
STATE OF ILLINOIS

OFFICE OF THE AUDITOR GENERAL

# STATE ACTUARY'S REPORT

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

DECEMBER 2019

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 2019 report on the actuarial assumptions and valuations of the State-funded retirement systems.

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

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

**SIGNED ORIGINAL ON FILE**

FRANK J. MAUTINO
Auditor General

Springfield, Illinois
December 2019

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**APPENDICES**

# GLOSSARY OF TERMS

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

**Actuarial Gain (Loss)** – A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two actuarial valuation dates, as determined in accordance with a particular actuarial funding method.

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

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

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

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

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

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

# GLOSSARY OF TERMS

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

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

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

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

**Present Value of Future Benefits** – The estimated amount of assets needed today to pay for 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 Unfunded Actuarial Liability represents the difference between the Actuarial Liability and Actuarial Value of Assets. This is sometimes referred to as "unfunded accrued liability."

**Chapter One**

# AUDITOR GENERAL'S SUMMARY

## REPORT CONCLUSIONS

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

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

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

### Review of Actuarial Assumptions

Cheiron reviewed the actuarial assumptions used in each of the six systems' actuarial valuations for the year ended June 30, 2019, and **concluded that they generally were reasonable. Cheiron did not recommend any changes to the assumptions used in the June 30, 2019 actuarial valuations.**

The combined total of the required Fiscal Year 2021 State contribution for the six retirement systems was $9,921,008,721. Cheiron verified the arithmetic calculations made by the systems' actuaries to develop the required State contribution and reviewed the assumptions on which it was based.

### Additional Disclosures and Changes for Future Valuations

Cheiron made recommendations for additional disclosures for the 2019 valuations and recommended changes for future valuations. Recommendations included the following:

- The Boards of SERS, JRS, and GARS should periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary.

- Cheiron continues to recommend the Boards annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly. All of the systems except for SURS complied with this recommendation prior to conducting the 2019 actuarial valuations.

- Cheiron assessed compliance for five of the systems (TRS, SURS, SERS, JRS, and GARS) with ASOP 51, a new actuarial standard which provides guidance to actuaries on the assessment and disclosure of risks. Cheiron found that each system made a good faith effort to comply with the new requirement but the risk sections in the valuation reports could be improved to better comply with the new requirements.

## State Mandated Funding Method

The Illinois Pension Code (for TRS, SURS, SERS, JRS, and GARS) establishes a method that does not adequately fund the systems. This law requires the actuaries to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the actuarial accrued liability in the year 2045 if all assumptions are met. This contribution level does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the actuarial accrued liability, not 90%. Cheiron continues to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of the systems.

According to the systems' 2019 actuarial valuation reports, the funded ratio of the retirement systems ranged from 47.4% (CTPF) to 16.0% (GARS), based on the actuarial value of assets as a ratio to the actuarial liability. If there is a significant market downturn, the unfunded actuarial liability and the required State contribution rate could both increase significantly, putting the sustainability of the systems further into question. Cheiron continues to recommend the systems include stress testing within the valuation reports to better understand these risks.

# INTRODUCTION AND BACKGROUND

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

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

## Requirements of Public Act 097-0694

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

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

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

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

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

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

## Requirements of Public Act 100-0465

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

- For State fiscal year 2018, the State shall contribute $221,300,000 for the employer normal cost.

- Beginning in State fiscal year 2019, the State shall contribute an amount equal to the employer normal cost for that fiscal year.

- On or before November 1 of each year, beginning November 1, 2017, the Board shall submit to the State Actuary, the Governor, and the General Assembly a proposed certification of the amount of the required State contribution to the Fund for the next fiscal year, along with all of the actuarial assumptions, calculations, and data upon which that proposed certification is based.

- On or before January 1 of each year, beginning January 1, 2018, the State Actuary shall issue a preliminary report concerning the proposed certification and identifying, if necessary, recommended changes in actuarial assumptions that the Board must consider before finalizing its certification of the required State contributions.

- On or before January 15, 2018, and each January 15 thereafter, the Board shall certify to the Governor and the General Assembly the amount of the required State contribution for the next fiscal year. The Board's certification must note any deviations from the State Actuary's recommended changes, the reason or reasons for not following the State Actuary's recommended changes, and the fiscal impact of not following the State Actuary's recommended changes on the required State contribution.

## Contracting with the State Actuary

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

## REVIEW OF THE ACTUARIAL ASSUMPTIONS

Cheiron reviewed the actuarial assumptions used in each of the six systems' actuarial valuations for the year ended June 30, 2019, and **concluded that they generally were reasonable. Cheiron did not recommend any changes to the assumptions used in the June 30, 2019 actuarial valuations.**

Cheiron did recommend additional disclosures for the 2019 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 Seven is a chart summarizing the status of recommendations made by the State Actuary in last year's 2018 report. This year's report contains 31 recommendations compared to 26 recommendations made in last year's report.

