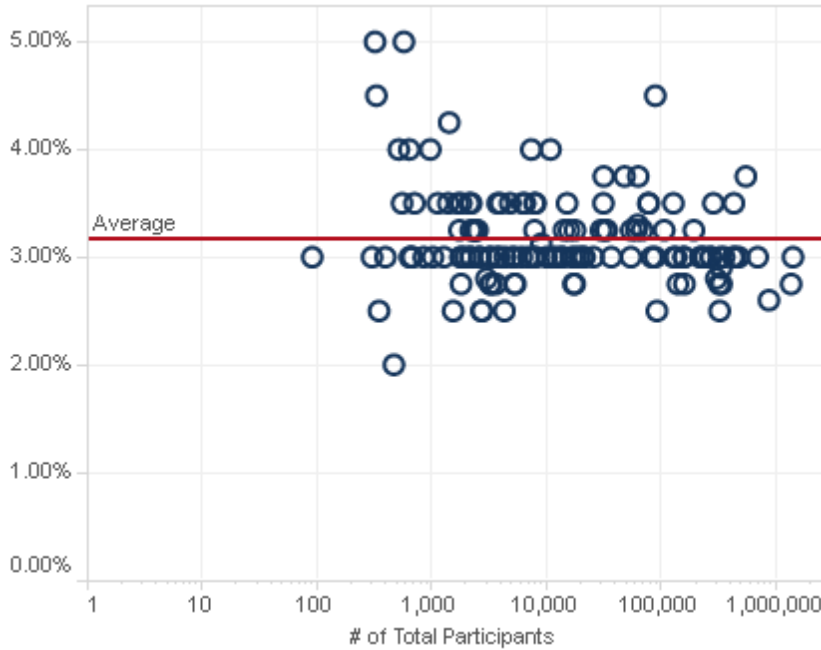
Our rationale for concurring with the 2.50% assumption:

- The June 2016 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/2016/tr2016.pdf>). Under the intermediate cost projection the Social Security Administration uses an assumption of 2.70%.

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- The *National Conference on Public Employee Retirement Systems* (NCPERS) November 2015 study provides the following graphic of respondents' inflation assumptions:



Source: NCPERS Public Retirement System Study – November 2015

This shows that the 2.50% assumption, which TRS uses, is on the lower end of the inflation assumptions used among the 179 systems who responded to this study, with 3.2% as the average.

3. *Salary (Annual Compensation) Increase Assumption:*

For the draft June 30, 2016 Actuarial Valuation, the individual salary increase assumption was lowered by 0.50% in coordination with the inflation rate reduction which is reasonable.

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

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

- The June 2016 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (between 2026 and 2090) real wage differential will average somewhere between 0.59% and 1.83%.
- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a consistent recent trend of declining 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%. With the reduction of the inflation assumption to 2.50% in 2016, the assumption for COLAs was decreased from 1.40% 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 1.40% to 1.25%.

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

B. Demographic Assumptions

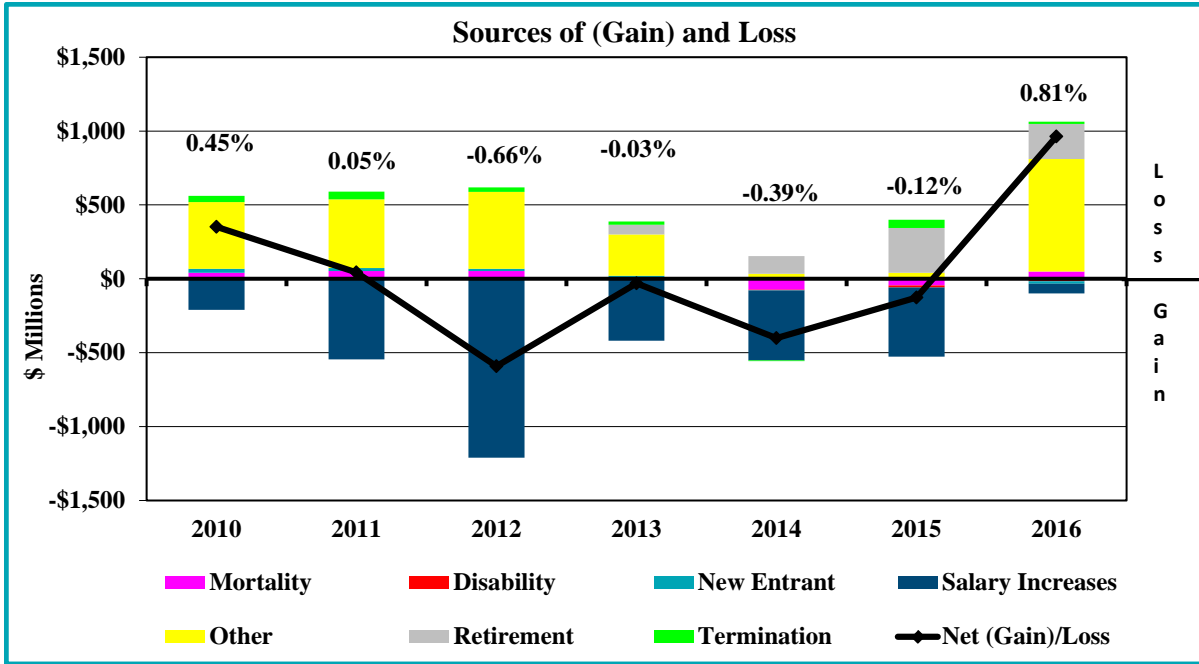
All demographic assumptions were reviewed with appropriate assumption changes adopted by the Board last year. Segal has not identified any changes to these assumptions and there is no additional evidence to support a change from those assumptions adopted last year.

In its annual actuarial valuation reports, TRS regularly reports sources of liability gains and losses. In the 2016 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 2010 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 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, and below zero represents an 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.

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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 draft June 30, 2016 Actuarial Valuation, a number of the consistent trends over this time period have been addressed.

Data Reconciliation:

The draft June 30, 2016 Actuarial Valuation includes a breakdown of gains and losses including those attributable to demographic changes made in the assumptions resulting from the experience analysis. We found this helpful in reconciling the changes in the unfunded liability from 2015 to 2016.

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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 | Under 5 Years of Service | | 5 or More Years of Service | |
|------------|---------------------------------|---------------|-----------------------------------|---------------|
| | 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 50-77, 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;

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- b. No additional service purchases will be assumed for members who currently have optional service credit;
- 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.

The liability covered by future member payments is not included in the liability on the valuation date, but is brought into projected liabilities as those payments are brought into the assets.

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

\$23,594,987 of administrative expenses is expected to be paid for the year beginning July 1, 2016. \$26,549,011 of administrative expenses is expected to be paid for the year beginning July 1, 2017 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-

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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 will be 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 #4). The implications of the use of the prior year's data brought forward to represent the current year's 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 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. 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 that the fluctuations in the actuarial value of assets will be less volatile over time than fluctuations in the market value of assets. **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, or no less than 80% of market value. In fact, the Internal Revenue Service (IRS) IRC §430(g)(3)(B)(iii) mandates this "corridor" for private sector pension

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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.”

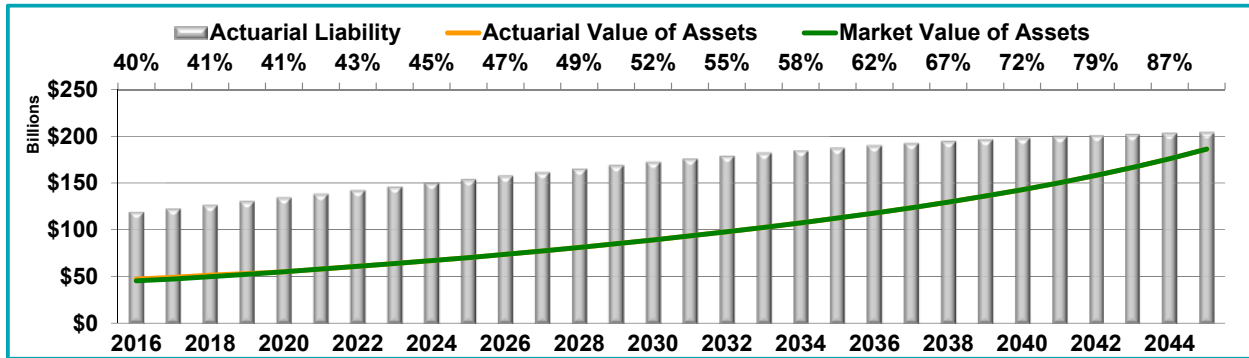
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SECTION IV - PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2016 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 contribution requirement performed by the State Actuary to verify that the System's 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, 2016 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 2030, the funding ratio is approximately 52% with assets being approximately \$89 billion and liabilities being approximately \$172 billion.

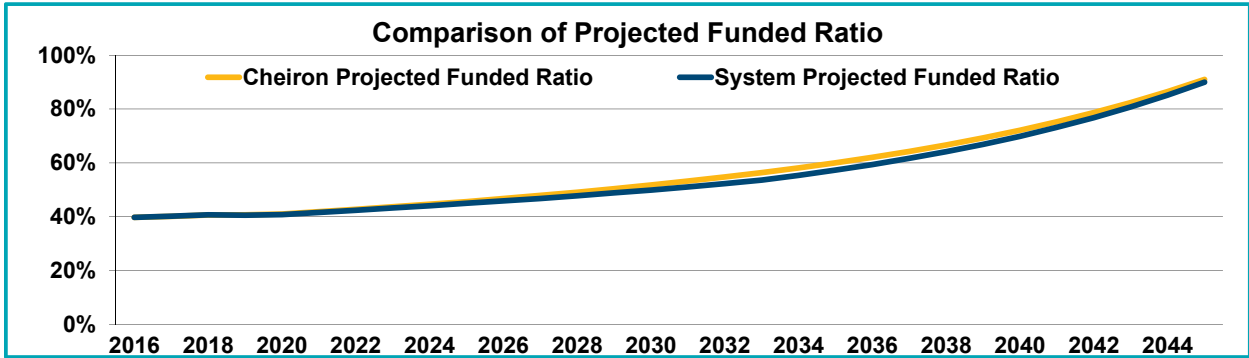


Source: Cheiron projection analysis.

When we compare our projected funding ratio against the results shown in the draft June 30, 2016 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 as expected by Cheiron's approximation. The draft June 30, 2016 Actuarial Valuation shows slightly lower funded ratios due to differences in projection methods.

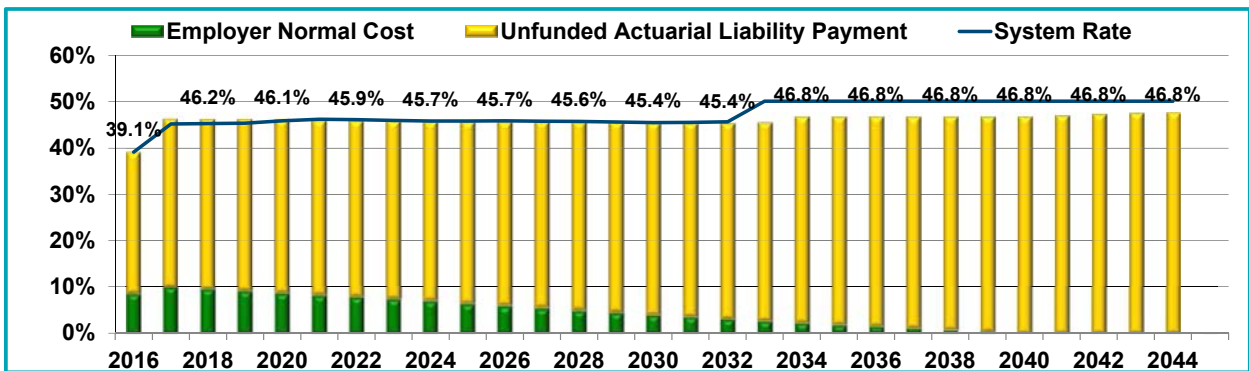
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Source: Cheiron projection analysis.

The following graph shows the expected contributions calculated under the statutory method. The contribution as a percent of payroll is shown above each bar. The value shown for the 2016 year was set based on the June 30, 2015 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2017 (Fiscal Year Ending June 30, 2018). 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, 2016 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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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

Response to Recommendations in 2015

In the State Actuary's Preliminary Report on the Teachers' Retirement System of Illinois presented December 19, 2015, 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, 2016 Actuarial Valuation.

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|---|------------------------------|---|
| 1. We recommend that the TRS 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. | Implemented | - Segal Consulting has been selected to complete the current valuation work. Segal's transition work will serve the same purpose performed by a replication audit. |
| 2. 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. | 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. - The funding policy targets full funding after 20 years and is considered actuarially sound under the method called <i>Actuarial Math 2.0</i> . Recommendation modified. |
| 3. We continue to recommend that the System's actuary expand the stress testing of the System within the valuation report and include a detailed explanation of the implications that volatile investment returns and a variety | Partially Implemented | - 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 |

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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|--|--------------------|--|
| of other stressors (e.g., membership declines, lower salary growth) will have on the potential unsustainable cost impact that could occur during the statutory funding period. | | 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. Recommendation repeated. |
| 4. We recommend the inclusion of the statutory State contribution development in the Executive Summary to emphasize the makeup of the State's funding obligation. | Implemented | - Found on pages 4 and 5 of the report. |
| 5. In relation to the discount rate calculated in accordance with GASB 67, we recommend Buck review their calculation regarding the treatment of future expenses, because we believe the method applied is flawed, and the resulting discount rate may be slightly higher than shown in the results. | Implemented | - The calculation performed by Segal addresses this issue (Exhibit 9 beginning on page 91 of the report). |
| 6. We recommend that TRS consider lowering the interest rate next year and the rate be developed taking into account the negative cash flow of TRS and the anticipated future interest rate environment. | Implemented | - TRS lowered the interest rate from 7.50% to 7.00%. |
| 7. We recommend the TRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to | Implemented | - Review of economic assumptions was presented at the August 2016 Board meeting with changes adopted to the interest rate, inflation, salary and Tier |

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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|---|------------------------|--|
| commencing the valuation work and adjust assumptions accordingly. | | 2 COLA assumptions (see page 2 of the actuarial valuation report for details). |
| 8. 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 2, 2016. The preliminary report was based on Cheiron's review of actuarial assumptions included in SURS' 2016 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the State Universities Retirement System. SURS' written response, provided on December 14, 2016, can be found in Appendix C.

December 15, 2016

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 Ladies and Gentlemen:

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 2018.

In summary, we believe that the assumptions and methods used in the draft June 30, 2016 Actuarial Valuation, which are used to determine the required Fiscal Year 2018 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 2018. 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, 2016 Actuarial Valuation.

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, summarized census data, the draft June 30, 2016 Actuarial Valuation, the 2015 Experience Review Report, the Fiscal Year 2015 Investment Plan, 2016 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 the body of our report as 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

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

SIGNED ORIGINAL ON FILE

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

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
STATE UNIVERSITIES 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 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) 2018. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the SURS Board to consider before GRS, the SURS actuary, finalizes its certification of the required State contributions to SURS for FY 2018.

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, 2016 Actuarial Valuation prepared by GRS, the 2015 Experience Review Report, the Fiscal Year 2015 Investment Plan, 2016 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, 2016 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, 2016 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 2018 required State contribution calculated under the current statutory funding plan is \$1,753,685,000. 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 prior year’s 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 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. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Assessment of Actuarial Assumptions Used in the 2016 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, 2016 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2016 Valuation

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. 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, they did prepare under separate cover a stress testing report showing various implications of volatile investment returns as

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SECTION II - SUMMARY OF RECOMMENDATIONS

well as illustrating different assumptions regarding future election rates to the Self-Managed Plan (SMP).

Recommended Changes for Future Valuations

3. We continue to recommend that the SURS Board consider lowering the current 7.25% interest rate assumption to 7.00% or lower and that rate should be developed taking into account the negative cash flow of SURS and the anticipated future interest rate environment.
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 2016 SURS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2016 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, have reviewed the assumptions on which it is based, and have 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 accept our prior year's 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. 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

State Mandated Funding Method:

The Illinois Pension Code (40 ILCS 5/15-155) is limited in meeting the risks of 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 acceptable 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, on-going benefits being 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 at least fully fund future plan benefit accruals to avoid continued systematic underfunding of SURS (Recommendation #1). Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.

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SECTION III - SUPPORTING ANALYSIS

The GRS draft June 30, 2016 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 28 years (which would result in full funding by 2045). Assuming a 28 year amortization schedule, GRS calculated a fiscal year 2018 State contribution amount of \$1,994,887,000. We concur with GRS's recommendation to increase the 90% funding target and to reduce the projection period, in accordance with generally accepted actuarial practices.

Based on the draft June 30, 2016 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 43.3%. 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 #2).

As mentioned in Section II, while GRS did not include such stress testing in this year's report, 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). 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. With respect to the stress testing that GRS performed in Exhibit X of the November 29, 2016 Stress Testing Scenarios letter to the Board of Trustees, GRS illustrates a comparison of total statutory contributions under a variety of stress testing assumptions. We find it important to note that under the baseline (static) investment assumption of 7.25%, State costs escalate in a gradual fashion, whereas under all other assumptions, in particular the volatile scenarios, there is dramatic escalation of State contributions in the later years that in most cases appear to be unsustainable.

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SECTION III - SUPPORTING ANALYSIS

Assessment of Actuarial Assumptions Used in the 2016 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, 2016 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. However, we do recommend that the Board consider lowering this assumption to 7.00% or lower in next year's valuation and that rate should be developed taking into account the negative cash flow of SURS and the anticipated future interest rate environment (Recommendation #3).