Exhibit 1-1
**RECOMMENDATIONS TO THE RETIREMENT SYSTEMS**

| Recommendations | TRS | SURS | SERS | JRS | GARS | CTPF |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Recommended Changes to Actuarial Assumptions used in the 2019 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 2019 Actuarial Valuations:** | | | | | | |
| • Expand/include stress testing of the System within the valuation report | X | X | X | X | X | |
| • Include a more detailed explanation of how the new entrant assumption was developed and how the assumed salaries for new entrants change from year to year | X | | | | | |
| • Add a recommendation that an additional risk assessment be performed and included in the valuation report | | X | | | | |
| • Expand the description of the mortality assumption in the valuation report | | | X | | | |
| **Recommended Changes for Future Actuarial Valuations:** | | | | | | |
| • Annually review the economic assumptions (interest rate and inflation rate) and adjust assumptions accordingly | X | X | X | X | X | X |
| • Improve the risk section of the valuation report to better comply with the requirements of ASOP 51 | X | X | X | X | X | |
| • Consider reducing the salary increase assumption in future valuations or provide additional analysis to support the increased assumption | X | | | | | |
| • Provide additional information about the population used in the projection such as the average age and service of the population each year | X | | | | | |
| • Provide additional explanation and justification for methods used to develop the mortality assumptions | | | X | | | |
| • Include stress testing of the System within the valuation report | | | | | | X |
| **Other Recommendations:** | | | | | | |
| • Periodically retain the services of an independent actuary to conduct a full scope actuarial audit in which the results of the valuation are fully replicated | | | X | X | X | |
| • Change the funding method to fully fund plan benefits and discontinue the systematic underfunding of the system | X | X | X | X | X | |

Source: OAG summary of Cheiron's preliminary reports to the six retirement systems.

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

## Economic Assumptions

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

### Interest Rate Assumption

The interest rate assumption (also called the investment return or discount rate) is **the most impactful assumption affecting the required State contribution amount**. This assumption is used to value liabilities for funding purposes. The retirement systems use varying interest rate assumptions. Exhibit 1-2 shows the interest rate assumptions for each of the six retirement systems. As can be seen in the exhibit, the interest rate assumption was lowered by three of the systems for the 2019 actuarial valuations.

Exhibit 1-2
**INTEREST RATE ASSUMPTIONS**
June 30, 2019 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 | 6.75% | Lowered from 7.25% for the June 30, 2018 actuarial valuation |
| State Employees' Retirement System | 6.75% | Lowered from 7.00% for the June 30, 2019 actuarial valuation |
| Judges' Retirement System | 6.50% | Lowered from 6.75% for the June 30, 2019 actuarial valuation |
| General Assembly Retirement System | 6.50% | Lowered from 6.75% for the June 30, 2019 actuarial valuation |
| Chicago Teachers' Pension Fund | 7.00% | Lowered from 7.25% for the June 30, 2018 actuarial valuation |

Source: Retirement system actuarial reports.

Cheiron concluded that the interest rate assumptions for the six systems were reasonable. The actuary for TRS recommended lowering the interest rate assumption from 7.00% to 6.75%. However, the Board did not lower the assumption. Cheiron concurred with TRS' actuary's recommendation to lower the interest rate assumption but also concluded that the use of 7.00% was reasonable.

As it did in last year's report, Cheiron again recommended that the Boards annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly. All of the systems except SURS complied with this recommendation prior to conducting the 2019 actuarial valuations.

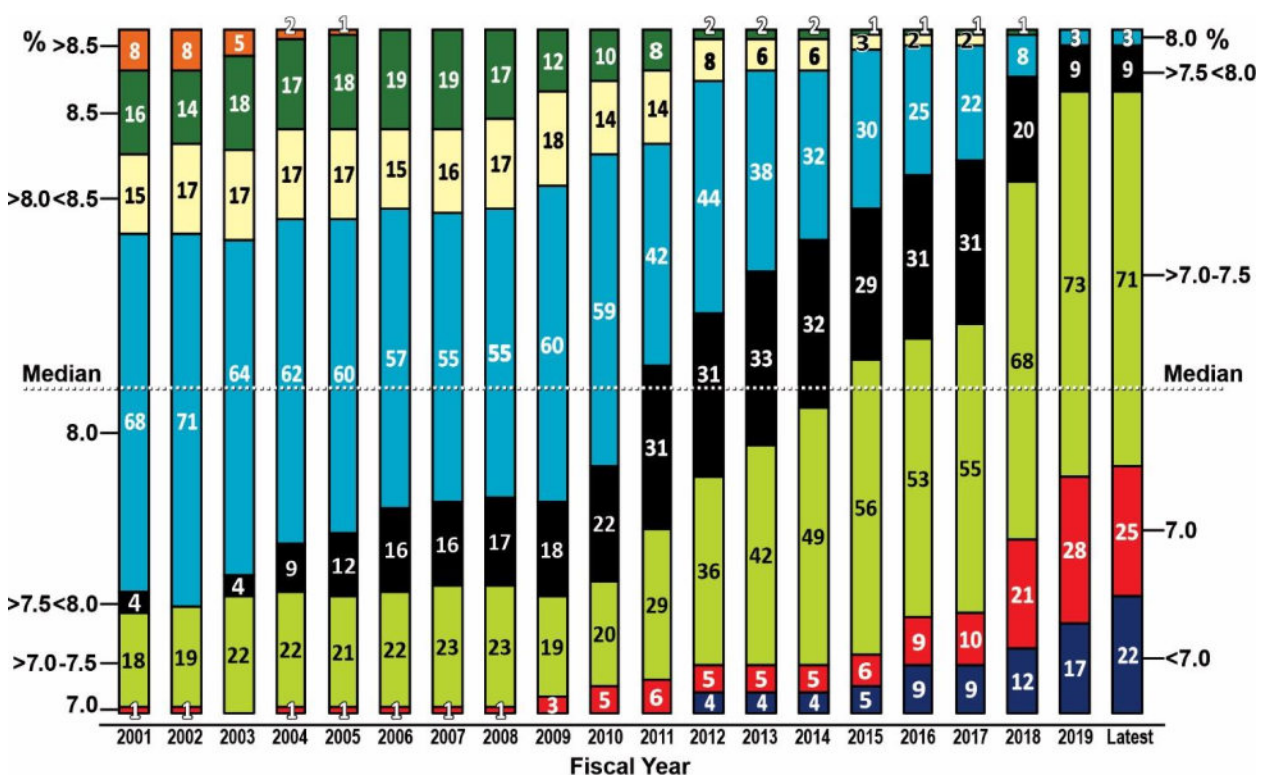
Cheiron noted that the systems are experiencing negative cash flows, which may impact the interest rate returns that are realized. Negative cash flow is measured as contributions less

benefits and expenses. Negative cash flows result in actuarial returns (i.e., "dollar weighted" returns) being less than "time weighted" returns.

Cheiron also noted that declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, in 2001 the yield on 10-year Treasury bonds (a proxy for a risk free investment) was 5.3%. To achieve an assumed return of 8.0%, a system's investments had to outperform the yield on the 10-year Treasury by 2.7%. As of June 30, 2019, the yield on the 10-year Treasury is now 2.1%, and to achieve an assumed return of 6.5%, a system's investments need to exceed the 10-year Treasury yield by 4.4%. So, even though, in this example, a system reduced its assumption by 150 basis points, it still has to take more investment risk in 2019 to meet its assumption than it did in 2001.

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 130 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 130 public pension plans.

Exhibit 1-3
**CHANGE IN INTEREST RATE ASSUMPTIONS SINCE 2001**
**130 PENSION PLANS IN THE NATION'S LARGEST PUBLIC RETIREMENT SYSTEMS**




Source: NASRA Public Fund Survey.

The exhibit shows the shift to lower interest rate assumptions. In 2001, 107 of the 130 plans (82%) used an interest rate assumption of 8.0% or higher. The most recent data, which includes results collected through November 2019, shows that this number has dropped to only 3 of 130 plans (2%) that use an interest rate of 8.0% or higher. The median assumption has fallen to 7.25%. Since Fiscal Year 2012, 114 of the 130 plans have reduced the interest rate assumption with an average reduction of 0.57%. In addition, 47 plans have adopted a rate of 7.0% or lower.

**Inflation Assumption**

The six retirement systems use inflation assumptions ranging from 2.25% to 2.50%. Exhibit 1-4 shows the inflation assumptions for each of the systems. Three of the systems lowered the inflation assumption for the 2019 valuations.

Exhibit 1-4
**INFLATION ASSUMPTIONS**
June 30, 2019 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 | 2.25% | Lowered from 2.75% for the June 30, 2018 actuarial valuation |
| State Employees' Retirement System | 2.25% | Lowered from 2.50% for the June 30, 2019 actuarial valuation |
| Judges' Retirement System | 2.25% | Lowered from 2.50% for the June 30, 2019 actuarial valuation |
| General Assembly Retirement System | 2.25% | Lowered from 2.50% for the June 30, 2019 actuarial valuation |
| Chicago Teachers' Pension Fund | 2.50% | Lowered from 2.75% for the June 30, 2017 actuarial valuation |

Source: Retirement system actuarial reports and experience studies.

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

- The April 2019 Old-Age, Survivors, and Disability Insurance Trustees Report projects that over the long-term (next 75 years), inflation will average somewhere between 2.0% and 3.2%. Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.6%.

- Cheiron presented three inflation comparisons: 1) the distribution of inflation expectations for the Third Quarter 2019 survey of professional economic forecasters published by the Philadelphia Federal Reserve; 2) the 2019 Horizon survey of investment consultant capital market assumptions; and 3) the 2018 inflation assumptions used by plans in the Public Plans Database. The 2.50% rate used by TRS and CTPF is higher than the middle of the range projected by professional

economic forecasters and investment consultants but is below the median rate used by other public plans. The 2.25% rate used by the remaining four systems is near the middle of the range projected by professional economic forecasters and investment consultants, and is on the low end of the range used by other public plans.

The inflation assumption primarily impacts the salary increase assumption. The salary increase assumption is generally comprised of the inflation assumption and a productivity, or real wage growth assumption. The systems that lowered their inflation assumptions also lowered their salary increase assumptions.

In 2018, TRS increased its salary increase assumption based on experience over the prior three years. Cheiron was concerned that the analysis performed for the salary increase assumptions resulted in an assumption for salary increases that is at the very high end of a reasonable range. Cheiron recommended the TRS Board consider reducing the salary increase assumption in future valuations or provide additional analysis to support the increased assumption.