We further 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:

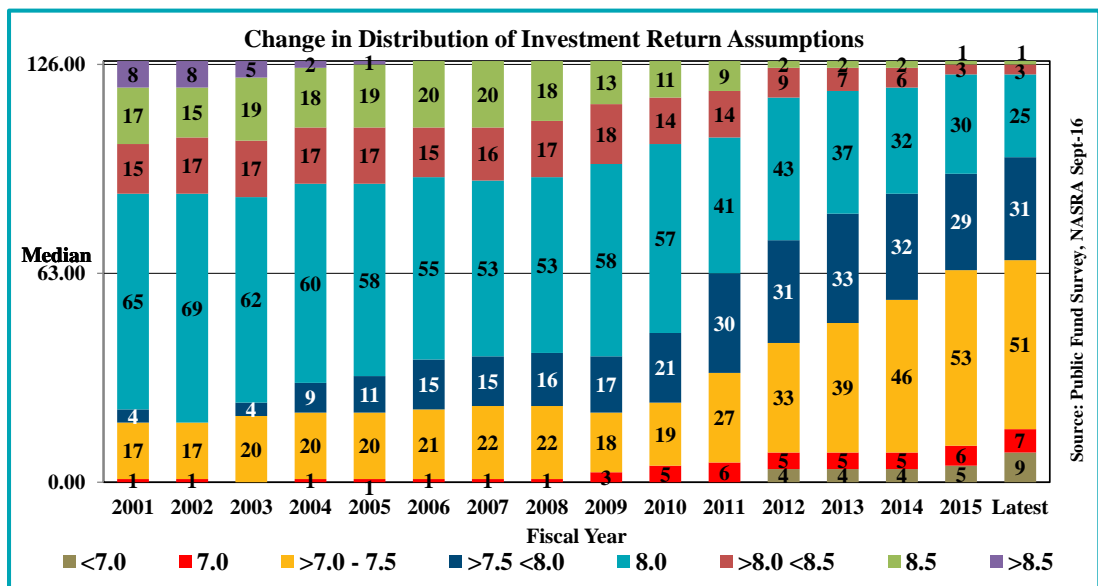
- A review of the interest and inflation rates does not involve the collection of significant data and can be updated annually. In addition, it keeps the Board focused more closely on these very important assumptions.
- The February 4, 2016 NEPC 2015 Outlook report shows an expected geometric return on the System's current actual asset allocation and proposed long-term allocation to be 7.5% 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 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 16, 2016 these yields are now 2.22%. This means, back in 1995 in order to

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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 5.03% 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 on the equity side of the assets in order to compensate for both declining bond returns and the need to earn 5.03% 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% 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 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 “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 last 15 years of the survey. The latest data includes results collected through September 2016.



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Over the period shown in the latest survey, there continues to be a pattern of reducing investment return assumptions. Eighty-three of the 127 plans have reduced the interest rate assumption since Fiscal Year 2011. For these 83 plans, the average reduction is 0.42%. The survey is consistent with the experience of other Cheiron clients, with which there has been a significant trend to reduce the investment return assumptions in the last several years.

- New GASB 67 and 68 pronouncements may subject many public pension plans, such as SURS, to effectively 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 (Pension Protection Act of 2006 p. 14. IRC §430(h)(2)(B)).

2. *Inflation Assumption:*

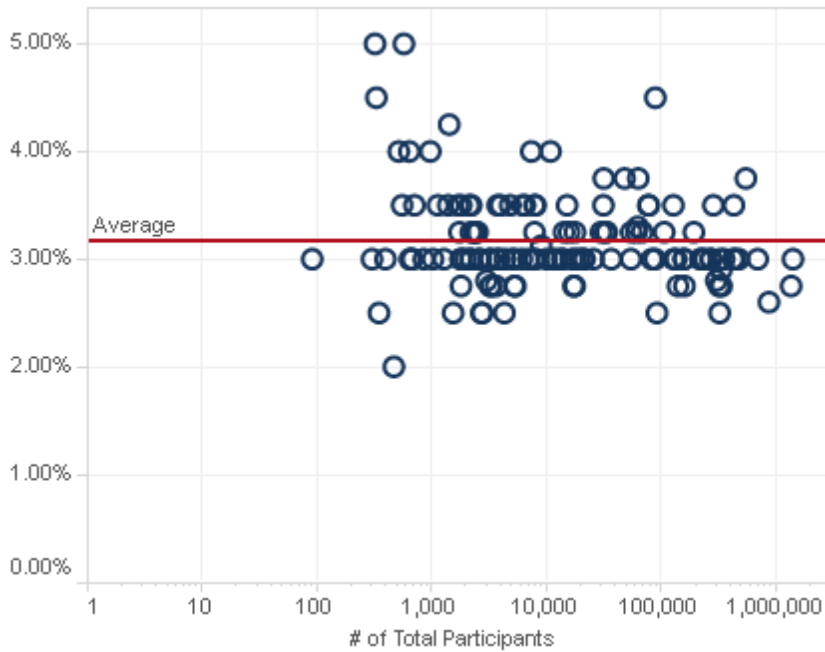
The inflation assumption of 2.75%, which primarily impacts the salary increase assumption used in the draft June 30, 2016 Actuarial Valuation by GRS, is reasonable.

Our rationale for concurring with the 2.75% assumption:

- The June 2016 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/2016/tr2016.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.70%.
- As shown on page 43 of the 2015 GRS Experience 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) November 2015 study provides the following graphic of respondents' inflation assumptions:

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Source: NCPERS Public Retirement System Study – November 2015

This shows that the 2.75% assumption, which SURS uses, is on the lower end of the inflation assumptions used among the 179 systems who responded to this study, with 3.2% as the average.

3. *Salary (Annual Compensation) Increase Assumption:*

Salary Increases for the 2016 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 a component for inflation of 2.75% per annum and 1.00% standard of living (i.e., productivity) increase.

The assumed rate of total payroll growth is 3.75%.

We find the assumption and the basis for setting it as reasonable for the 2016 valuation.

Our rationale for concurring with GRS's recommended salary increase assumption for the 2015 valuation:

- The June 2016 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (between 2026 and 2090), real wage differential will average somewhere between 0.59% and 1.83%.
- 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, 2016, there was again a small experience gain from this assumption (i.e., salary increases were less than assumed) as shown on page 21 of the draft June 30, 2016 Actuarial Valuation. The table on page 22 shows that there have been gains due to salary increases for the last four years. However, this alone

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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 consistent recent trend of declining salary increases for public sector employees.

4. Cost-of-Living Adjustment Assumption:

Benefits are increased annually as described on page 42 of the draft June 30, 2016 Actuarial Valuation. Annual increases are 3% 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 51 of the draft June 30, 2016, Actuarial Valuation to be \$111,572 for 2016.

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% is generous given today’s low interest rate environment.**

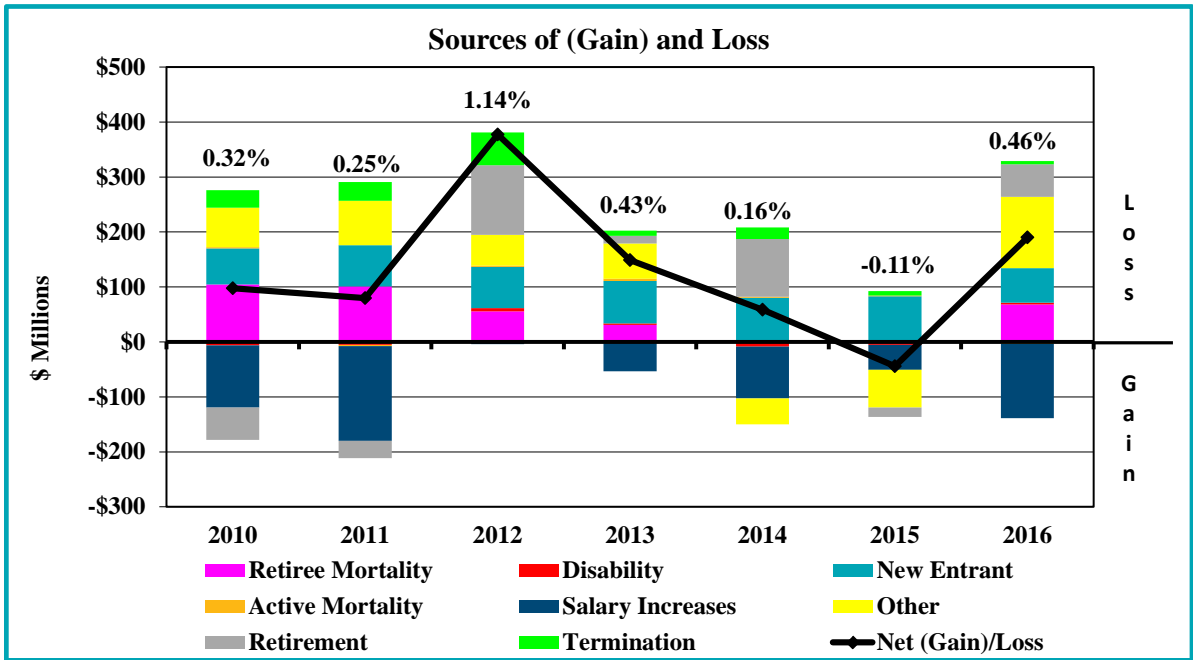
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B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2016 Actuarial Valuation, these are shown on page 22. In the chart below, we have collected similar data from GRS's past valuation reports dating back to 2010 and presented a historical review of past demographic and salary increase experience gains and losses.

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, and below zero represents an experience gain for that year. 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. In every year since 2010, 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. For 2010 through 2013, there were consistent losses attributable to SURS retiree mortality. GRS addressed this with staff and determined that much of this loss was due to

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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, another loss, similar in size to the earlier losses, occurred in 2016. We will monitor future valuations to determine if this is an indication that the assumption needs to be modified.

3. A trend of salary gains has appeared in most years including the last three. 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 2010 termination from employment experience has consistently shown losses, and diminishing in size in 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. While there is a pattern of consistent losses, the percent is generally quite small.

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Below we summarize all remaining 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

Sample rates and a description of the tables follows. Note that the sample rates shown are as of the base year 2014.

| 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 | Future Life Expectancy (years) in 2016 | | | | Future Life Expectancy (years) in 2030 | | | |
|------------|---|---------------|---------------------------|---------------|---|---------------|---------------------------|---------------|
| | Postretirement | | Disabled - Retiree | | Postretirement | | Disabled - Retiree | |
| | Male | Female | Male | Female | Male | Female | Male | Female |
| 35 | 51.99 | 54.08 | 29.64 | 34.42 | 53.33 | 55.36 | 31.72 | 36.32 |
| 40 | 46.75 | 48.86 | 26.21 | 30.34 | 48.08 | 50.14 | 28.14 | 32.12 |
| 45 | 41.61 | 43.71 | 23.01 | 26.55 | 42.91 | 44.97 | 24.74 | 28.18 |
| 50 | 36.57 | 38.63 | 19.95 | 22.89 | 37.84 | 39.86 | 21.50 | 24.37 |
| 55 | 31.67 | 33.63 | 16.96 | 19.26 | 32.90 | 34.82 | 18.33 | 20.61 |
| 60 | 26.91 | 28.71 | 14.06 | 15.74 | 28.07 | 29.87 | 15.25 | 16.97 |
| 65 | 22.29 | 23.99 | 11.28 | 12.51 | 23.38 | 25.09 | 12.34 | 13.60 |
| 70 | 17.89 | 19.49 | 8.72 | 9.70 | 18.91 | 20.53 | 9.63 | 10.65 |
| 75 | 13.82 | 15.29 | 6.49 | 7.35 | 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. Self-Managed Plan Election

Thirty percent of total future hires will elect to participate in the Self-Managed Plan.

4. 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.

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

5. Retirement Rates

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

| Age | <u>Members Hired before January 1, 2011 and Eligible for</u> | | <u>Members Hired on or after January 1, 2011 and Eligible for</u> | |
|----------|--|---------------------|---|---------------------|
| | 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 | 7.5% | - | - |
| 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% | - |
| 68 | 15.0 | - | 35.0 | - |
| 69 | 15.0 | - | 30.0 | - |
| 70-74 | 15.0 | - | 15.0 | - |
| 75-79 | 20.0 | - | 20.0 | - |
| 80+ | 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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6. 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.

7. 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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8. Spouse's Age

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

9. 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.

10. 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.

11. Load on Final Average Salary

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

12. 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.

13. 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.

14. Reciprocal Service

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

The recently updated actuarial assumptions (including retirement and termination rates) were based on SURS service only. Therefore, reciprocal service was not included for current

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active members. Reciprocal service will be collected and analyzed in the future and will be considered in the next Experience Review.

15. 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.

30% of total future hires will elect to participant in the Self-Managed Plan.

New entrants have an average age of 37.1 and average capped pay of \$37,154 and average uncapped pay of \$38,672 (2016 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 2016 dollars) of current active members with service between one and four years.

| Age | Number Males | Average Pay | | Number Females | Average Pay | | Total Number | Average Pay | |
|--------------|-----------------|----------------|------------------|-------------------|------------------|--------------------|-----------------|-----------------|-------------------|
| | | Capped Male | Uncapped Male | | Capped Female | Uncapped Female | | Capped Total | Uncapped Total |
| <20 | 59 | \$16,107 | \$16,107 | 60 | \$13,789 | \$13,789 | 119 | 14,938 | 14,938 |
| 20 - 24 | 767 | 27,799 | 27,799 | 1,220 | 26,320 | 26,320 | 1,987 | 26,891 | 26,891 |
| 25 - 29 | 1,786 | 37,574 | 38,109 | 2,383 | 34,770 | 34,912 | 4,169 | 35,971 | 36,282 |
| 30 - 34 | 1,661 | 44,499 | 46,305 | 2,149 | 38,199 | 39,143 | 3,810 | 40,946 | 42,265 |
| 35 - 39 | 1,082 | 45,535 | 48,736 | 1,465 | 37,749 | 38,783 | 2,547 | 41,057 | 43,011 |
| 40 - 44 | 770 | 45,334 | 48,078 | 1,165 | 35,853 | 37,082 | 1,935 | 39,626 | 41,457 |
| 45 - 49 | 677 | 41,933 | 45,689 | 966 | 34,100 | 35,173 | 1,643 | 37,328 | 39,506 |
| 50 - 54 | 664 | 40,479 | 45,533 | 826 | 31,392 | 32,777 | 1,490 | 35,442 | 38,462 |
| 55 - 59 | 463 | 38,280 | 44,087 | 578 | 32,982 | 35,007 | 1,041 | 35,338 | 39,045 |
| 60 - 64 | 277 | 35,870 | 41,096 | 271 | 30,569 | 33,360 | 548 | 33,249 | 37,271 |
| 65 - 69 | 11 | 22,899 | 22,899 | 10 | 17,973 | 17,973 | 21 | 20,553 | 20,553 |
| Total | 8,217 | 40,239 | 42,621 | 11,093 | 34,378 | 35,227 | 19,310 | 36,872 | 38,373 |

16. 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 2017 are \$488,530 and actual FY 2016 SMP employer forfeitures used to reduce the certified contributions for FY 2018 are \$5,284,434. Estimated SMP expenses for FY 2018 and after are assumed to increase by 2.75%. Estimated SMP employer forfeitures used to reduce the certified contributions for FY 2019 and after are assumed to be 7.5% of the gross SMP employer contribution.

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17. 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%.

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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 5/15). **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 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 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 that the fluctuations in the actuarial value of assets will be less volatile over time than fluctuations in the market value of assets. **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 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, or no less than 80% of market value. In fact, the Internal Revenue Service (IRS), IRC §430(g)(3)(B)(iii), mandates this "corridor" for private sector pension

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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."

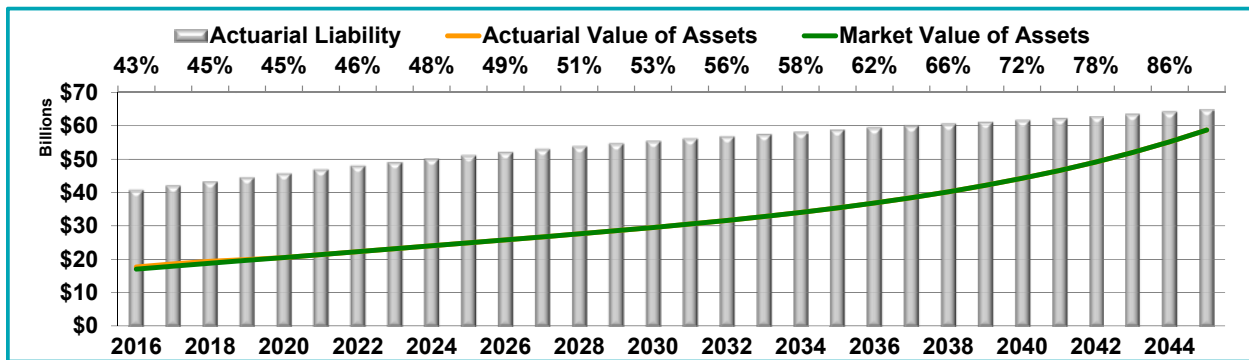
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SECTION IV- PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2016 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 contribution requirement performed by the State Actuary to verify that the System's 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 7 of the draft June 30, 2016 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 2030, the funding ratio is approximately 53%, with assets being approximately \$30 billion and liabilities being approximately \$56 billion.

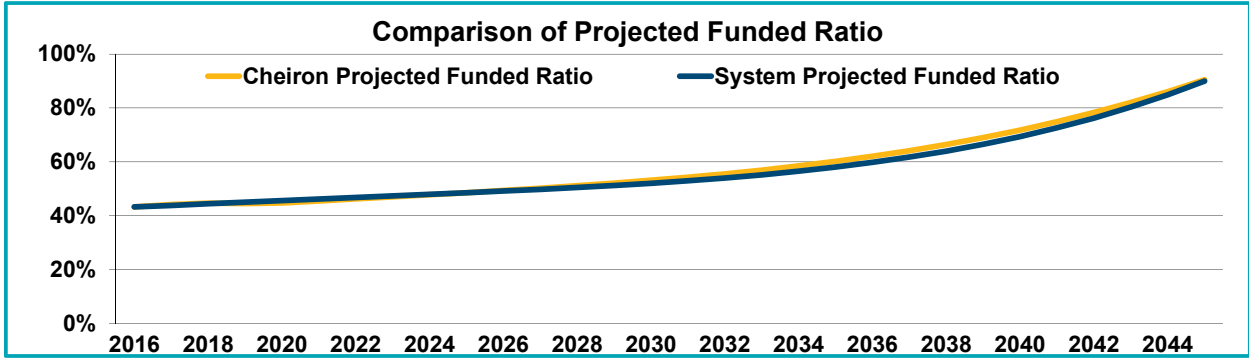


Source: Cheiron projection analysis.

When we compare our projected funding ratio against the results shown in the draft June 30, 2016 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 as expected by Cheiron's approximation. The draft June 30, 2016 Actuarial Valuation Report shows slightly lower funded ratios due to differences in projection methods.