## Demographic Assumptions

The retirement systems utilize a number of demographic assumptions such as mortality rates, disability rates, and termination rates. Cheiron reviewed the demographic assumptions and concluded that they were reasonable. As it did last year, Cheiron included additional analysis in its reports on each of the systems. Cheiron collected data from past valuation reports dating back to 2013 and presented a historical review of past demographic and salary increase experience gains and losses. Results were presented in a chart which showed the pattern of annual gains and losses attributable to different sources. These charts can be found in Chapters Two through Seven. Different measures were used for each system depending on the information available but sources used included:

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

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

## PROPOSED CERTIFICATION OF REQUIRED STATE CONTRIBUTION

Each of the six retirement systems submitted to the State Actuary a proposed certification of the amount of the required State contribution for that system. **Cheiron verified the arithmetic calculations made by the systems' actuaries to develop the required State contribution and reviewed the assumptions on which it was based.** Exhibit 1-5 shows the amounts of proposed State contributions submitted by the systems for Fiscal Year 2021 and compares it to the previous year's contribution.

Exhibit 1-5
**AMOUNTS OF STATUTORILY REQUIRED STATE CONTRIBUTIONS**

| System | State Contribution (for Fiscal Year 2020) | State Contribution (for Fiscal Year 2021) |
|---|---|---|
| Teachers' Retirement System | $4,813,577,696 | $5,140,736,721 |
| State Universities Retirement System | $1,864,976,000 | $2,001,296,000 |
| State Employees' Retirement System | $2,293,074,000 | $2,348,499,000 |
| Judges' Retirement System | $144,160,000 | $148,618,000 |
| General Assembly Retirement System | $25,754,000 | $27,299,000 |
| Chicago Teachers' Pension Fund[1] | $245,487,000 | $254,560,000 |
| **Total** | **$9,387,028,696** | **$9,921,008,721** |

[1]The State contribution for CTPF is limited to the employer normal cost for that fiscal year.

Source: 2019 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. This does not apply to CTPF as Cheiron's review of CTPF is more limited in scope.

Two of the systems (TRS and SURS) complied with this recommendation but SERS, JRS, and GARS have not. Given the size of the systems, 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. The response to last year's reports stated that the Boards at SERS, JRS, and GARS would discuss the need for a full scope actuarial audit with management prior to the next valuation. We were provided no evidence that any discussions took place.

# ACTUARIAL FUNDING METHODS

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and (3) the amortization method.

## Actuarial Cost Method

All of the retirement systems use the Projected Unit Credit 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 Projected Unit Credit 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 funding method as it is more consistent with the Pension Code's requirement for level percentage of pay funding.

Under the Projected Unit Credit 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 present value of these benefits based on past service and future compensation is the actuarial accrued liability for a given active participant. Under the Projected Unit Credit 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 Projected Unit Credit method is not an unreasonable method, more plans use the Entry Age Normal funding method to mitigate this effect. It should also be noted that the Entry Age Normal method is the required method to calculate liability for the Governmental Accounting Standards Board Statements 67 and 68.

## Asset Valuation Method

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

## Amortization Method

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2045 (2059 for CTPF). While not a traditional amortization method, this methodology effectively amortizes a portion of the unfunded actuarial liability over the remaining period until 2045, which is currently 26 years.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be "a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period." Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

Typical public plan amortization methods are designed to increase each year by expected payroll growth. Under the State mandated method, however, the effective amortization payment increases each year by more than the expected growth in payroll. As a result, the State mandated method defers payments on the unfunded actuarial liability further into the future than under typical public plan amortization methods.

## STATE MANDATED FUNDING METHOD

The Illinois Pension Code (for TRS, SURS, SERS, JRS, and GARS) establishes a method that does not adequately fund the systems. This law requires the actuaries to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the actuarial accrued liability in the year 2045 if all assumptions are met. This contribution level does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the actuarial accrued liability, not 90%. In addition, the State mandated method produces a contribution that results in a significant increase in the unfunded actuarial liabilities over the next decade if all assumptions are met.

Cheiron continues to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of the systems. The funding method should target 100% of the actuarial accrued liability, and contributions should ramp up as quickly as possible to a level that is expected to prevent the unfunded actuarial accrued liability from growing. Continuing the practice of underfunding the systems increases the risk of needing even larger contributions in the future that may make the systems unsustainable.

In the actuarial valuation reports, the systems' actuaries discuss their concerns with the State mandated funding method. The actuarial valuation reports include recommended funding policies that conform to a goal of full funding within a reasonable time period and conform with generally accepted actuarial principles and practices.

Exhibit 1-6
**SYSTEM FUNDED RATIO**
**(ACTUARIAL VALUE OF ASSETS)**

| System | Funded Ratio |
|---|---|
| Teachers' Retirement System | 40.6% |
| State Universities Retirement System | 42.3% |
| State Employees' Retirement System | 37.8% |
| Judges' Retirement System | 38.3% |
| General Assembly Retirement System | 16.0% |
| Chicago Teachers' Pension Fund | 47.4% |

Source: 2019 actuarial valuation reports.