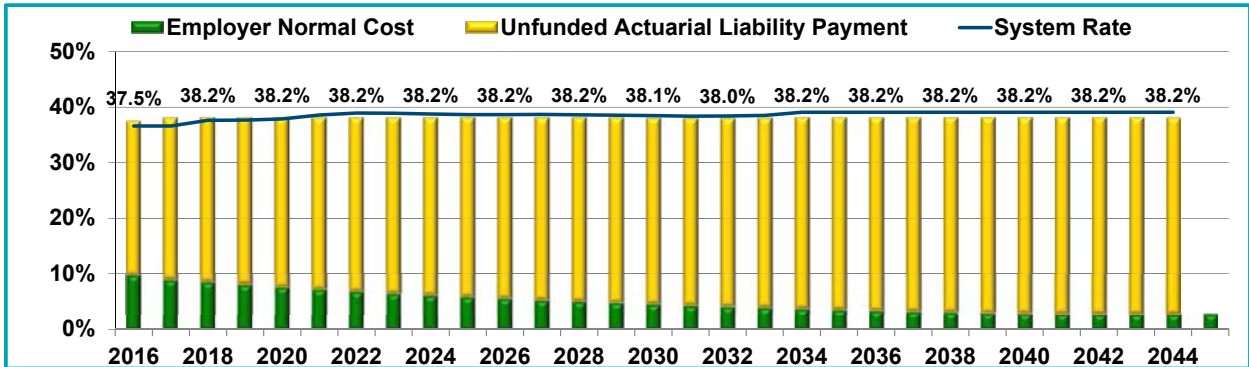
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SECTION IV- PROJECTION ANALYSIS



Source: Cheiron projection analysis.

The following graph shows the expected contributions calculated under the statutory method. The contribution as a percent of payroll is shown above each bar. The value shown for the 2016 year was set based on the June 30, 2015 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2017 (Fiscal Year Ending June 30, 2018). 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, 2016 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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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

Response to Recommendations in 2015

In the State Actuary's Preliminary Report on the State Universities Retirement System of Illinois presented December 19, 2015, 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, 2016 Actuarial Valuation.

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|--|------------------------------|---|
| 1. We recommend that the SURS 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. | Implemented | - The SURS Board engaged Segal Consulting in 2016 to perform a full scope (level 1) actuarial audit that found all SURS methods, assumptions, and calculations to be reasonable. |
| 2. We 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 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 modified. |
| 3. We continue to 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 (e.g., membership declines, lower salary growth) will have on the potential unsustainable cost impact that could occur during | 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. |

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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|--|---------------------------------|--|
| the statutory funding period. On December 2, 2015, GRS provided stress tests demonstrating three volatile return scenarios in a separate communication from the valuation report. | | |
| 4. 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 developed taking into account the negative cash flow of SURS and the anticipated future interest rate environment. | Not Implemented | - The System believes that the current assumption continues to be conservative and reasonable. An economic study was completed by GRS and presented to the SURS Board in September 2015. The Board approved maintaining the current assumptions at the December 2015 meeting. Recommendation repeated. |
| 5. 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 SURS Board reviewed the economic assumptions in the December 10, 2015 Board of Trustees meeting. |
| 6. The wage inflation assumption of 3.75% consists of a 2.75% price inflation and 1.0% productivity (standard of living) increase assumption. We recommend that GRS provide justification for the 1.0% productivity assumption given the fiscal challenges facing the State of Illinois. | Implemented | - Justification of the 1.0% productivity assumption was provided. |
| 7. We recommend that in future experience studies, GRS specifically request the | Not Applicable this Year | - No experience study performed this year, so the opportunity to implement has not occurred. |

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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|---|---------------|-----------------|
| <p>investment consultants referenced in developing market expectations to provide longer term market expectations (30+ years) and that GRS also obtain the specific expectations of the investment consultant serving the SURS.</p> | | |

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 2, 2016. The preliminary report was based on Cheiron's review of actuarial assumptions included in SERS' 2016 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the State Employees' Retirement System. SERS' written response, provided on December 15, 2016, can be found in Appendix C.

December 15, 2016

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 Ladies and Gentlemen:

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 2018.

In summary, we believe that the assumptions and methods used in the draft June 30, 2016 Actuarial Valuation, which are used to determine the required Fiscal Year 2018 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 2018. Section III also includes comments on other issues impacting the funding of the 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, 2016 Actuarial Valuation.

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, summarized census data, the draft June 30, 2016 Actuarial Valuation, the draft 2016 GASB 67/68 Report prepared by GRS, 2016 minutes of the SERS Board of Trustee meetings, 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 the body of our report as 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

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

SIGNED ORIGINAL ON FILE

Gene Kalwarski, FSA, FCA, EA, MAAA
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 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) 2018. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the SERS Board to consider before GRS, the SERS actuary, finalizes its certification of the required State contributions to SERS for FY 2018.

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, 2016 Actuarial Valuation, the draft 2016 GASB 67/68 Report, minutes of the 2016 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 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 Qualifications 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, 2016 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, 2016 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 2018 required State contribution calculated under the current statutory funding plan is \$2,327,649,000. 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 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 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. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Assessment of Actuarial Assumptions Used in the 2016 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, 2016 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2016 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. GRS did

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SECTION II - SUMMARY OF RECOMMENDATIONS

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.

Recommended Changes for Future Valuations

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.
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.

GASB 67 and 68

The 2016 SERS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2016 SERS 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, have reviewed the assumptions on which it is based, and have 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 the SERS Plan, the Plan'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 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 Methods

State Mandated Funding Method

The Illinois Pension Code (40 ILCS 5/14-131) is limited in meeting the risks of 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 acceptable 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, on-going benefits being 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 recommend that the funding method be changed to at least fully fund future plan benefit accruals to avoid continued systematic underfunding of SERS (Recommendation #2). Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.

Since GRS has concluded that the State mandated funding method does not conform to Actuarial Standards of Practice, the Board adopted a separate funding policy for GASB 67, the Actuarially Determined Contribution, which is based on contributing the annual normal cost plus amortization of the unfunded actuarial liability over 25 years as a level percent of capped payroll. According to this methodology the States' contribution amount would be \$2,759,110,028 for Fiscal 2018. We concur with the GRS's recommendations that the System should be funded in accordance with generally accepted actuarial practices.

Based on the draft June 30, 2016 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 34.4%. 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). 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 Plan look to for assessing the Plan'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.

Assessment of Actuarial Assumptions Used in the 2016 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. This assumption, which is used to value liabilities for funding purposes, was lowered to 7.00% for the draft June 30, 2016 Actuarial Valuation, from 7.25% used for the June 30, 2015 report.

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After reviewing all the materials (see Appendix B of the report) that were made available, Cheiron concludes that lowering the interest rate to 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 #4).

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 (Recommendation #5).

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 2016 Experience Review, it 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 expected arithmetic mean of the SERS portfolio is 7.30% (See pages 8-10 GRS April 2016 Experience Review Report). GRS then converted this arithmetic mean to what it refers to as a geometric rate of return of 6.62% that can be seen in the bottom row of the GRS chart below in the 50th percentile column. These figures show that SERS has only a 44.2% chance of meeting the revised assumption of 7.0% (see the fifth column, bottom row). This suggests the Board may want to consider in future years lowering the rate.

| Investment Consultant | Distribution of 20-Year Average Geometric Net Nominal Return | | | Probability of exceeding | Probability of exceeding |
|-----------------------|--|------------------|------------------|--------------------------|--------------------------|
| | 25 th | 50 th | 75 th | 7.00% | 7.25% |
| (1) | (2) | (3) | (4) | (6) | (6) |
| 1 | 3.93% | 5.53% | 7.15% | 27.0% | 23.7% |
| 2 | 4.57% | 6.25% | 7.95% | 38.2% | 34.5% |
| 3 | 4.28% | 6.16% | 8.07% | 38.3% | 34.9% |
| 4 | 4.68% | 6.56% | 8.48% | 43.9% | 40.4% |
| 5 | 5.16% | 6.89% | 8.64% | 48.3% | 44.4% |
| 6 | 5.13% | 6.90% | 8.70% | 48.5% | 44.8% |
| 7 | 5.40% | 7.09% | 8.81% | 51.4% | 47.5% |
| 8 | 5.68% | 7.60% | 9.56% | 58.3% | 54.8% |
| Average | 4.85% | 6.62% | 8.42% | 44.2% | 40.6% |

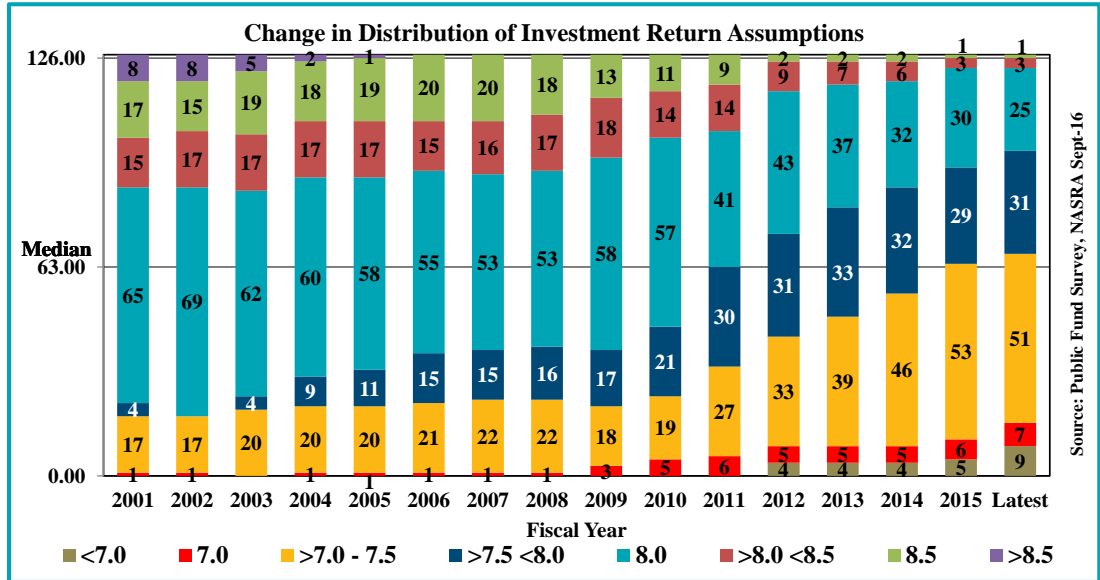
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SECTION III - SUPPORTING ANALYSIS

- In GRS's April 2016 Experience Review, it 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 arithmetic mean of the SERS portfolio is 8.32% (See pages 8-10 GRS April 2016 Experience Review Report). Similar to what was done in the table above, GRS converted this arithmetic mean to a geometric rate of return with a mean of 7.54%. Based on the capital market assumptions provided by Meketa, SERS has a 57.6% chance of meeting the revised assumption of 7.0%. This supports the reasonableness of assuming a 7.00% rate for the current year.
- 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 16, 2016, these yields are now 2.22%. 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 4.78% 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 on the equity side of the assets in order to compensate for both declining bond returns and the need to earn 4.78% above the risk free rates of return.
- SERS is projected to have a negative cash flow (contribution income less benefit and expense payout) in Fiscal Year Ending 2020 and the negative cash flow is expected to grow significantly to over a billion dollars per year by 2031 (3.3% of assets) as shown in the graph on page 14 and table 4d on pages 26 and 27 of the draft actuarial valuation report. When short-term returns are expected to be lower than the long-term expectation, which is the case with SERS, a plan with negative cash flows will have actuarial returns (i.e., dollar-weighted returns) that are less than "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 last 15 years of the survey. The latest data includes results collected through September 2016.

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Over the period shown in the latest survey, there continues to be a pattern of reducing investment return assumptions. Eighty-three of the 127 plans have reduced the interest rate assumption since Fiscal Year 2011. For these 83 plans, the average reduction is 0.42%. The survey is consistent with the experience of other Cheiron clients, with which there has been a significant trend to reduce the investment return assumptions in the last several years.

- New GASB 67 and 68 pronouncements subject many public pension plans to effectively use a lower interest rate for accounting disclosures and pension expense determinations in fiscal years 2014 and later. For example, SERS uses 7.02% as of June 30, 2015 and 6.64% as of June 30, 2016 for accounting purposes. 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 (Pension Protection Act of 2006 p. 14. IRC §430(h)(2)(B)).

2. Inflation Assumption

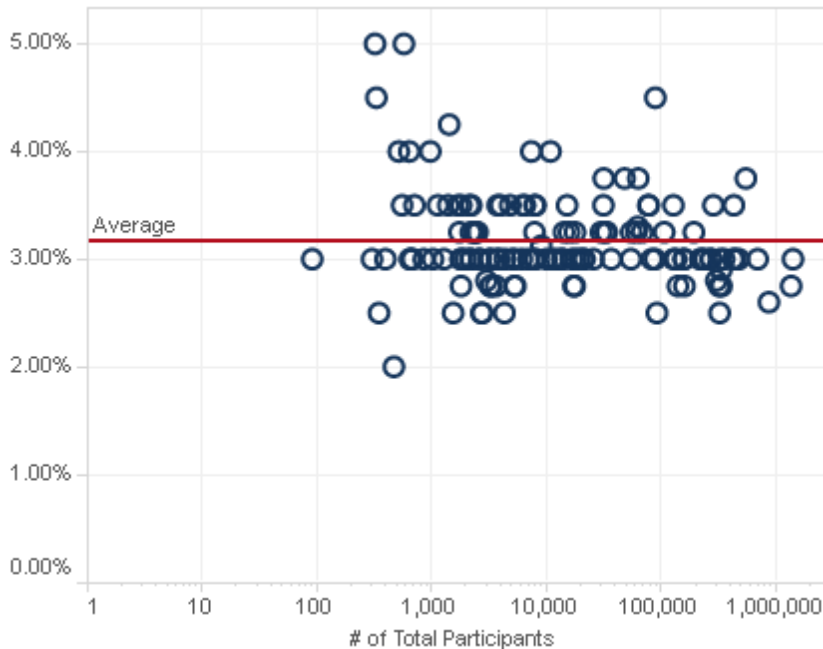
We find that lowering the inflation assumption to 2.75%, which primarily impacts the salary increase assumption used in the draft June 30, 2016 Actuarial Valuation by GRS in certifying the required State contribution, is reasonable.

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Our rationale for concurring with the 2.75% assumption:

- In GRS's April 2016 Experience Review, it surveyed the inflation assumptions of eight independent investment consultants and found they ranged from 2.11% to 2.5%, with an average of 2.27%.
- The June 2016 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/2016/tr2016.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.70%.
- As shown on pages 5 and 6 of the GRS April 2016 Experience Review Study, 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) November 2015 study, provides the following graphic of respondents' inflation assumptions:



Source: NCPERS Public Retirement System Study – November 2015

This shows that the 2.75% assumption, which SERS uses, is on the lower end of the inflation assumptions used among the 179 systems who responded to this study, with 3.2% as the average.

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3. *Salary (Annual Compensation) Increase Assumption*

The salary scale 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 a component for inflation of 2.75% per annum and overall payroll growth (inflation plus productivity) is 3.25%.

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

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

- The June 2016 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (between 2026 and 2090) real wage differential will average somewhere between 0.59% and 1.83%.
- This assumption is composed of inflation and for productivity, which is employer specific, is supported by credible data as shown on pages 12-15 of the April 2014 Experience Review Study performed by GRS. Thus keeping the productivity component consistent with past experience and lowering the overall salary increase assumption in line with the decrease in inflation is consistent.
- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a consistent recent trend of declining salary increases for public sector employees.

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4. *Cost of Living Adjustment Assumption:*

Benefits are increased annually as described on page 35 of the draft June 30, 2016 Actuarial Valuation. Annual increases are 3% 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:*

This assumption is not specifically listed in the SERS report. However, page 42 makes clear that benefits for members hired after January 1, 2011 are calculated using pay that is capped under 40 ILCS 5/1-160.

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

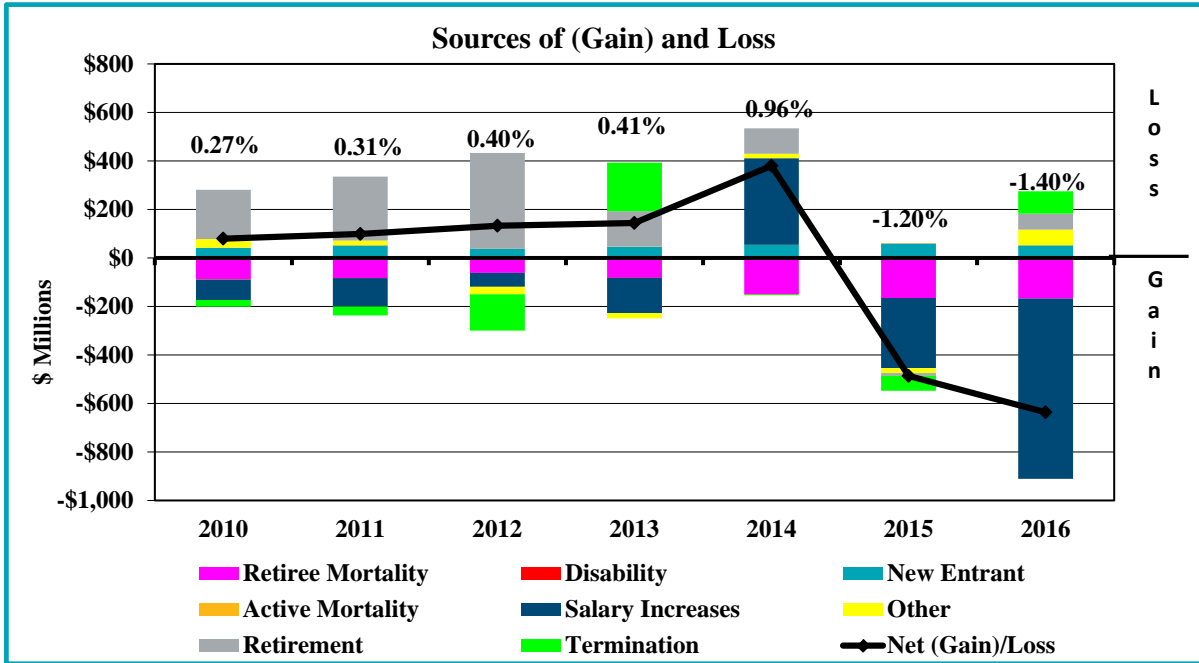
B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2016 Actuarial Valuation, these are shown on page 19. In the chart below, we have collected similar data from GRS's past valuation reports dating back to 2010 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 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, and below zero represents an 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.

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Key observations from this chart are as follows:

1. For both 2015 and 2016, there was a net gain in the valuation. This is primarily due to the significant salary gain in each year. This does not indicate the need to update assumptions, but is a reflection of the current economic environment for the Employees in this system.
2. However, retirement, which had been a source of consistent losses, showed a very small gain in 2015 and small loss in 2016. This is an indication that the increased retirement rates adopted in the 2014 valuation are more closely matching experience.
3. In every year since 2010 there have been small experience losses attributable to new entrants joining SERS. The continuing source of losses due to new entrants commonly is expected for most pension plans. This is because members who are hired after the valuation date may earn a partial year service credit that does not show up until the following valuation, and at that point the extra liabilities are treated as a liability loss. These losses, however, are largely offset by asset gains attributable to contributions made on behalf of these new members that were also not anticipated.
4. Since 2010, there have been consistent mortality gains attributable to SERS retirees but there have been insignificant mortality gains or losses attributable to active members. This means that there have been more deaths than anticipated for retirees and deaths for actives were largely as anticipated. This is reflection that the current mortality assumption has a measure of conservatism built in.

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5. Termination from employment experience has been irregular. This is not surprising as termination from employment rates are commonly volatile as short-term changes in the economy, anticipated plan changes, employment opportunities elsewhere, etc., all impact this behavior.
6. Disability experience is too small to be noticed on the chart, given its insignificant size relative to other experience items.

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Out of the demographic assumptions, there are three assumptions that were updated for the June 30, 2016 draft valuation based on the April 2016 Experience Review.

1. Mortality Assumption

Post-Retirement Mortality

The base table of 105% of the RP2014 Healthy Annuitant mortality table, sex distinct, was retained for this valuation. However, generational mortality improvement factors using the MP-2014 two-dimensional mortality improvement scales were added to reflect future mortality improvement. Page 24 of the April 2016 Experience Review show that the base table provides a margin of conservatism of over 20% based on the experience study for the period from July 1, 2012 to June 30, 2015. The combination of a conservative mortality table and projection tables that are more conservative than the recently released MP-2015 and MP-2016 tables may mean there is an overestimate of life expectancy within the valuation

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

The mortality table is based on a percentage of 75% for males and 95% for females of the RP2014 Total Employee mortality table with generational mortality improvement factors using the MP-2014 two-dimensional mortality improvement scales to reflect future mortality improvement. 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 crucial for this plan.

We find the mortality assumption used is reasonable.

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2. Termination

The termination assumptions for Tier 2 members were increased based on the April 2016 Experience Review. We find that the updated assumptions to be reasonable.

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.

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

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| 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 |

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3. Unused Sick Leave and Optional Service Purchases

At retirement, members who have accumulated unused sick leave and vacation days may receive additional service credit for these days to increase their retirement benefits. Members may also qualify to purchase optional service credit prior to retirement. To estimate the impact of these provisions on the System, GRS reviewed the retirement data during the experience study period. It found the additional service expected due to unused sick leave was 0.14 years, and the additional service due to purchased service was 0.23 years. The sum of these two expectations equates to just over 4.4 months of additional service. The System adopted an assumption that each current and future active member be increased by 4.5 months to reflect additional service at retirement.

We find this assumption is reasonable.

We have concluded that all remaining demographic assumptions are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. 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.

2. 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).

3. Disability

Because members who receive disability benefits typically spend less than one year on disability, they are considered active members. Therefore, a load of 1.50% 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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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 Regular Formula Employees | | |
|---|--------------|----------------|
| | 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 | | |
|---|--------------|----------------|
| | 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% |

| Retirement Rates for Alternate Formula Employees | | | | |
|---|---|----------------|---|----------------|
| | Eligible for Alternate Formula Benefits Only | | Eligible for Regular Formula Benefits Only | |
| Age | 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 |

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.

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6. Spouse's Age

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

7. 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 |

8. 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.

9. 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.

10. 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.

11. Decrement Timing

All decrements are assumed to occur mid-year.

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12. Decrement Relativity

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

13. Decrement Operation

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

14. Eligibility Testing

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

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15. 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.

| Age Group | New Entrant Benefit Groups | | | | | | | | | | | | Total | |
|--------------|---|------------------------|-----------|---|--------------|----------------------|--|----------------------|------------|---|------------|---------------------|---------------|------------------------|
| | New Entrants Eligible for Regular Formula Benefits who are Covered by Social Security | | | 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 now Eligible for Regular Formula Benefits | | | New Entrants in Positions Formerly Eligible for Alternate Formula Benefits who are not Covered by 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 | 3,872,874 | 1 | 26,799 | 44 | 1,975,105 | 25 | 1,137,764 | 221 | 14,978,514 | 94 | 5,995,884 | 197 | 7,012,542 |
| 20-24 | 2,358 | 89,038,889 | 11 | 429,561 | 1,094 | 50,125,614 | 666 | 30,958,960 | 221 | 14,978,514 | 94 | 5,995,884 | 4,444 | 191,527,422 |
| 25-29 | 3,837 | 168,212,418 | 27 | 1,432,871 | 1,257 | 59,986,803 | 736 | 36,511,392 | 328 | 23,223,940 | 107 | 7,224,519 | 6,292 | 296,591,943 |
| 30-34 | 3,384 | 162,906,051 | 16 | 903,512 | 727 | 37,518,624 | 559 | 30,241,315 | 133 | 9,823,513 | 59 | 4,262,116 | 4,878 | 245,655,131 |
| 35-39 | 2,862 | 146,796,295 | 7 | 334,481 | 536 | 28,881,538 | 423 | 24,070,993 | 58 | 4,198,434 | 22 | 1,531,771 | 3,908 | 205,813,512 |
| 40-44 | 2,840 | 149,591,599 | 7 | 380,083 | 461 | 26,045,645 | 316 | 18,932,247 | 31 | 2,183,460 | 3 | 199,778 | 3,658 | 197,332,812 |
| 45-49 | 2,395 | 126,831,531 | 7 | 401,206 | 349 | 19,757,322 | 232 | 14,739,023 | 9 | 565,822 | 2 | 130,034 | 2,994 | 162,424,938 |
| 50-54 | 1,986 | 108,077,735 | 4 | 241,720 | 219 | 12,956,378 | 120 | 7,771,706 | 10 | 718,243 | 2 | 129,765,782 | 2,339 | 129,765,782 |
| 55-59 | 1,248 | 64,941,673 | 5 | 347,444 | 145 | 8,688,965 | 59 | 3,598,009 | 11 | 821,323 | 1 | 78,397,414 | 1,468 | 78,397,414 |
| 60-64 | 432 | 22,688,711 | 40 | 2,433,614 | 13 | 1,022,423 | 2 | 162,406 | 2 | 162,406 | 2 | 26,307,154 | 487 | 26,307,154 |
| 65-69 | 36 | 2,066,101 | 2 | 136,680 | | | | | | | | | 38 | 2,202,781 |
| 70 & Over | | | | | | | | | | | | | | |
| Total | 21,505 | \$1,045,023,877 | 85 | \$4,497,677 | 4,874 | \$248,506,288 | 3,149 | \$168,983,832 | 803 | \$56,675,655 | 287 | \$19,344,102 | 30,703 | \$1,543,031,431 |
| Avg. Salary | | \$48,594 | | \$52,914 | | \$50,986 | | \$53,663 | | 70,580 | | 67,401 | | 50,257 |
| Avg. Age | | 37.54 | | 33.80 | | 32.82 | | 32.66 | | 28.92 | | 27.59 | | 35.96 |
| Percent Male | | 43% | | 88% | | 77% | | 74% | | 90% | | 86% | | 53% |

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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SECTION III - SUPPORTING ANALYSIS

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 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. 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 that fluctuations in the actuarial value of assets will be less volatile over time than fluctuations in the market value of assets. **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 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, or no less than 80% of market value. In fact the Internal Revenue Service (IRS), IRC §430(g)(3)(B)(iii), mandates this "corridor" for private sector pension

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SECTION III - SUPPORTING ANALYSIS

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."

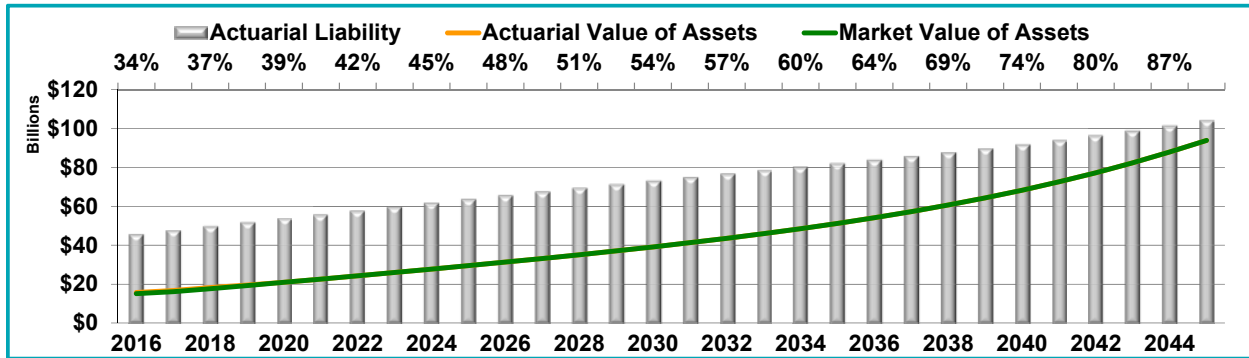
**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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SECTION IV – PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2016 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 contribution requirement performed by the State Actuary to verify that the System's 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, 2016 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 2030, the funding ratio is approximately 54% with assets being approximately \$39 billion and liabilities being approximately \$73 billion.

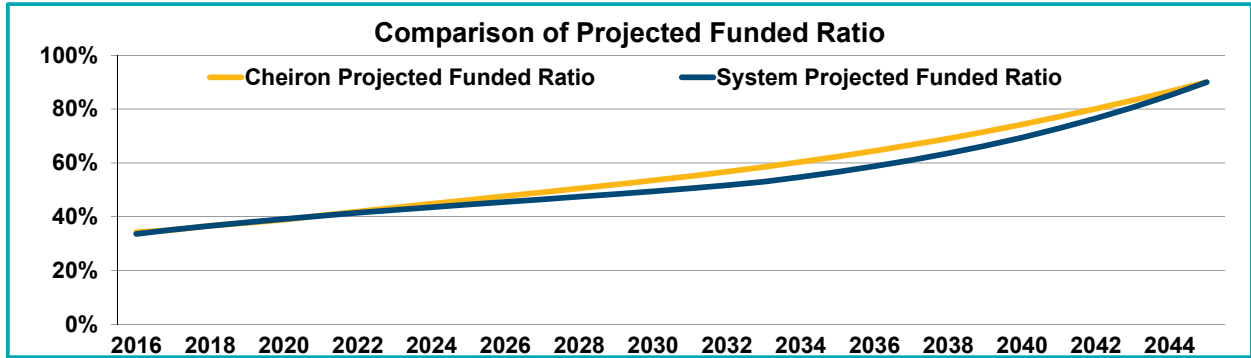


Source: Cheiron projection analysis.

When we compare our projected funding ratio against the results shown in the draft June 30, 2016 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 as expected by Cheiron's approximation. The draft June 30, 2016 Actuarial Valuation shows slightly lower funded ratios due to differences in projection methods.

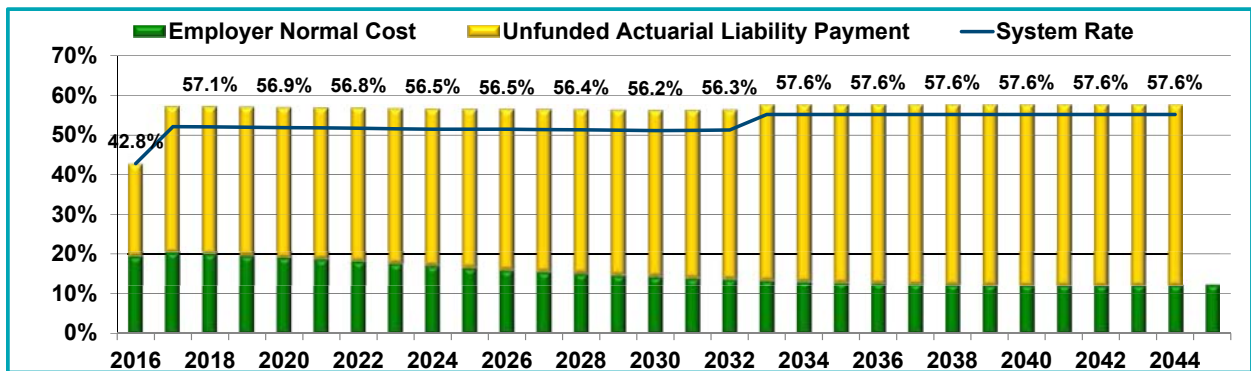
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SECTION IV – PROJECTION ANALYSIS



Source: Cheiron projection analysis.

The following graph shows the expected contributions calculated under the statutory method. The contribution as a percent of payroll is shown above each bar. The value shown for the 2016 year was set based on the June 30, 2015 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2017 (Fiscal Year Ending June 30, 2018). 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, 2016 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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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

Response to Recommendations in 2015

In the State Actuary's Preliminary Report on the State Employees' Retirement System of Illinois presented December 19, 2015, 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, 2016 Actuarial Valuation.

| Recommendations to Retirement System from 2015 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 | - Such an actuarial audit had not been performed despite our prior year's recommendation to do so. Recommendation repeated. |
| 2. We 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 modified. |
| 3. We continue to recommend that GRS include stress testing of the System within the valuation report and a include detailed explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) will have on the potential unsustainable | 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. |

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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|---|--------------------|---|
| cost impact that could occur during the statutory funding period. On December 15, 2015, the System provided stress tests demonstrating a variety of scenarios in a separate communication from the valuation report. | | Recommendation modified. |
| 4. We recommend that SERS consider lowering the interest rate next year and the rate be developed taking into account the anticipated future negative cash flow of SERS and the anticipated future interest rate environment. | Implemented | - The interest rate was lowered from 7.25% to 7.00%. |
| 5. We continue to recommend the SERS Board annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work, and adjust assumptions accordingly. | Implemented | - An experience study was completed in which the economic assumptions (interest rate and inflation) were reviewed prior to commencing the valuation work. |
| 6. We recommend that GRS consider the use of generational mortality improvement assumptions in future valuations. In the event that GRS does not choose to use such assumptions, then we recommend it disclose its rationale and whether or not the recommended mortality tables sufficiently cover anticipated life expectancy increases through 2045. | Implemented | - An experience study was performed and generational mortality improvement scales were implemented. |

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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|--|------------------------------|---|
| 7. We recommend that GRS consider whether additional revisions to the demographic assumptions, specifically the termination assumption, for Tier 2 members are appropriate to their benefit structure and consistent with the revised retirement rates already implemented. | Implemented | - An experience study was performed and separate termination assumptions were implemented for Tier 2 members. |
| 8. We recommend that in future experience studies, GRS specifically request that the investment consultants referenced in developing market expectations provide longer-term market expectations (30+ years) and that GRS also obtain the specific expectations of the investment consultant serving the SERS and the Illinois State Board of Investment (ISBI). | Partially Implemented | - Expectations were obtained from investment consultant serving SERS. - Long-term geometric return was developed from the short-term assumptions given by the investment consultants. Investment consultants unlikely to provide 30+ year assumptions. Recommendation removed. |
| 9. 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. | Not Implemented | - The interest rate used for SERS differs from that used for JRS and GARS. Recommendation repeated. |

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 2, 2016. The preliminary report was based on Cheiron's review of actuarial assumptions included in JRS' 2016 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the Judges' Retirement System. JRS' written response, provided on December 15, 2016, can be found in Appendix C.

December 15, 2016

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 Ladies and Gentlemen:

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 2018.

In summary, we believe that the assumptions and methods used in the draft June 30, 2016 Actuarial Valuation, which are used to determine the required Fiscal Year 2018 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 2018. 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, 2016 Actuarial Valuation.

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, summarized census data, the draft June 30, 2016 Actuarial Valuation, the draft 2016 GASB 67/68 Report, 2016 minutes of the JRS Board of Trustee meetings, 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 the body of our report as 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

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

SIGNED ORIGINAL ON FILE

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

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
JUDGES' 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 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) 2018. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the JRS Board to consider before GRS, the JRS actuary, finalizes its certification of the required State contributions to the JRS Board for FY 2018.

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, 2016 Actuarial Valuation, the draft 2016 GASB 67/68 Report, the 2016 Experience Review, minutes of the 2016 Board of Trustees meetings, and various studies and memos prepared by the System's advisors, staff, and Executive Director. 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 JRS 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, 2016 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, 2016 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 2018 required State contribution calculated under the current statutory funding plan is \$146,766,000. 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 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 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 System.

Assessment of Actuarial Assumptions Used in the 2016 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, 2016 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2016 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. GRS did

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SECTION II - SUMMARY OF RECOMMENDATIONS

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.

Recommended Changes for Future Valuations

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.
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.
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.

GASB 67 and 68

The 2016 JRS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2016 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, have reviewed the assumptions on which it is based, and have 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 the JRS Plan, the Plan'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 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 Methods

State Mandated Funding Method

The Illinois Pension Code (40 ILCS 5/18-131) is limited in meeting the risks of the System. This law requires that the actuary base the required contribution on a prescribed funding method that achieves 90% funding in the year 2045. This does not meet generally acceptable 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, on-going benefits being 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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SECTION III – SUPPORTING ANALYSIS

We recommend that the funding method be changed to at least fully fund future plan benefit accruals to avoid continued systematic underfunding of JRS (Recommendation #2). Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.

Since GRS has concluded that the State mandated funding method does not conform to Actuarial Standards of Practice, the Board adopted a separate funding policy for GASB 67, the Actuarially Determined Contribution, which is based on contributing the annual normal cost plus amortization of the unfunded actuarial liability over a closed 25-year period as a level percent of capped payroll. As of June 30, 2016, the remaining amortization period is 24 years. According to this methodology, the State's contribution amount would be \$168,056,916 for FY 2018. We concur with GRS's recommendations that the System should be funded in accordance with generally accepted actuarial practices.