Based on the systems' 2019 actuarial valuation reports, the funded ratio of the systems ranged from 47.4% (CTPF) to 16.0% (GARS) based on the actuarial value of assets as a ratio to the actuarial liability (see Exhibit 1-6). If there is a significant market downturn, the unfunded actuarial liability and the required State contribution rate could both increase, putting the sustainability of the systems further into question.

Cheiron recommended stress testing be done to better understand risks to the sustainability of the systems. The stress testing should be included 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 illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made. Cheiron recommends such stress testing be included in the valuation report because that is the report that most stakeholders of the plan look to for assessing the plan's financial condition. Supplemental reports may not be publicly identified and therefore not readily accessible.

### Assessment and Disclosure of Risk

A new Actuarial Standard of Practice (ASOP) has been introduced, ASOP 51, and is effective for the systems' actuarial valuation starting June 30, 2019. ASOP 51 provides guidance to actuaries on the assessment and disclosure of risks to help readers of the actuarial valuation report "*understand the effects of future experience differing from the assumptions used*" and "*the potential volatility of future measurements resulting from such differences*".

Cheiron assessed compliance with ASOP 51 for five of the systems (TRS, SURS, SERS, JRS, and GARS.) Cheiron found that each system made a good faith effort to comply with the new requirement, but the risk section in the valuation reports could be improved to better comply with the new requirements. For future risk disclosure, Cheiron recommended:

- An assessment should be provided for each risk that is identified.
- An explanation should be provided as to how the maturity measures calculated and disclosed help the reader to understand the risks identified.
- Historical values that are significant to understanding the risks identified should be disclosed along with an explanation of how they help the reader understand the risks identified.

## ANALYSIS OF FUNDING ADEQUACY

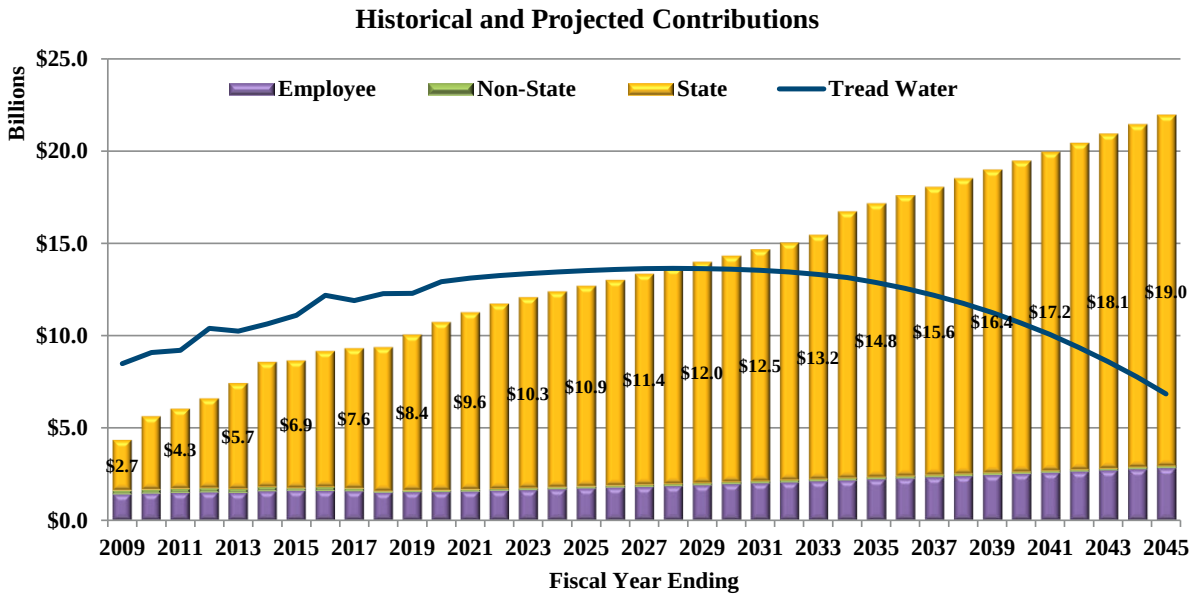
Cheiron examined the adequacy of the funding for the systems, including funded status, the sources of changes in the unfunded actuarial liability, and projections of the unfunded actuarial liability. This analysis is contained in the State Actuary's preliminary reports for each of the retirement systems, found in Chapters Two through Seven of this report.

One of the persistent sources of the increase in unfunded actuarial liability is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the unfunded actuarial liability from increasing if all assumptions are met).

Exhibit 1-7 shows the combined historical and projected contributions for five of the systems (TRS, SURS, SERS, JRS, and GARS). As the chart below shows, actual contributions have been significantly less than the tread water cost, and this trend is projected to continue for several years into the future. Each year that total contributions remain below the tread water cost

(blue line), the unfunded actuarial liability is expected to grow. As shown in the graph below, the contributions from the State will need to increase significantly before the total contribution reaches the tread water contribution and begins to pay down the unfunded actuarial liability.

Exhibit 1-7
**HISTORICAL AND PROJECTED CONTRIBUTIONS COMPARED TO TREAD WATER COST**




Source: Cheiron analysis of system funding adequacy.