Based on the draft June 30, 2016 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 34.2%. 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.

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). 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 Plan look to for assessing the Plan's financial conditions. Supplemental reports, such as the stress testing report GRS provided under separate cover for the prior valuation, are may not be publicly identified, and therefore not readily accessible.

Assessment of Actuarial Assumptions Used in the 2016 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 lowered to 6.75% for the draft June 30, 2016 Actuarial Valuation, from 7.00% used for the June 30, 2015 report.

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SECTION III – SUPPORTING ANALYSIS

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

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

We further recommend that the Boards of the three systems whose assets are commingled (JRS, the General Assembly Retirement System (GARS), and the State Employees' Retirement System (SERS)) consider whether different interest rate assumptions for these systems are appropriate (Recommendation #5).

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 2016 Experience Review, it 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 expected arithmetic mean of the JRS portfolio is 7.30% (See page 8 of the GRS April 2016 Experience Review Report). GRS then converted this arithmetic mean to what it refers to as a geometric rate of return of 6.62% that can be seen in the bottom row of the GRS chart below in the 50th percentile column. These figures show that JRS has only a 47.9% chance of meeting the revised assumption of 6.75% (see the fifth column, bottom row). This suggests the Board may want to consider in future years lowering the rate.

| Investment Consultant | Distribution of 20-Year Average Geometric Net Nominal Return | | | Probability of exceeding 6.75% | Probability of exceeding 7.00% |
|-----------------------|--|------------------|------------------|--------------------------------|--------------------------------|
| | 25 th | 50 th | 75 th | | |
| (1) | (2) | (3) | (4) | (6) | (6) |
| 1 | 3.93% | 5.53% | 7.15% | 30.6% | 27.0% |
| 2 | 4.57% | 6.25% | 7.95% | 42.0% | 38.2% |
| 3 | 4.28% | 6.16% | 8.07% | 41.7% | 38.3% |
| 4 | 4.68% | 6.56% | 8.48% | 47.4% | 43.9% |
| 5 | 5.16% | 6.89% | 8.64% | 52.1% | 48.3% |
| 6 | 5.13% | 6.90% | 8.70% | 52.3% | 48.5% |
| 7 | 5.40% | 7.09% | 8.81% | 55.4% | 51.4% |
| 8 | 5.68% | 7.60% | 9.56% | 61.6% | 58.3% |
| Average | 4.85% | 6.62% | 8.42% | 47.9% | 44.2% |

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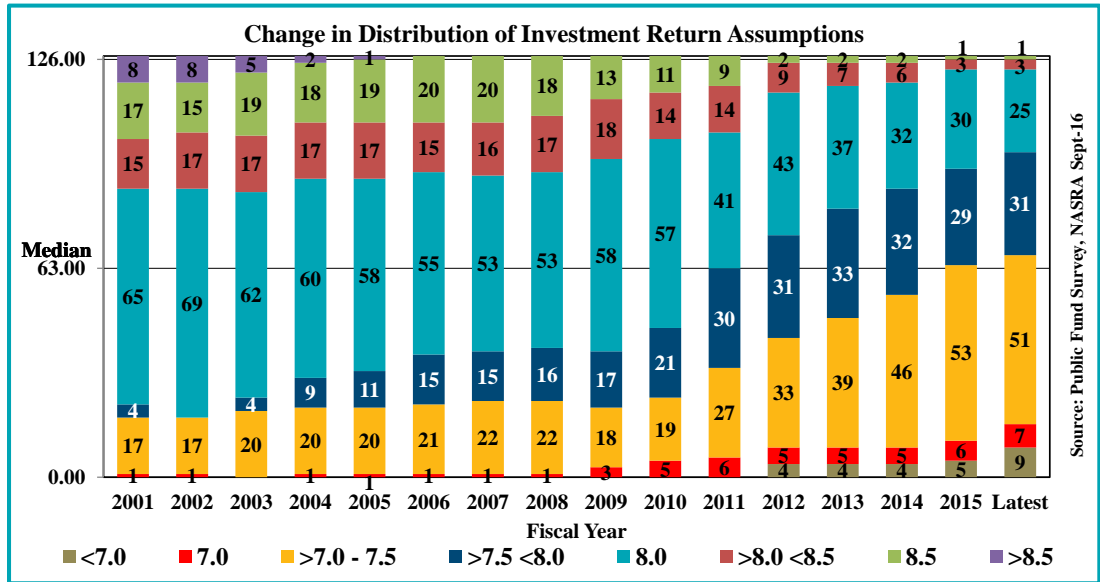
SECTION III – SUPPORTING ANALYSIS

- In GRS's April 2016 Experience Review, it 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 arithmetic mean of the JRS portfolio is 8.32% (See page 8 of the GRS April 2016 Experience Review Report). Similar to what was done in the table above, GRS converted this arithmetic mean to a geometric rate of return with mean of 7.54%. Based on the capital market assumptions provided by Meketa, JRS has a 61.0% chance of meeting the revised 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 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 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 16, 2016, these yields are now 2.22%. This means, back in 1995 in order to achieve 6.75%, a system only had to earn 0.54% more than the ten-year treasury yields ("risk free" rates), whereas today a system would have to earn 4.53% 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 on the equity side of the assets in order to compensate for both declining bond returns and the need to earn 4.53% above the risk free rates of return.
- JRS is projected to have a negative cash flow (contribution income less benefit and expense payout) in Fiscal Year Ending 2020 and the negative cash flow is expected to grow as shown in the graph on page 13 and table 4d of the draft 2016 Actuarial Valuation. When short-term returns are expected to be lower than the long-term expectations, which is the case with JRS, a plan with negative cash flows will have actuarial returns (i.e., dollar-weighted returns) that are less than "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

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assumptions for the last 15 years of its survey. The latest data includes results collected through September 2016.



Over the period shown in the latest survey, there continues to be a pattern of reducing investment return assumptions. Eighty-three of the 127 plans have reduced the interest rate assumption since Fiscal Year 2011. For these 83 plans, the average reduction is 0.42%. The survey is consistent with the experience of other Cheiron clients, with which there has been a significant trend to reduce the investment return assumptions in the last several years.

- New GASB 67 and 68 pronouncements subject many public pension plans to effectively use a lower interest rate for accounting disclosures and pension expense determinations in fiscal years 2014 and later. For example, JRS uses 6.85% as of June 30, 2015 and 6.48% as of June 30, 2016. 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 rate assumptions based on short-term and mid-term bond rates, which are very low (Pension Protection Act of 2006 p. 14. IRC §430(h)(2)(B)).

2. *Inflation Assumption:*

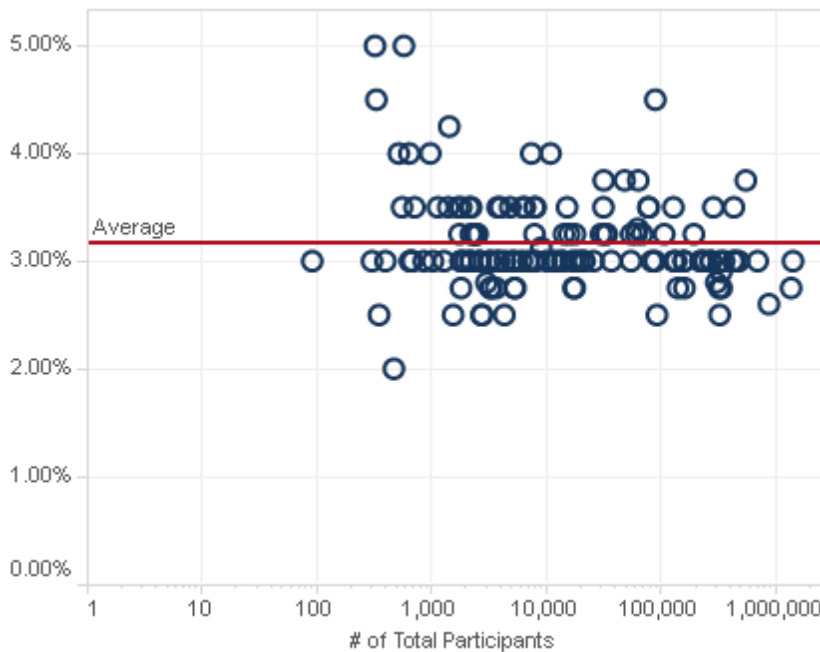
We find that lowering the inflation assumption from 3.00% to 2.75%, which primarily impacts the salary increase assumption used in the draft June 30, 2016 Actuarial Valuation by GRS in certifying the required State contribution, is reasonable.

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Our rationale for concurring with the 2.75% assumption:

- In GRS's April 2016 Experience Review, it surveyed the inflation assumptions of eight independent investment consultants and found they ranged from 2.11% to 2.5%, with an average of 2.27%.
- The June 2016 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/2016/tr2016.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.70%.
- As shown on pages 5 and 6 of the GRS April 2016 Experience 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) November 2015 study provides the following graphic of respondents' inflation assumptions:



Source: NCPERS Public Retirement System Study – November 2015

This shows that the 2.75% assumption, which JRS uses, is on the lower end of the inflation assumptions used among the 179 systems that responded to this study, with 3.2% as the average.

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3. *Salary (Annual Compensation) Increase Assumption:*

The salary scale 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 change in the inflation assumption.

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

- The June 2016 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (between 2026 and 2090) real wage differential will average somewhere between 0.59% and 1.83%.
- This assumption is comprised of inflation and for productivity, which is employer specific, is supported by credible data as shown on pages 11-13 of the April 2016 Experience Review Study performed by GRS.
- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a consistent recent trend of declining salary increases for public sector employees.

4. *Cost of Living Adjustment Assumption:*

While Tier 1 members receive an annual automatic COLA, Tier 2 members receive an annual increase of the lesser of the 3% 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 is reasonable.

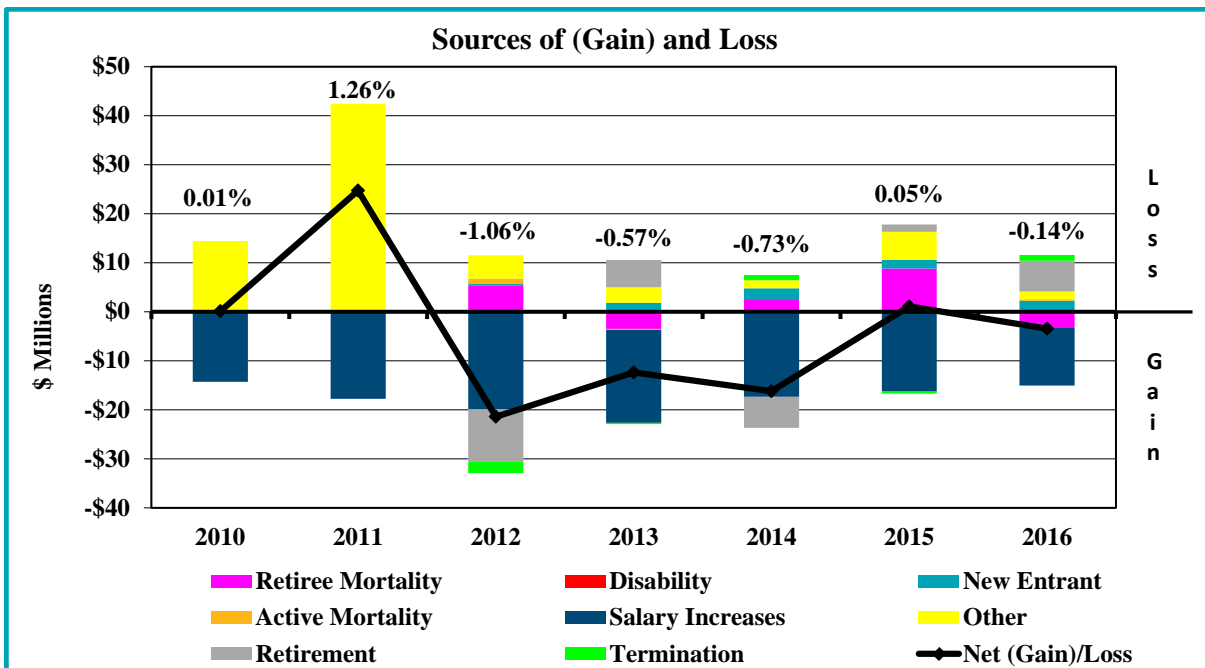
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B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2016 Actuarial Valuation, these are shown on page 18. In the chart below, we have collected similar data from past valuation reports dating back to 2010 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 report, and the results prior to 2012 were provided by the prior actuary, Goldstein and Associates.

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, and below zero represents an experience gain for that year. 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.

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. Retirement experience, retiree mortality, and termination experience have all been volatile over the last five years where experience is provided and have not shown any particular trend.
2. There has been a gain due to salary for each of the last seven years.

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Out of the demographic assumptions, there were three assumptions that were updated for the draft June 30, 2016 Actuarial Valuation based on the April 2016 Experience Review.

1. Mortality

Post-Retirement Mortality

The mortality table was updated to the RP-2014 White Collar Total Healthy Annuitant mortality table 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 scale to reflect future mortality improvement. Page 28 of the April 2016 Experience Review shows that the base table provides a margin of conservatism of 23% based on the experience review for the period July 1, 2012 to June 30, 2015. The combination of a conservative mortality table and projection tables that are more conservative than the recently released MP-2015 and MP-2016 tables may mean there is an overestimate of life expectancy within the valuation.

Pre-Retirement Mortality

The mortality table was updated to the RP-2014 White Collar Total Employee mortality table with generational mortality improvement using the MP-2014 two-dimensional mortality improvement scale to reflect future mortality improvement.

We find the mortality assumption reasonable.

2. Termination

The overall termination rates were increased based on the April 2016 Experience Review.

Illustrative termination rates 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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We find the updated termination assumptions reasonable.

3. Retirement

Overall retirement rates were decreased based on the April 2016 Experience Review.

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 | 11.0% |
| 63 | 12.0% |
| 64 | 13.0% |
| 65 | 14.0% |
| 66 | 15.0% |
| 67 | 30.0% |
| 68-70 | 13.0% |
| 71 | 11.0% |
| 72 | 12.00% |
| 73 | 13.00% |
| 74 | 14.00% |
| 75-79 | 15.00% |
| 80 | 100.00% |

We find the updated retirement assumptions reasonable.

There was one demographic assumption, which was not, analyzed in the April 2016 Experience Review:

- 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

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retirement system. **We recommend that GRS include an additional disclosure as to how this assumption was developed** (Recommendation #6).

We have concluded that all remaining demographic assumptions are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. Disability

No assumption for disability.

2. Spouse's Age

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

3. New Entrants

The new entrant profile includes uncapped and capped salary information. New entrants are assumed to enter with an average age of 47.23, average uncapped pay of \$188,102 and average capped pay of \$115,481. The size of the active group will 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.

4. Decrement Timing

All decrements are assumed to occur beginning of year.

5. Decrement Relativity

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

6. Decrement Operation

Turnover decrements do not operate after member reaches retirement eligibility.

7. Eligibility Testing

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

8. Marriage Assumption

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

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9. Employee Contribution Election

For purposes of the valuation, it is assumed that all judges elect to contribute only on increases in salary when they become eligible for this provision.

10. 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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SECTION III – SUPPORTING ANALYSIS

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 to 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 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 their 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 affect. 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 that fluctuations in the actuarial value of assets will be less volatile over time than fluctuations in the market value of assets. **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, or no less than 80% of market value. In fact, the Internal Revenue Service (IRS), IRC §430(g)(3)(B)(iii), mandates this "corridor" for private sector pension

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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.”

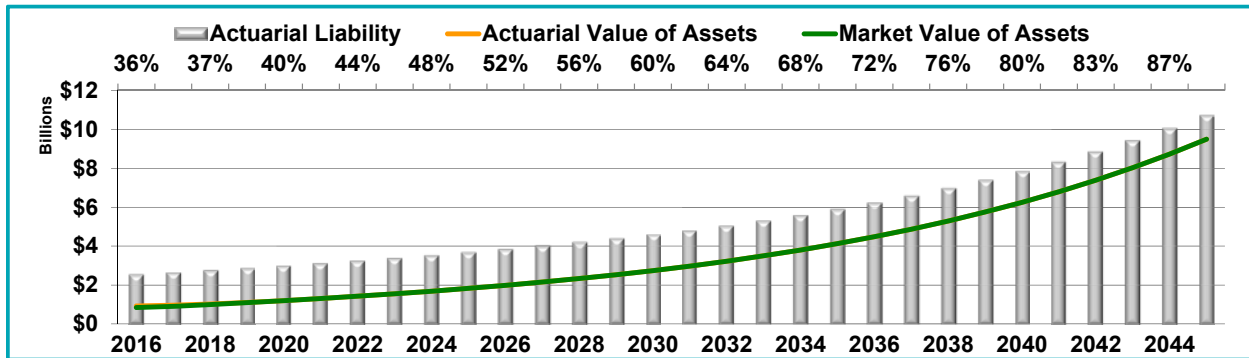
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SECTION IV – PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2016 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 of the contribution requirement performed by the State Actuary to verify that the System's 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 12 of the draft June 30, 2016 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 2030, the funding ratio is approximately 60% with assets being approximately \$2.7 billion and liabilities being approximately \$4.5 billion.

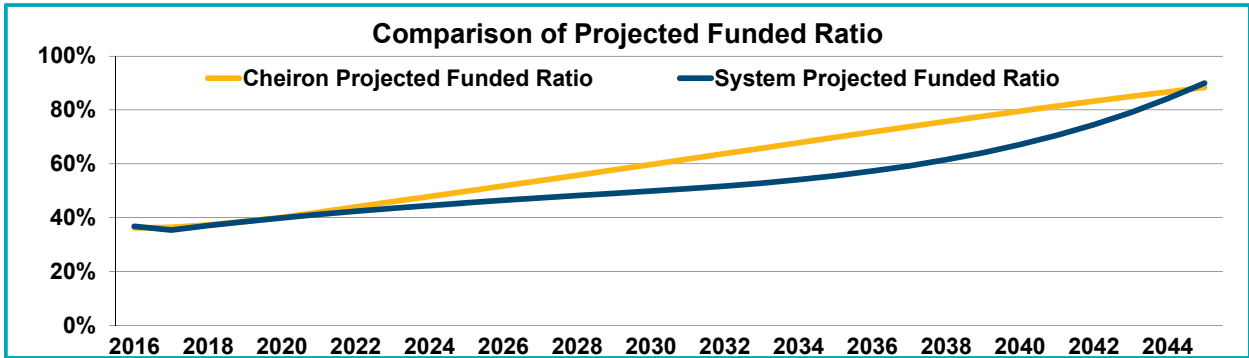


Source: Cheiron projection analysis.

When we compare our projected funding ratio against the results shown in the draft June 30, 2016 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 as expected by Cheiron's approximation. The draft June 30, 2016 Actuarial Valuation shows slightly lower funded ratios due to differences in projection methods.

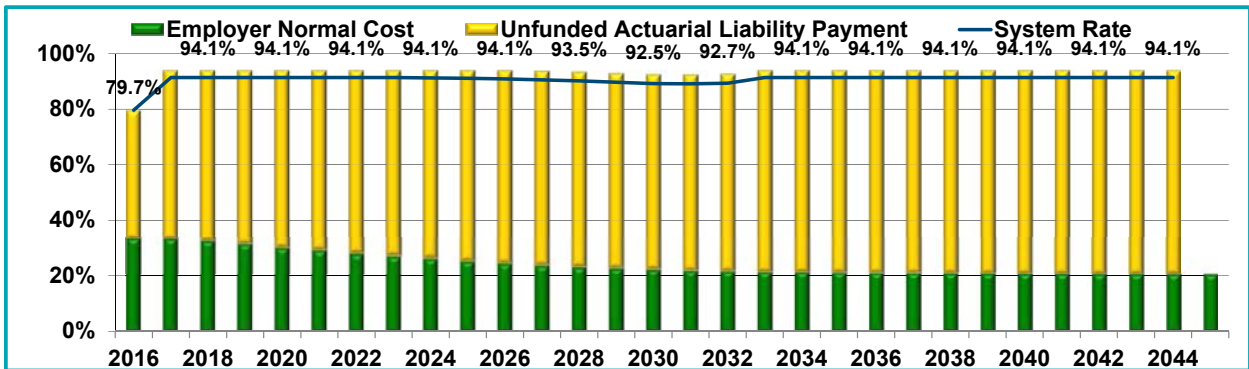
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Source: Cheiron projection analysis.

The following graph shows the expected contributions calculated under the statutory method. The contribution as a percent of payroll is shown above each bar. The value shown for the 2016 year was set based on the June 30, 2015 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2017 (Fiscal Year Ending June 30, 2018). 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, 2016 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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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

Response to Recommendations in 2015

In the State Actuary's Preliminary Report on the Judges' Retirement System of Illinois presented December 19, 2015, 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, 2016 Actuarial Valuation.

| Recommendations to Retirement System from 2015 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 | - Such an actuarial audit had not been performed despite our prior year's recommendation to do so. Recommendation repeated. |
| 2. We 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 | - 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 modified. |
| 3. We continue to recommend that GRS include stress testing of the System within the valuation report and a include detailed explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) will have on the potential unsustainable cost impact that could occur | 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. |

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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|---|------------------------|---|
| during the statutory funding period. | | |
| 4. We continue to recommend the JRS Board annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work, and adjust assumptions accordingly. | Implemented | - An experience study was completed in which the economic assumptions (interest rate and inflation) were reviewed prior to commencing the valuation work. |
| 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. | Not Implemented | - The interest rate used for SERS differs from that used for JRS and GARS. Recommendation repeated. |
| 6. We recommend that when the next experience study is performed, as an alternative base mortality table, GRS review the RP-2000 Annuitant and Non-Annuitant mortality tables to determine if such tables result in a better fit and thus more reasonably project anticipated future plan experience. | Implemented | - An experience study was performed and the mortality tables were updated. |
| 7. We recommend that GRS consider the use of generational mortality improvement assumptions in future valuations. In the event that GRS does not choose to use such assumptions, then we recommend it disclose | Implemented | - An experience study was performed and generational mortality improvement scales were implemented. |

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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|--|--------------------|--|
| its rationale and whether or not the recommended mortality tables sufficiently cover anticipated life expectancy increases through 2045. | | |
| 8. We recommend that in future experience studies, GRS specifically request the investment consultants referenced in developing market expectations to provide longer-term market expectations (30+ years) and that GRS obtain the specific expectations of the investment consultant serving JRS and the Illinois State Board of Investment (ISBI). | Implemented | - Provided in the April 2016 Experience Review. |
| 9. Page 36 of the draft June 30, 2015 Actuarial Valuation discloses that mortality improvement is projected based upon a "static table". As there are multiple mortality improvement scales to be applied to base mortality rates, GRS should fully disclose which projection scale is being utilized in the June 30, 2015 Actuarial Valuation. | Implemented | - The projection scale was not fully disclosed in the final June 30, 2015 Actuarial Valuation Report, however, it was disclosed in the draft June 30, 2016 Actuarial Valuation Report. |
| 10. We recommend that GRS review appropriateness of the 3.75% wage inflation assumption if consistent gains continue in future years. | Implemented | - An experience study was performed and the wage inflation assumption was updated. |

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 2, 2016. The preliminary report was based on Cheiron's review of actuarial assumptions included in GARS' 2016 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the General Assembly Retirement System. GARS' written response, provided on December 15, 2016, can be found in Appendix C.

December 15, 2016

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 Ladies and Gentlemen:

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 2018.

In summary, we believe that the assumptions and methods used in the draft June 30, 2016 Actuarial Valuation, which are used to determine the required Fiscal Year 2018 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 the GRS's determination of the required State Contribution for Fiscal Year 2018. 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, 2016 Actuarial Valuation.

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, summarized census data, the draft June 30, 2016 Actuarial Valuation, the draft 2016 GASB 67/68 Report prepared by GRS, 2016 minutes of the GARS Board of Trustee meetings, 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 the body of our report as 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

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

SIGNED ORIGINAL ON FILE

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

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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) 2018. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the GARS Board to consider before GRS, the GARS actuary, finalizes its certification of the required State contributions to the GARS Board for FY 2018.

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, 2016 Actuarial Valuation, the draft 2016 GASB 67/68 Report, the 2016 Experience Review, minutes of the 2016 Board of Trustees meetings, and various studies and memos prepared by the System's advisors, staff, and Executive Director. 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 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, 2016 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, 2016 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 2018 required State contribution calculated under the current statutory funding plan is \$26,679,000. 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 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 Methods

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. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Assessment of Actuarial Assumptions Used in the 2016 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, 2016 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2016 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. GRS did

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SECTION II - SUMMARY OF RECOMMENDATIONS

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.

Recommended Changes for Future Valuations

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, as they did for this valuation.
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.
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.

GASB 67 and 68

The 2016 GARS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2016 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, have reviewed the assumptions on which it is based, and have 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 the GARS Plan, the Plan's low funded ratio, the recent changes in legal requirements, and guidance issued by the Government Finance Officers Association, we are recommending 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 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 Methods

State Mandated Funding Method:

The Illinois Pension Code (40 ILCS 5/2-124) is limited in meeting the risks of 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 acceptable 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, on-going benefits being 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 3.14.1 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 recommend that the funding method be changed to at least fully fund future plan benefit accruals to avoid continued systematic underfunding of GARS (Recommendation #2). Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable.

Since GRS has concluded that the State mandated funding method does not conform to Actuarial Standards of Practice, the Board adopted a separate funding policy for GASB 67, the Actuarially Determined Contribution, which is based on contributing the annual normal cost plus amortization of the unfunded actuarial liability over a closed 20-year period as a level percent of capped payroll. As of June 30, 2016, the remaining amortization period is 19 years. According to this methodology, the State's contribution amount would be \$32,082,644 for FY 2018. We concur with GRS's recommendations that the System should be funded in accordance with generally accepted actuarial practices.

Based on the draft June 30, 2016 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial accrued liability, is currently at 13.99%. 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). 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 Plan look to for assessing the Plan'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.

Assessment of Actuarial Assumptions Used in the 2016 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 lowered to 6.75% for the draft June 30, 2016 Actuarial Valuation, from 7.00% used for the June 30, 2015 report.

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After reviewing all the materials (see Appendix B of this report) that were made available, Cheiron concludes that lowering the interest rate to 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 #4).

We further recommend that the Boards of the three systems whose assets are commingled (GARS, the Judges' Retirement System (JRS), and the State Employees' Retirement System (SERS)) consider whether different interest rate assumptions for these systems are appropriate (Recommendation #5).

Our rationale for this recommendation is as follows:

- 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 2016 Experience Review, it 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 expected arithmetic mean of the GARS portfolio is 7.30% (See page 8 of the GRS April 2016 Experience Review Report). GRS then converted this arithmetic mean to what it refers to as a geometric rate of return of 6.62% that can be seen in the bottom row of the GRS chart below in the 50th percentile column. These figures show that GARS has only a 47.9% chance of meeting the revised assumption of 6.75% (see the fifth column, bottom row). This suggests the Board may want to consider in future years lowering the rate.

| Investment Consultant | Distribution of 20-Year Average Geometric Net Nominal Return | | | Probability of exceeding 6.75% | Probability of exceeding 7.00% |
|-----------------------|--|------------------|------------------|--------------------------------|--------------------------------|
| | 25 th | 50 th | 75 th | | |
| (1) | (2) | (3) | (4) | (6) | (6) |
| 1 | 3.93% | 5.53% | 7.15% | 30.6% | 27.0% |
| 2 | 4.57% | 6.25% | 7.95% | 42.0% | 38.2% |
| 3 | 4.28% | 6.16% | 8.07% | 41.7% | 38.3% |
| 4 | 4.68% | 6.56% | 8.48% | 47.4% | 43.9% |
| 5 | 5.16% | 6.89% | 8.64% | 52.1% | 48.3% |
| 6 | 5.13% | 6.90% | 8.70% | 52.3% | 48.5% |
| 7 | 5.40% | 7.09% | 8.81% | 55.4% | 51.4% |
| 8 | 5.68% | 7.60% | 9.56% | 61.6% | 58.3% |
| Average | 4.85% | 6.62% | 8.42% | 47.9% | 44.2% |

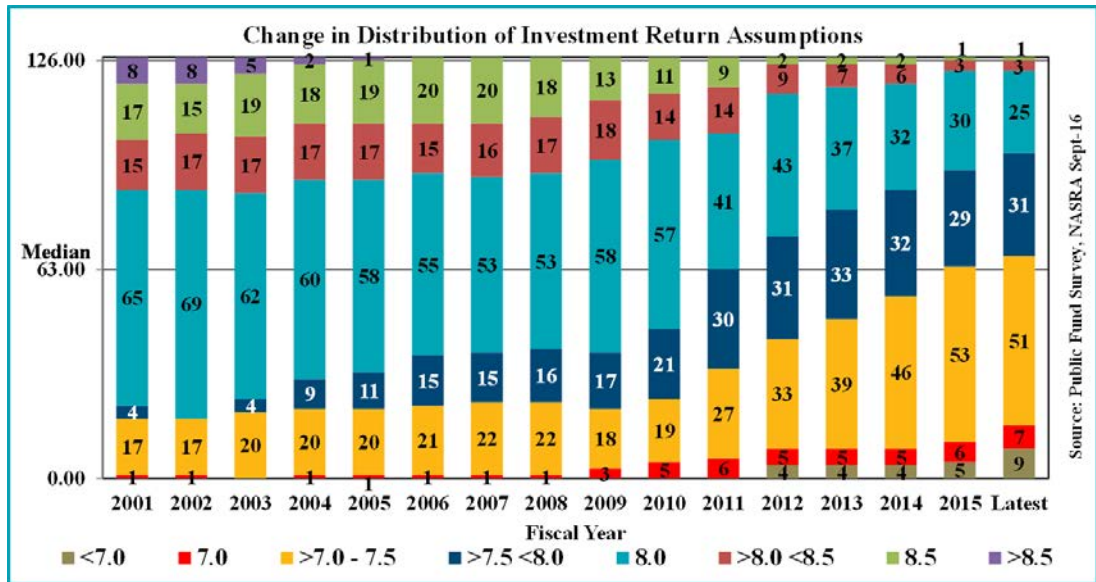
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- In GRS's April 2016 Experience Review, it also presented the expectation of the Illinois State Board of Investment's investment consultant Meketa Investment Group. After adjusting for GRS's assumed rate of inflation, Meketa's expected arithmetic mean of the GARS portfolio is 8.32% (See page 8 of the GRS April 2016 Experience Review Report). Similar to what was done in the table above, GRS converted this arithmetic mean to a geometric rate of return with mean of 7.54%. Based on the capital market assumptions provided by Meketa, GARS has a 61.0% chance of meeting the revised 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 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 16, 2016, these yields are now 2.22%. This means, back in 1995 in order to achieve 6.75%, a system only had to earn 0.54% more than the ten-year treasury yields ("risk free" rates), whereas today a system would have to earn 4.53% 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 on the equity side of the assets in order to compensate for both declining bond returns and the need to earn 4.53% above the risk free rates of return.
- As is the case with most maturing pension plans, GARS is experiencing negative cash flows measured as contributions less benefits and expenses. GARS' negative cash flow is 10% of assets. This negative cash flow is expected to grow in the coming years as shown in the graph on page 13 and table 4d of the draft 2016 Actuarial Valuation. When short-term returns are expected to be lower than the long term expectations, which is the case with GARS, a plan with negative cash flows will have actuarial returns (i.e., dollar weighted returns) that are less than "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 last 15 years of the survey. The latest data includes results collected through September 2016.

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Over the period shown in the latest survey, there continues to be a pattern of reducing investment return assumptions. Eighty-three of the 127 plans have reduced the interest rate assumption since Fiscal Year 2011. For these 83 plans, the average reduction is 0.42%. The survey is consistent with the experience of other Cheiron clients, with which there has been a significant trend to reduce the investment return assumptions in the last several years.

- New GASB 67 and 68 pronouncements subject many public pension plans to effectively use a lower interest rate for accounting disclosures and pension expense determinations in fiscal years 2014 and later. For example, GARS uses 6.91% as of June 30, 2015 and 6.60% as of June 30, 2016. 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 rate assumptions based on short-term and mid-term bond rates, which are very low (Pension Protection Act of 2006 p. 14. IRC §430(h)(2)(B)).

2. Inflation Assumption:

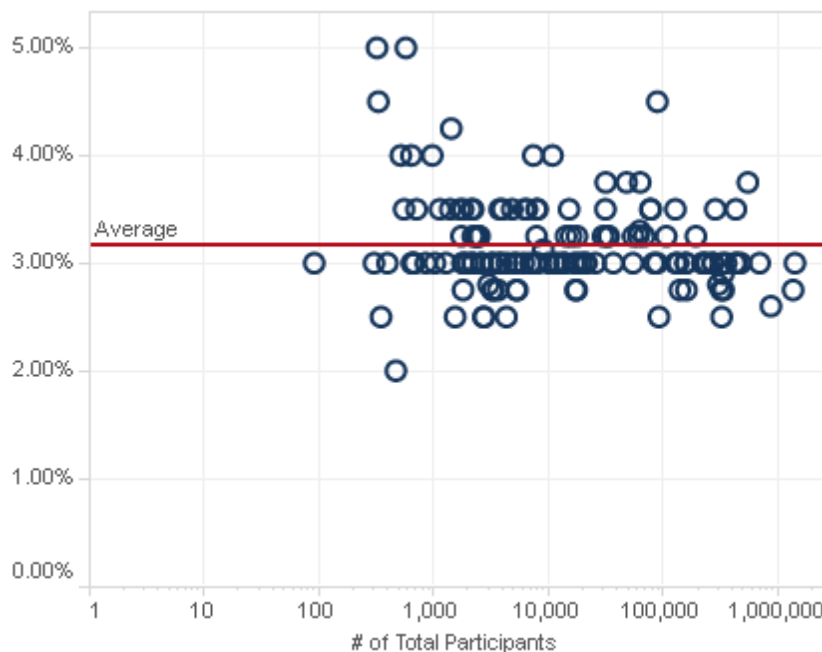
We find that lowering the inflation assumption from 3.00% to 2.75%, which primarily impacts the salary increase assumption used in the draft June 30, 2016 Actuarial Valuation by GRS in certifying the required State contribution, is reasonable.

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Our rationale for concurring with the 2.75% assumption:

- In GRS's April 2016 Experience Review, it surveyed the inflation assumptions of eight independent investment consultants and found they ranged from 2.11% to 2.5%, with an average of 2.27%.
- The June 2016 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/2016/tr2016.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.70%.
- As shown on pages 5 and 6 of the GRS April 2016 Experience 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) November 2015 study provides the following graphic of respondents' inflation assumption:



Source: NCPERS Public Retirement System Study – November 2015

This shows that the 2.75% assumption, which GARS uses, is on the lower end of the inflation assumptions used among the 179 systems that responded to this study, with 3.2% as the average.

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3. *Salary (Annual Compensation) Increase Assumption:*

The salary scale 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 2017.

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

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

- The June 2016 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (between 2026 and 2090) real wage differential will average somewhere between 0.59% and 1.83%.
- This assumption is comprised of inflation and productivity, which is employer specific. It is supported by credible data as shown on pages 12 and 13 of the April 2016 Experience Review performed by GRS.
- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a consistent recent trend of declining salary increases for public sector employees.

4. *Cost of Living Adjustment Assumption:*

While Tier 1 members receive an annual automatic COLA of 3%, Tier 2 members receive an annual increase of the lesser of the 3% COLA received by Tier 1 and the annual change in the Consumer Price Index for all Urban Consumers.

We find the assumption as 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 is reasonable.