## RESPONSES TO THE RECOMMENDATIONS

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

**Chapter Two**

# PRELIMINARY REPORT ON THE TEACHERS' RETIREMENT SYSTEM

In accordance with 30 ILCS 5/2-8.1, Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the Teachers' Retirement System (TRS) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to TRS on December 3, 2019. The preliminary report was based on Cheiron's review of actuarial assumptions included in TRS' 2019 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the Teachers' Retirement System. TRS' written response, provided on December 12, 2019, can be found in Appendix C.

**OVERVIEW**
**TEACHERS' RETIREMENT SYSTEM**
as of June 30, 2019

| | |
|---|---|
| Actuarial accrued liability | $131,456,968,953 |
| Actuarial value of assets | $53,391,192,733 |
| Unfunded liability | $78,065,776,220 |
| Funded ratio | 40.6% |
| | |
| Employer normal cost | $1,167,182,741 |
| State contribution (FY21) | $5,140,736,721 |
| | |
| Active members | 160,752 |
| Inactive members | 139,559 |
| Current benefit recipients | 122,895 |
| Total membership | 423,206 |
| | |
| Interest rate assumption | 7.00% |
| Inflation assumption | 2.50% |
| Actuarial cost method | Projected Unit Credit |
| Asset valuation method | 5-year Smoothing |
| | |
| Executive Director | Dick Ingram |
| Actuarial Firm | Segal Consulting |

Source: June 30, 2019 TRS actuarial valuation report.

December 17, 2019

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

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

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Segal Consulting (Segal) of the required State contribution to the Teachers' Retirement System of the State of Illinois (TRS or System) for Fiscal Year 2021.

**In summary, we believe that the assumptions and methods used in the draft June 30, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, 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 2021. 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 minimum funding requirements for the System. **In our opinion, the statutory mandated minimum funding requirements are inadequate, producing contribution amounts that are expected to result in a significant increase to the unfunded actuarial liability over the next decade.** Section IV reviews the projections contained in the draft June 30, 2019 Actuarial Valuation. Finally, Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by TRS and Segal. This information includes actuarial assumptions and methods adopted by the TRS Board, plan provisions, the draft June 30, 2019 Actuarial Valuation, minutes of the 2019 TRS Board of Trustee meetings, Segal's investment assumption presentation of June 2019, and various studies and memos prepared by the System's advisors, staff, and Executive Director. A detailed description of all information provided for this review is contained in Appendix B.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. 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

William R. Hallmark, ASA, FCA, MAAA, EA
Consulting Actuary

SIGNED ORIGINAL ON FILE

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

## 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) 2021. The purpose of this review is to identify any recommended changes to the actuarial assumptions and methods for the TRS Board to consider before finalizing its certification of the required State contribution for FY 2021.

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, 2019 Actuarial Valuation prepared by Segal, minutes of the 2019 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, 2019 Actuarial Valuation.

## SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2019 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 2021 required State contribution calculated under the current statutory funding plan is $5,140,736,721. 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. We have accepted Segal's annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

## State Mandated Funding Method

1. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of TRS. Continuing the practice of underfunding future accruals such that the unfunded liability is expected to continue to grow and targeting a funded percentage less than 100% increases the risk of the System becoming unsustainable. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

## Conformance to Statutory Funding Changes of Public Act 100-0023

*Recognition of Changes in Actuarial Assumptions*

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes be phased-in over a five-year period. This phase-in provides time to adjust to a higher level of contributions, but for a system in which the unfunded liability is already expected to continue to grow for more than a decade; such delays allow the unfunded liability to increase even more if the assumption change is an increase in cost, adding additional risks to the System.

*Optional Hybrid Plan*

P.A. 100-0023 created an optional hybrid plan for current Tier 2 members and future new hires. The optional hybrid plan consists of a reduced defined benefit plan and a defined contribution plan. Segal has not reflected the hybrid plan in the June 30, 2019 valuation. We understand that TRS will not implement the optional hybrid plan until clarifying legislation is passed. Given the need for clarifying legislation, we believe it is reasonable not to reflect the hybrid plan in the current valuation.

*Earnings That Exceed the Governor's Salary*

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

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

## Conformance to Changes of Public Act 100-0587

*Final Average Salary Increase Threshold*

Public Act 100-0587 (P.A. 100-0587), enacted on June 4, 2018, required School Districts to pay the present value of any increase in benefits due to any salary increases affecting a member's Final Average Salary in excess of 3%. Previously, the threshold was 6%. However, Public Act 101-0010 repealed the 3% cap, restoring it to 6%.

We have verified that Segal has reflected the repeal of the 3% cap in the development of the net State contribution.

*Accelerated Pension Benefit Payments*

P.A. 100-0587 created two accelerated pension benefit payment options. Inactive vested members have the option of receiving a lump-sum equal to 60% of the present value of their benefits in lieu of their annuity benefits, and Tier 1 members have the option upon retirement of accepting a reduced automatic increase in exchange for a lump-sum equal to 70% of the present value of the reduced annuity benefits. Eligible members must make an election by June 30, 2024 if they want to receive the accelerated pension benefit payments.

There is very little experience on which to base an assumption as to who is likely to elect one of the accelerated pension benefit payments. On a preliminary basis, Segal has opted to use the same assumptions as the Illinois Legislature that 22% of inactive vested members will elect the accelerated pension benefit payment in lieu of their annuity benefits, but reduced the assumption to 15% (from 25% used by the Legislature) of eligible retiring Tier 1 members who will elect the accelerated pension benefit payment for a reduction in their automatic annual increases. Segal intends to monitor actual experience and may revise this assumption as experience emerges. We believe this approach is reasonable.

## SECTION II – SUMMARY OF RECOMMENDATIONS

## Assessment of Actuarial Assumptions Used in the 2019 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 all the actuarial assumptions used in the draft June 30, 2019 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

## Recommended Additional Disclosures for the 2019 Valuation

2. We recommend that Segal include a more detailed explanation of how the new entrant assumption was developed, whether the number of full-time and substitutes are each assumed to remain level, and how the assumed salaries for new entrants change from year to year.

3. 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 illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made.

## Recommended Changes for Future Valuations

A new Actuarial Standard of Practice became effective for this valuation on the Assessment and Disclosure of Risk (ASOP 51). Segal made an effort to comply with the new requirements, but the risk section in the valuation report could be improved to better comply with the new requirements.

4. For future risk disclosures, we recommend that:
   - An assessment be provided for each risk that is identified by Segal,
   - An explanation be provided as to how the maturity measures calculated and disclosed by Segal help the reader to understand the risks identified by Segal, and
   - Historical values that are significant to understanding the risks identified by Segal be disclosed along with an explanation of how they help the reader understand the risks identified by Segal.

5. We are concerned that the analysis performed for the salary increase assumptions results in an assumption for salary increases that is at the very high end of a reasonable range. We recommend the TRS Board consider reducing the salary increase assumption in future valuations or provide additional analysis to support the increased assumption.

## SECTION II – SUMMARY OF RECOMMENDATIONS

6. We recommend that Segal provide additional information in the valuation report about the population used in the projection such as the average age and service of the population each year.

7. 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, as they did for this valuation.

## GASB 67 and 68

The 2019 TRS GASB 67 and 68 information was provided in the 2019 Valuation. We find that the assumptions and methods used to prepare the 2019 TRS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

## 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 the required State contribution, reviewed the assumptions on which it is based, and accepted Segal's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

## State Mandated Methods

The Illinois Pension Code (40 ILCS 5/16-158) establishes a method that does not adequately fund the System. This law requires the actuary to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the actuarial accrued liability in the year 2045 if all assumptions are met. This contribution level does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the actuarial accrued liability, not 90%. In addition, the State mandated method produces a contribution that results in a significant increase in the unfunded actuarial liabilities over the next decade if all assumptions are met.

**We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of TRS** (Recommendation #1). The funding method should target 100% of the actuarial accrued liability, and contributions should ramp up as quickly as possible to a level that is expected to prevent the unfunded actuarial accrued liability from growing. Continuing the practice of underfunding the System increases the risk of needing even larger contributions in the future that may make the System unsustainable.

In its draft June 30, 2019 Actuarial Valuation on pages 2 and 3, Segal comments that the statutory funding method calls for contributions in fiscal year 2019 that are insufficient to reduce the unfunded actuarial accrued liability. In the same report on pages 6 through 9, Segal also demonstrates the implications of the statutory funding amounts on the growth of the unfunded actuarial accrued liability. With support of the TRS Board, Segal reports on an alternative funding policy that they consider adequate and refers to this method as the *Board-Adopted Actuarial Funding Policy*. Using this methodology, the State's contribution amount would be $8,344,196,301 for FY 2021. We concur with Segal's recommendations and demonstration of an alternative funding approach. It conforms to a goal of full funding within a reasonable time period and is consistent with generally accepted actuarial principles and practices.

## SECTION III – SUPPORTING ANALYSIS

The method Segal calls the *Board-Adopted Actuarial Funding Policy* is described in Section 2 beginning on page 30 of their Actuarial Valuation Report with the cost developed on page 31. The method includes the following provisions:

- The use of the Entry Age Normal Method (EAN) instead of the Projected Unit Credit (PUC) method. The method uses the Entry Age Normal Cost Method (the same method called for in the GASB 67 and 68 disclosures). Actuarial methods differ in how they allocate the cost of benefits over a participant's life time. PUC, which is called for in the statutory contribution determination, determines the cost of benefits at the participant's attained age. Therefore, as a participant gets older and the cost of the benefit is discounted over a decreasing period from expected retirement to attained age, their cost–the normal cost–will increase. With a large group and stable population, the actual normal costs don't necessarily increase because the average age of the population remains constant. Under EAN, the normal cost is determined as a level percent of pay from age at entry into the system to normal retirement. This method typically provides a more stable cost as a percent of pay and is the same method adopted by GASB for the Statement 67 and 68 disclosures.

- The unfunded liability under the *Board-Adopted Actuarial Funding Policy* 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 Segal, the expected State revenue growth rate. This assumption should be documented and a reference cited for the source in the valuation report, as well as an explanation of why revenue growth is expected to be lower than inflation. 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 of each amortization base covering the interest cost on the unfunded liability as well as a portion of the principal. We have confirmed TRS' statement that, based on this method of amortization, the principal on the unfunded liability would begin to be paid down in the first year.