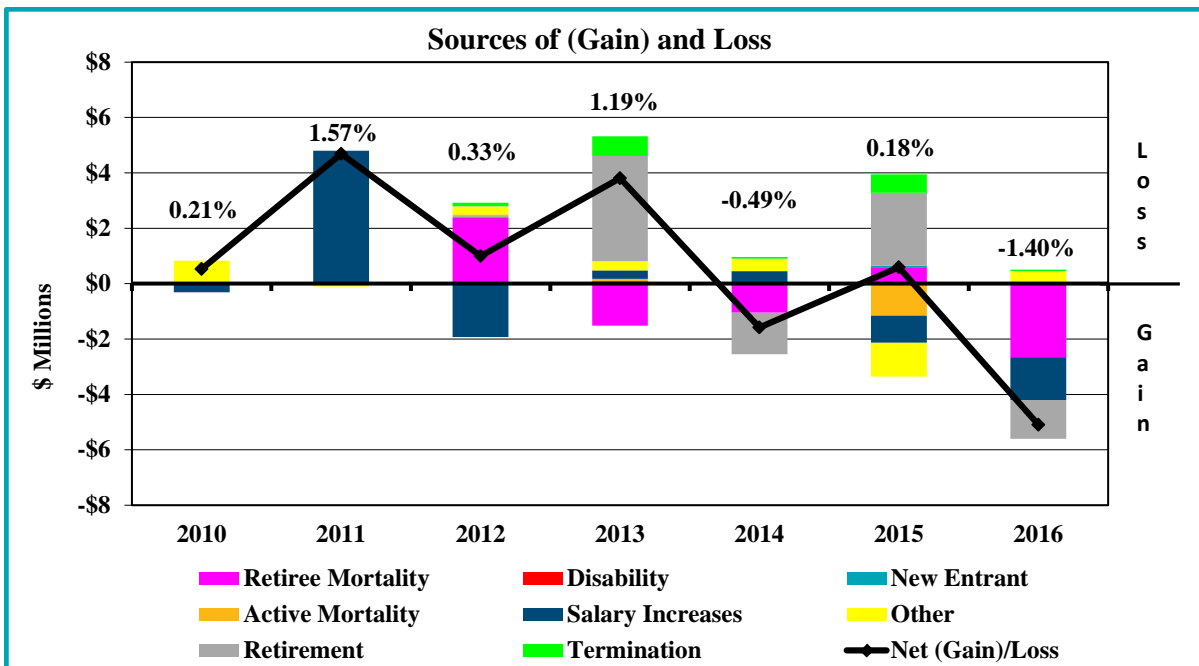
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B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2016 Actuarial Valuation, these are shown on page 18. In the chart below, we have collected similar data from past valuation reports dating back to 2010 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 below shows the pattern of annual gains and losses attributable to different sources as shown in the legend above. When the colored bar slices appear above zero on the Y axis that represents an experience loss, and below zero represents an experience gain for that year. The net liability (gain)/loss are shown by the black line on the first graph above. This net (gain)/loss as a percent of liability are 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. 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 seven years, total payroll has decreased significantly over the period and the average pay has been relatively stable.
5. Certain types of experience, such as disability experience and new entrant experience, are too small to be noticed on the chart, given their insignificant size relative to other experience items.

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Out of the demographic assumptions, there were three assumptions that were updated for the draft June 30, 2016 Actuarial Valuation based on the April 2016 Experience Review.

1. Mortality

Post-Retirement Mortality

The mortality table was updated to the RP-2014 White Collar Total Healthy Annuitant mortality table 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 scale to reflect future mortality improvement. Page 27 of the April 2016 Experience Review shows that the base table provides a margin of conservatism of 19% based on the experience review for the period July 1, 2012 to June 30, 2015. The combination of a conservative mortality table and projection tables that are more conservative than the recently released MP-2015 and MP-2016 tables may mean there is an overestimate of life expectancy within the valuation.

Pre-Retirement Mortality

The mortality table was updated to the RP-2014 White Collar Total Employee mortality table with generational mortality improvement using the MP-2014 two-dimensional mortality improvement scale to reflect future mortality improvement.

We find the mortality assumption reasonable.

2. Termination

The termination rate for Tier 1 members, and Tier 2 members with more than five years of service, was increased to 5% based on the April 2016 Experience Review. In addition, the termination rate for Tier 2 members with less than five years was increased to 10%.

We find the updated termination assumptions reasonable.

3. Retirement

The overall retirement rates were increased based on the April 2016 Experience Review.

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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% |

We find the updated retirement assumptions reasonable.

There was one demographic assumption which was not analyzed in the April 2016 Experience Review:

- 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 (Recommendation #6).

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We have concluded that all remaining demographic assumptions are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. Marriage Assumption

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

2. Disability

No assumption for disability.

3. New Entrants

The new entrant profile includes uncapped and capped salary information. New entrants are assumed to enter with an average age (41.84), average uncapped pay of \$79,576, and average capped pay of \$80,317. 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 141 members as of the valuation date, to 72 members in 2045 and ultimately reach 71 members in 2049. The average increase in uncapped payroll for the projection period is 3.00% per annum.

4. Spouse's Age

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

5. Decrement Timing

All decrements are assumed to occur at the beginning of the year.

6. Decrement Relativity

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

7. Decrement Operation

Turnover decrements do not operate after member reaches retirement eligibility.

8. Eligibility Testing

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

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SECTION III - SUPPORTING ANALYSIS

9. 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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SECTION III - SUPPORTING ANALYSIS

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 5/2). **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 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 their 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 affect. It should also be noted that the EAN method is the required method to calculate liability for GASB 67 and 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 that the fluctuations in the actuarial value of assets will be less volatile over time than fluctuations in the market value of assets. **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, or no less than 80% of market value. In fact, the Internal Revenue Service (IRS), IRC §430(g)(3)(B)(iii), mandates this "corridor" for private sector pension

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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."

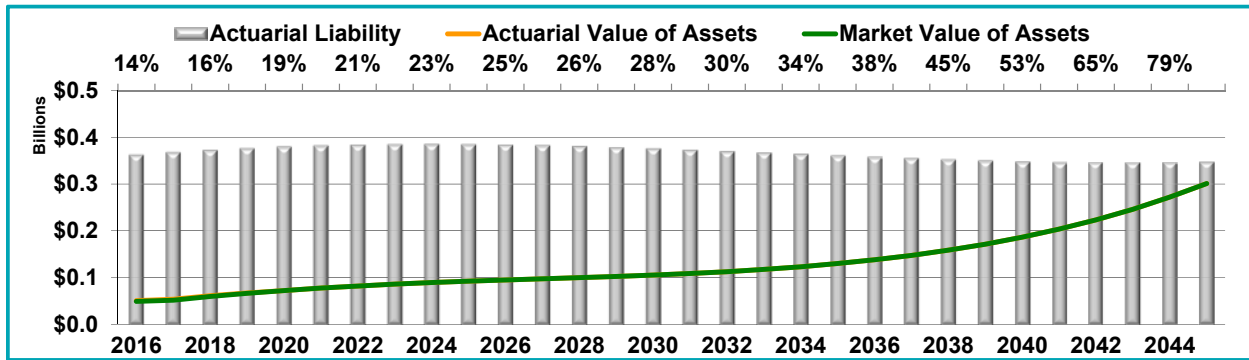
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SECTION IV - PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2016 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 of the contribution requirement performed by the State Actuary to verify that the System's 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 12 of the draft June 30, 2016 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 2030, the funding ratio is approximately 28% with assets being approximately \$105 million and liabilities being approximately \$375 million.

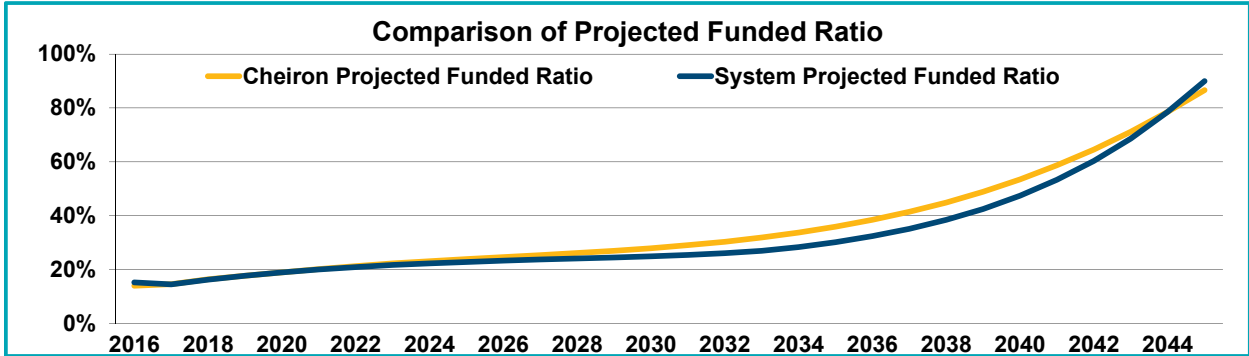


Source: Cheiron projection analysis.

When we compare our projected funding ratio against the results shown in the draft June 30, 2016 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 as expected by Cheiron's approximation. The draft June 30, 2016 Actuarial Valuation shows slightly lower funded ratios due to differences in projection methods.

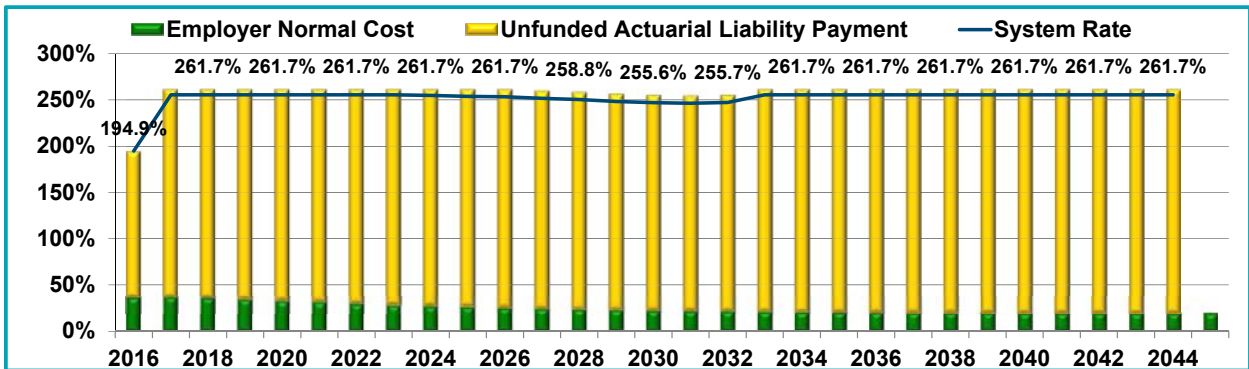
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SECTION IV - PROJECTION ANALYSIS



Source: Cheiron projection analysis.

The following graph shows the expected contributions calculated under the statutory method. The contribution as a percent of payroll is shown above each bar. The value shown for the 2016 year was set based on the June 30, 2015 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2017 (Fiscal Year Ending June 30, 2018). 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, 2016 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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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

Response to Recommendations in 2015

In the State Actuary's Preliminary Report on the General Assembly Retirement System of Illinois presented December 19, 2015, 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, 2016 Actuarial Valuation.

| Recommendations to Retirement System from 2015 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 | - Such an actuarial audit had not been performed despite our prior year's recommendation to do so. Recommendation repeated. |
| 2. We 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 | - 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 modified. |
| 3. We continue to recommend that GRS include stress testing of the System within the valuation report and include a detailed explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower | 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. |

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|--|------------------------|---|
| salary growth) will have on the potential unsustainable cost impact that could occur during the statutory funding period. | | Recommendation modified. |
| 4. We continue to recommend the GARS Board annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work, and adjust assumptions accordingly. | Implemented | - An experience study was completed in which the economic assumptions (interest rate and inflation) were reviewed prior to commencing the valuation work. |
| 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. | Not Implemented | - The interest rate used for SERS differs from that used for JRS and GARS. Recommendation repeated. |
| 6. We recommend that in future experience studies, GRS specifically request the investment consultants referenced in developing market expectations to provide longer-term market expectations (30+ years) and that GRS also obtain the specific expectations of the investment consultant serving GARS and the Illinois State Board of Investment (ISBI). | Implemented | - Provided in the April 2016 Experience Review. |
| 7. The draft June 30, 2015 Actuarial Valuation contains | Removed | - The classification of "Other" activity was not broken-out further in the |

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|--|--------------------|--|
| <p>an exhibit on page 18 which reconciles Gain / Loss activity by source, one of which is due to "Other" activity. We recommend that the classification of "Other" activity be broken-out further so that the resulting impact can be understood and reviewed for reasonableness.</p> | | <p>June 30, 2016 Actuarial Valuation. However, this item was small relative to the other gain/loss activities.</p> <p style="text-align: center;">Recommendation removed.</p> |
| <p>8. We recommend that when the next experience study is performed, as an alternative base mortality table, GRS review the RP-2000 Annuitant and Non-Annuitant mortality tables to determine if such tables result in a better fit and thus more reasonably project anticipated future plan experience.</p> | Implemented | <p>- An experience study was performed and the mortality tables were updated.</p> |
| <p>9. We recommend that GRS consider the use of generational mortality improvement assumptions in future valuations. In the event that GRS does not choose to use such assumptions, then we recommend it disclose its rationale and whether or not the recommended mortality tables sufficiently cover anticipated life expectancy increases through 2045.</p> | Implemented | <p>- An experience study was performed and generational mortality improvement scales were implemented.</p> |
| <p>10. Page 36 of the draft June 30, 2015 Actuarial Valuation discloses that mortality</p> | Implemented | <p>- The projection scale was not fully disclosed in the final June 30, 2015 Actuarial Valuation, however, it was</p> |

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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PURSUANT TO 30 ILCS 5/2-8.1**

STATUS OF RECOMMENDATIONS FROM THE 2015 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2015 State Actuary Report | Status | Comments |
|--|------------------------|---|
| improvement is projected based upon a "static table". As there are multiple mortality improvement scales that can be applied to base mortality rates, GRS should fully disclose which projection scale is being utilized in the June 30, 2015 Actuarial Valuation. | | disclosed in the draft June 30, 2016 Actuarial Valuation. |
| 11. The draft June 30, 2015 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. | Not Implemented | - Additional disclosure as to how the 10% load was developed was not disclosed in the June 30, 2016 Actuarial Valuation. Recommendation repeated. |
| 12. We recommend that GRS review appropriateness of the salary increase assumption and total payroll assumption in future valuations. | Implemented | - An experience study was performed and the wage inflation assumption was updated. |

APPENDICES

APPENDIX A

**Illinois State Auditing Act
(30 ILCS 5/2-8.1)**

(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.)

APPENDIX B
Materials Reviewed by Cheiron

MATERIALS REVIEWED BY CHEIRON

Following is a listing of information reviewed by Cheiron for each of the five State funded 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
- 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 Board Meeting Presentation
 - Board Meeting Minutes and Agendas from 2013-2016
 - Buck IL TRS 2007-2015 Valuation Reports
 - Segal IL TRS 2016 Valuation Report
 - Buck IL TRS 2012-2015 Certifications of Required State Contribution
 - Segal IL TRS 2016 Certification of Required State Contribution
 - Buck IL TRS Experience Analysis Reports for 2007, 2012, 2015
 - Segal IL TRS Experience Analysis 2016
 - 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
 - November 2015 *National Conference on Public Employee Retirement Systems* (NCPERS) Public Retirement Systems Study
 - September 2016 Survey published by the National Association of State Retirement Agencies (NASRA)
 - June 2016 *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

- Files received from the State Universities Retirement System:
 - Board Meeting Minutes and Agendas from 2013-2016
 - GRS IL SURS 2008-2016 Valuation Reports
 - GRS IL SURS 2012 - 2016 Certifications of Required State Contribution
 - GRS IL SURS DRAFT 2014-2016 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 2016
 - 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
 - November 2015 *National Conference on Public Employee Retirement Systems* (NCPERS) Public Retirement Systems Study
 - September 2016 Survey published by the National Association of State Retirement Agencies (NASRA)
 - June 2016 *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

- 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 2013-2016

- GRS IL SERS 2007-2016 Valuation Reports
- GRS IL SERS 2012-2016 Certifications of Required State Contribution
- GRS IL SERS spreadsheet with additional details on Tables 4 and 7-10 from 2014 & 2015 AVR
- SERS IL spreadsheet with additional details on Funding Projections
- GRS IL SERS DRAFT 2014-2016 GASB 67/68 Reports
- GRS IL SERS Stress Testing Scenarios
- ISBI Fund Evaluation Reports 2015-2016
- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - November 2015 *National Conference on Public Employee Retirement Systems* (NCPERS) Public Retirement Systems Study
 - September 2016 Survey published by the National Association of State Retirement Agencies (NASRA)
 - June 2016 *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
- Files received from the Judges' Retirement System:
 - JRS Experience Review for July 1, 2012 to June 30, 2015
 - Goldstein & Associates JRS 2006 – 2011 Valuation Reports
 - GRS IL JRS 2012 – 2016 Valuation Reports
 - GRS IL JRS 2012 – 2016 Certifications of Required State Contributions
 - Board Meeting Minutes and Agendas from 2013 and 2016
 - GRS IL JRS spreadsheet with additional details on Tables 4 and 7-10 from 2014 – 2016 Valuation Reports
 - GRS JRS Stress Testing Scenarios
 - GRS JRS 2015 – 2016 DRAFT GASB 67 and 68 Reports
- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - November 2015 *National Conference on Public Employee Retirement Systems* (NCPERS) Public Retirement Systems Study
 - September 2016 Survey published by the National Association of State Retirement Agencies (NASRA)
 - June 2016 *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

- Files received from the General Assembly Retirement System:
 - GARS Experience Review for July 1, 2012 to June 30, 2015
 - Goldstein & Associates GARS 2006 – 2011 Valuation Reports
 - GRS IL GARS 2012 – 2016 Valuation Reports
 - GRS IL GARS 2012 – 2016 Certifications of Required State Contributions
 - Board Meeting Minutes and Agendas from 2013 – 2016
 - GRS IL GARS spreadsheet with additional details on Tables 4 and 7-10 from 2014 – 2016 Valuation Reports
 - GRS GARS Stress Testing Scenarios
 - GRS GARS 2015 – 2016 DRAFT GASB 67/68 Reports

- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - November 2015 *National Conference on Public Employee Retirement Systems* (NCPERS) Public Retirement Systems Study
 - September 2016 Survey published by the National Association of State Retirement Agencies (NASRA)
 - June 2016 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)

APPENDIX C

Responses from the Retirement Systems



TEACHERS' RETIREMENT SYSTEM OF THE STATE OF ILLINOIS

Richard W. Ingram, Executive Director
2815 West Washington Street, P.O. Box 19253
Springfield, Illinois 62794-9253

December 8, 2016

VIA ELECTRONIC MAIL (jbutcher@auditor.illinois.gov)

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 Cheiron, the state actuary, on the preliminary 2016 actuarial valuation prepared by Segal Consulting. We see that Cheiron did not recommend any changes in the assumptions or methods used to calculate the FY 2018 state funding requirement under current law. We appreciate Cheiron's careful review.

TRS and Segal have discussed Cheiron's suggestions and offer the following joint response.

State Mandated Funding Method

- 1) Cheiron continues to recommend that the funding method be changed to at least fully fund future benefit accruals to avoid continued systematic underfunding. 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 the retirement system.**

We agree that the current funding methodology does not follow Actuarial Standards of Practice. The TRS board of trustees has demonstrated its concern over inadequate funding since 2012 by certifying alternative funding requirements that are consistent with standard actuarial practice.

Cheiron reviewed Segal's alternative calculation for the FY 2018 state contribution under "Actuarial Math 2.0." The state actuary confirms that the alternative funding method conforms to a goal of full funding within a reasonable period of time and that Segal's calculation is correct.

In the discussion of the amortization method under Actuarial Math 2.0, Cheiron suggests disclosing the rationale for the 2 percent assumption for growth in state revenue. We will include that discussion in next year's report.

Recommended Additional Disclosures for the 2016 Valuation

- 2) Cheiron recommends that Segal expand the stress testing of the System within the valuation report and include a detailed explanation of the implications that volatile investment returns and a variety of stressors (e.g., membership declines, lower salary growth) will have on the potential unsustainable cost impact that could occur during the statutory funding period. Cheiron expresses concern that TRS is at risk of insolvency following a severe market downturn.**

Segal does not feel it is appropriate to include more extensive insolvency scenarios in the valuation. Their view is consistent with that of our former actuary, Buck Consultants.

During the October 2016 board meeting, when Segal presented the preliminary valuation results, they included a discussion of insolvency scenarios. This presentation is posted on our website. At the April 2017 board retreat, Segal will present additional insolvency scenarios. Those scenarios will be modeled in conjunction with the asset allocation study that our investment consultant, RVK, will be presenting at the retreat.

We agree with Cheiron that the risks to the system of continued underfunding are very serious. However, our judgment is that the board is better served by educational sessions designed to help trustees meet their fiduciary responsibilities. Most educational materials are later available to the public,

Recommended Changes for Future Valuations

- 3) Cheiron recommends that the TRS board continue its annual review of the interest (investment return) and inflation assumptions before starting the valuation work and adjust assumptions accordingly.**

The TRS actuaries have been reviewing the interest and inflation assumptions each year since Cheiron made this suggestion. The 2016 analysis led to a reduction in the assumed rate of return, from the 7.5 percent adopted in 2014 to the current 7.0 percent. TRS will continue reviewing both assumptions annually.

- 4) Cheiron recommends that Segal provide discussion and quantification of the impact of the one-year data lag for participant information. (Member information as of June 30, 2015 was used for the June 30, 2016 valuation.)**

Page 18 of the preliminary 2016 valuation states that any changes in liabilities due to demographic experience during the most recent plan year are captured during the subsequent valuation. In the June 30, 2017 valuation, Segal will be in its second year as actuary and in a better position to make a comparison based on data it prepared for both years. Segal does not believe the impact would be significant but is likely to include an analysis of the data lag next year.

Mr. Joe Butcher
December 8, 2016
Page 3

We would be happy to discuss any of these points with you or Cheiron. Thank you for the opportunity to respond.

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 14, 2016

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

Re: Response to the State Actuary Report of 2016

Dear General Mautino:

This is the official response from the State Universities Retirement System of Illinois (SURS) regarding the recommendations from The State Actuary's Preliminary Report on the State Universities Retirement System of Illinois under Public Act 097-694.

Attached to this response is a detailed response for each of the recommendations from our actuary, Gabriel Roeder Smith & Company (GRS).

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: While the funding policy is established by the legislature and is not under the control of the Board, the Board supports full funding and will continue to communicate that support to the legislature.

Recommended Changes for Future Valuations

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 funded status of the System.

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 five alternative investment and two alternative future member plan election scenario stress tests to the State Actuary. The results of the stress test will be forwarded with our certification letter.

2. **The State Actuary recommends the SURS board consider lowering the current 7.25% interest rate assumption to 7.0% or lower and that rate should be developed taking into account the negative cash flow of SURS and the anticipated future interest rate environment.**

Response: An economic study was completed by GRS and presented to the SURS Board September 2015. The board approved to maintain the current assumptions at the December 2015 meeting. The board will review the economic assumption again at the March 2017 meeting.

3. **The State Actuary recommends the Board annually review the economic assumptions.**

Response: The Board reviews the economic assumptions annually and will continue to do so.

Please do not hesitate to call me if you have any questions or concerns with our response to the recommendations.

Sincerely,

SIGNED ORIGINAL ON FILE

Martin Noven
Executive Director

Encl: Gabriel Roeder Smith & Company Response to State Actuary Report of 2016

cc: Mike Noble, Cheiron
Joseph Butcher, Office of the Auditor General
Ameen Dada, Office of the Auditor General
Heather Powell, BKD, LLP

December 6, 2016

Board of Trustees
State Universities Retirement System of Illinois
1901 Fox Drive
Champaign, Illinois 61820

Re: Response to State Actuary Report of 2016

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 Universities Retirement System of Illinois (“SURS”) Pursuant to 30 ILCS 5/2-8.1. This report was a review of the June 30, 2016, actuarial valuation prepared by Gabriel, Roeder, Smith & Company.

Assessment of Actuarial Assumptions and Methods Used in the 2016 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, 2016, Actuarial Valuation, which are used to determine the required Fiscal Year 2018 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, 2016 actuarial valuation is prescribed in accordance with Article 15 of the Illinois Pension Code and is not under the actuary or the Board’s control; therefore, no action is required. We note that the 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.

Assessment of Actuarial Assumptions Used in the 2016 Valuation

Cheiron states “We have reviewed all the actuarial assumptions used in the State Universities Retirement System’s draft June 30, 2016 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.”

Recommended Changes for Future Valuations

Recommendation #2 is to include stress testing within the actuarial valuation report and include an explanation of the implications that volatile investment returns and a variety of stressors may have on the sustainability of the level of statutory contributions during the statutory funding period.

As Cheiron noted, GRS included language in the actuarial valuation report of the implications of assumptions not being met. In addition, GRS did provide alternative stress testing scenarios to SURS in a separate letter (i.e., not in the actuarial valuation report), which was noted by Cheiron on page A-1 of the State Actuary's Preliminary Report.

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 volume of information and number of exhibits that are already included in the actuarial valuation report, adding an additional section to the report with the stress testing analysis may add confusion to the users of the actuarial valuation report.

Recommendation #3 is that the Board consider lowering the current 7.25% interest rate assumption to 7.00% or lower and that rate should be developed taking into account the negative cash flow of SURS and the anticipated future rate environment.

Based on analysis by GRS and the SURS investment consultant, there was expected to be higher than a 50% probability of meeting the long-term current assumption of 7.25% over the next 20 to 30 years. We believe that the asset allocation and capital market assumptions reflect SURS' negative cash flow situation and long-term expectations. Therefore, in our opinion, the current investment return assumption of 7.25% is reasonable based on the most recent analysis. GRS and the Board will continue to annually review the economic assumptions and reduce the interest rate assumption, when appropriate.

Recommendation #4 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 2016 Board meeting and voted to keep the same economic assumptions for the actuarial valuation as of June 30, 2016, that were used for the actuarial valuation as of June 30, 2015. 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
Senior Consultant and Team Leader

SIGNED ORIGINAL ON FILE

Amy Williams, ASA, MAAA
Consultant

AW:kb

cc: David Kausch, Gabriel, Roeder, Smith & Company
Kristen Brundirks, Gabriel, Roeder, Smith & Company



December 15, 2016

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, 2016 Actuarial Valuation, prepared by Gabriel, Roeder, Smith and Company. The report notes the State Actuary (Cheiron) believes **"the assumptions and methods used in the draft June 30, 2016 Actuarial Valuation, which are used to determine the required Fiscal Year 2018 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 five 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 recommends 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: SERS is preparing a Request For Proposal (RFP) for the completion of a full scope actuarial audit to be performed during FY 2017. Management expects the RFP will generate several proposals, and the full scope actuarial audit will be completed if the budgetary resources allow. It should be noted the Commission on Government Forecasting and Accountability (CoGFA) prepares parallel valuations annually using the SERS membership data, assumptions and methodology.

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 SERS. 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.

Recommended Additional Disclosures for 2016 Valuation

- 3. Cheiron recommends SERS include stress testing of the System within the valuation report and include detailed explanation of the implications that volatile investment returns and a variety of other stressors (e.g. membership declines, lower salary growth) will have on the potential unsustainable cost impact that could occur during the statutory funding period. GRS did not include stress testing in this year's report; however, they did include in the report the various explanations on the implications of assumptions not being met.**

Response: SERS and GRS will add stress testing results to the FY 2016 valuation report.

Recommended Changes for Future Valuations

- 4. Cheiron recommends 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.**

Response: The Board of Trustees will continue to annually review the economic assumptions in a manner (April and July Board meetings) that will allow adjustments to the assumptions to be included in the next valuation.

- 5. Cheiron recommends 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.**

Response: GRS will continue to annually review the liquidity requirements, projected funded status, and contribution requirements in order to evaluate the appropriateness of using different interest rate assumptions for each respective plan.

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 15, 2016

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 2016 – 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, 2016, actuarial valuation for SERS.

Assessment of Actuarial Assumptions and Methods Used in the 2016 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, 2016, Actuarial Valuation, which are used to determine the required Fiscal Year 2018 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 Statements 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 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.”

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.

Recommended Additional Disclosures for the 2016 Valuation

In **item 3**, the State Actuary recommends that the actuarial valuation report include a section with stress testing information. Stress testing was completed for SERS and delivered on December 1, 2016. The stress testing analysis included 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 December 1, 2016, stress test letter shows the impact to the funded ratio and contributions under the following scenarios:

- Assets earn the 5th percentile return of 2.36 percent on a static basis and alternatively a volatile basis.
- Assets earn the 25th percentile return of 4.85 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 29-year period.

The stress test letter is included in the Appendix of the updated June 30, 2016, actuarial valuation report.

Recommended Changes for Future Valuations

In **item 4**, 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.

In **item 5**, the State Actuary recommends that SERS, JRS and GARS, whose assets are commingled with ISBI, consider the appropriateness of using different interest rate assumptions.

On an annual basis, we will continue to review the liquidity requirements, projected funded status and contribution requirements in order to evaluate the appropriateness of using different interest rate assumptions for each respective plan. Future valuation reports will include additional commentary on the appropriateness of using different interest rate assumptions among SERS, JRS and GARS.

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 15, 2016

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, 2016 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, 2016 Actuarial Valuation, which are used to determine the required Fiscal Year 2018 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 five 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 recommends 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: JRS is preparing a Request For Proposal (RFP) for the completion of a full scope actuarial audit to be performed during FY 2017. Management expects the RFP will generate several proposals, and the full scope actuarial audit will be completed if the budgetary resources allow. It should be noted the Commission on Government Forecasting and Accountability (CoGFA) prepares parallel valuations annually using the JRS membership data, assumptions and methodology.

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.

Recommended Additional Disclosures for 2016 Valuation

- 3. Cheiron recommends JRS include stress testing of the System within the valuation report and include detailed explanation of the implications that volatile investment returns and a variety of other stressors (e.g. membership declines, lower salary growth) will have on the potential unsustainable cost impact that could occur during the statutory funding period. GRS did not include stress testing in this year's report; however, they did include in the reported the various explanations on the implications of assumptions not being met.**

Response: JRS and GRS will add stress testing results to the FY 2016 valuation report.

Recommended Changes for Future Valuations

- 4. Cheiron recommends 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.**

Response: The Board of Trustees will continue to annually review the economic assumptions in a manner (April and July Board meetings) that will allow adjustments to the assumptions to be included in the next valuation.

- 5. Cheiron recommends that the Boards of the three systems whose assets are commingled, the State Employees' Retirement System (SERS), JRS, and the General Assembly Retirement System (GARS), consider whether different interest rate assumptions for these systems are appropriate.**

Response: GRS will continue to annually review the liquidity requirements, projected funded status, and contribution requirements in order to evaluate the appropriateness of using different interest rate assumptions for each respective plan.

- 6. Cheiron notes 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. They recommend that GRS include an additional disclosure as to how this assumption was developed.**

Response: Per GRS, this assumption was incorrectly included in the "Assumptions" section of the report, but was not used in the valuation. This language will be deleted from the report.

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 15, 2016

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 2016 – 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, 2016, actuarial valuation for JRS.

Assessment of Actuarial Assumptions and Methods Used in the 2016 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, 2016 Actuarial Valuation, which are used to determine the required Fiscal Year 2018 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 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 a policy to be used to calculate the Actuarially Determined Contribution ("ADC") under GASB Statements 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 finances 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 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.”

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.

Recommended Additional Disclosures for the 2016 Valuation

In **item 3**, the State Actuary recommends that the actuarial valuation report include a section with stress testing information. Stress testing was completed for JRS and delivered on December 1, 2016. The stress testing analysis included scenarios with significant market downturn or significant volatility in investment returns 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 December 1, 2016, stress test letter shows the impact to the funded ratio and contributions under the following scenarios:

- Assets earn the 5th percentile return of 2.36 percent on a static basis and alternatively a volatile basis.
- Assets earn the 25th percentile return of 4.85 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 29-year period.

The stress test letter is included in the Appendix of the updated June 30, 2016, actuarial valuation report.

Recommended Changes for Future Valuations

In **item 4**, 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.

In **item 5**, the State Actuary recommends that SERS, JRS and GARS, whose assets are commingled with ISBI, consider the appropriateness of using different interest rate assumptions.

On an annual basis, we will continue to review the liquidity requirements, projected funded status and contribution requirements in order to evaluate the appropriateness of using different interest rate assumptions for each respective plan. Future valuation reports will include additional commentary on the appropriateness of using different interest rate assumptions among SERS, JRS and GARS.

In **item 6**, the State Actuary recommends that GRS include an additional disclosure as to how the assumption of a 10 percent load on inactive vested liabilities to reflect increases in inactive members' pay due to current participation in a reciprocal retirement system was developed.

In Section E, Actuarial Methods and Assumptions, in our draft actuarial valuation report, we incorrectly included language pertaining to the assumption "Load for Inactive Members Eligible for Deferred Vested Pension Benefits." This assumption was not used in the actuarial valuation for JRS and the language referencing the assumption will be deleted from the updated actuarial valuation report prior to the actuarial valuation report being finalized.

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 15, 2016

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, 2016 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, 2016 Actuarial Valuation, which are used to determine the required Fiscal Year 2018 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 six 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 recommends 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: GARS is preparing a Request For Proposal (RFP) for the completion of a full scope actuarial audit to be performed during FY 2017. Management expects the RFP will generate several proposals, and the full scope actuarial audit will be completed if the budgetary resources allow. It should be noted the Commission on Government Forecasting and Accountability (CoGFA) prepares parallel valuations annually using the GARS membership data, assumptions and methodology.

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.

Recommended Additional Disclosures for 2016 Valuation

- 3. Cheiron recommends GARS include stress testing of the System within the valuation report and include detailed explanation of the implications that volatile investment returns and a variety of other stressors (e.g. membership declines, lower salary growth) will have on the potential unsustainable cost impact that could occur during the statutory funding period. GRS did not include stress testing in this year’s report; however, they did include in the reported the various explanations on the implications of assumptions not being met.**

Response: GARS and GRS will add stress testing results to the FY 2016 valuation report.

Recommended Changes for Future Valuations

- 4. Cheiron recommends the GARS 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.**

Response: The Board of Trustees will continue to annually review the economic assumptions in a manner (April Board meeting) that will allow adjustments to the assumptions to be included in the next valuation.

- 5. Cheiron recommends that the Boards of the three systems whose assets are commingled, the State Employees’ Retirement System (SERS), the Judges’ Retirement System (JRS), and GARS, consider whether different interest rate assumptions for these systems are appropriate.**

Response: GRS will continue to annually review the liquidity requirements, projected funded status, and contribution requirements in order to evaluate the appropriateness of using different interest rate assumptions for each respective plan.

- 6. Cheiron notes 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. They recommend that GRS include an additional disclosure as to how this assumption was developed.**

Response: GRS agrees and will include the disclosure in the actuarial 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 15, 2016

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 2016 – 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, 2016, actuarial valuation for GARS.

Assessment of Actuarial Assumptions and Methods Used in the 2016 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, 2016 Actuarial Valuation, which are used to determine the required Fiscal Year 2018 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 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 a policy to be used to calculate the Actuarially Determined Contribution (“ADC”) under GASB Statements 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 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 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.”

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.

Recommended Additional Disclosures for the 2016 Valuation

In **item 3**, the State Actuary recommends that the actuarial valuation report include a section with stress testing information. Stress testing was completed for GARS and delivered on December 1, 2016. The stress testing analysis included scenarios with significant market downturn or significant volatility in investment returns 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 December 1, 2016, stress test letter shows the impact to the funded ratio and contributions under the following scenarios:

- Assets earn the 5th percentile return of 2.36 percent on a static basis and alternatively a volatile basis.
- Assets earn the 25th percentile return of 4.85 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 29-year period.

The stress test letter is included in the Appendix of the updated June 30, 2016, actuarial valuation report.

Recommended Changes for Future Valuations

In **item 4**, 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.

In **item 5**, the State Actuary recommends that SERS, JRS and GARS, whose assets are commingled with ISBI, consider the appropriateness of using different interest rate assumptions.

On annual basis, we will continue to review the liquidity requirements, projected funded status and contribution requirements in order to evaluate the appropriateness of using different interest rate assumptions for each respective plan. Future valuation reports will include additional commentary on the appropriateness of using different interest rate assumptions among SERS, JRS and GARS.

In **item 6**, the State Actuary recommends that GRS include an additional disclosure as to how the assumption of a 10 percent load on inactive vested liabilities to reflect increases in inactive members' pay due to current participation in a reciprocal retirement system was developed.

We agree with the State Actuary's recommendation and have included disclosure on the development of this assumption in the current actuarial valuation report.

Respectfully submitted,

Gabriel, Roeder, Smith & Company

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