- 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 using the same 20-year amortization methodology.

Based on the draft June 30, 2019 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 40.6%. The unfunded actuarial accrued liability is currently about $78 billion and is expected to increase to $86 billion before contributions start to reduce it. The required State contribution rate is 40.9% of payroll for FY 2019 and is expected to increase to about 46.6% of payroll for FY 2022. The required State contribution rate is expected to increase to about 49.8% of payroll for FY 2034 when the POB's have been paid off. If there is a significant market downturn, the unfunded actuarial liability and the required State contribution rate could both increase significantly, putting the sustainability of the system further into question. Stress testing should be performed to better understand these

## SECTION III – SUPPORTING ANALYSIS

risks and the potential advantages of additional contributions in the near term to maintain the sustainability of the system.

**We continue to 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 illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made.** (Recommendation #3).

As mentioned in Section II, a new Actuarial Standard of Practice (ASOP) has been introduced, ASOP 51, and is effective for TRS' actuarial valuations starting June 30, 2019. ASOP 51 provides guidance to actuaries on the assessment and disclosure of risks to help readers of the actuarial valuation report *"understand the effects of future experience differing from the assumptions used" and "the potential volatility of future measurements resulting from such differences."*

ASOP 51's first requirement is to *"identify risks that, in the actuary's professional judgment, may reasonably be anticipated to significantly affect the plan's future financial condition."* Segal identified four sources of risk to TRS: investment risk, longevity risk, contribution risk, and demographic risk. With the exception of the contribution risk due to the statutorily-required amount of contributions, the risks Segal identified are relatively generic and would apply to most pension plans. There are other risks specific to TRS that we believe Segal should also address. For example, the current projected growth rate for contributions under the statutorily-required method significantly exceeds the projected growth rate for State revenues under TRS' assumptions, creating what appears to be a significant risk to future contributions.

ASOP 51 requires the actuary to assess each of the risks identified. While the assessment does not have to be quantitative, it does have to take into account the specifics of the individual plan. ASOP 51 also describes several quantitative methods that may be used to assess risk.

- Investment Risk. Segal describes the impact of a 1% variation in the investment return in the next year, and in Section 1 of their report beginning on page 14, Segal quantifies the impact of one year of 0% or 14% investment returns. These sensitivity projections provide a limited assessment of investment risk.

- Longevity Risk. Segal does not appear to provide either a qualitative or quantitative assessment of longevity risk other than to indicate that experience that differs from the assumptions will either increase or decrease costs.

- Contribution Risk. Segal discusses several issues with the statutorily-required contribution amounts in the risk section as well as in other parts of the valuation report. It would be useful to reference the other analyses of contribution risk that are in the report in the risk section.

## SECTION III – SUPPORTING ANALYSIS

- Demographic Risk. Segal provides an explanation of demographic risks, but does not appear to provide either a qualitative or quantitative assessment of these risks.

ASOP 51 requires the actuary to recommend a more detailed assessment of risks if it *"would be significantly beneficial."* Segal recommends such an assessment, stating "Given the System's current funding level and contribution history, we recommend a detailed risk assessment be performed for TRS." We believe some or all of the additional risk assessment should be included in the valuation report because that is the report most stakeholders of the System look to for assessing the System's financial condition. Supplemental reports may not be publicly identified, and therefore not readily accessible.

ASOP 51 requires the actuary to *"calculate and disclose plan maturity measures that … are significant to understanding the risks associated with the plan."* Segal calculates the current Full-Time actives to annuitant ratio and the current year's net cash flow, but there is no explanation of how these measures help to understand any of the risks identified. There are also other maturity measures, such as the assets to payroll ratio and the actuarial liability to payroll ratio that provide significant information about the potential effects of investment risk and demographic risk. Segal discusses the importance of monitoring the continued maturation of the plan, but doesn't provide any projections of any of these maturity measures even though they are all readily available given the projections required to determine the statutory contribution amounts.

ASOP 51 requires the actuary to "*identify and disclose relevant historical values of the plan's actuarial measurements that, in the actuary's professional judgment, are significant to understanding the risks identified*…." While some relevant historical and projected information is already included in the valuation report, there is no connection to the discussion of risk except for the important discussion of the inadequate statutory funding policy. The risk section does not even refer to the historical information provided in Chart 1, and no historical information is provided on net cash flow or any of the maturity measures. The historical information would give some context to the current measures.

Since this year is the first in which ASOP 51 is effective, most actuaries are working with their clients to develop the appropriate assessment and disclosure of risk. Segal has made a good faith effort to meet the requirements of ASOP 51. **In future valuation reports, we recommend that an assessment should be provided for each risk that is identified by Segal, that an explanation should be provided as to how the maturity measures calculated and disclosed by Segal help the reader to understand the risks identified by Segal, and that historical values that are significant to understanding the risks identified by Segal should be disclosed along with an explanation of how they help the reader understand the risks identified by Segal.** (Recommendation #4).

## SECTION III – SUPPORTING ANALYSIS

# Conformance to Statutory Funding Changes of Public Act 100-0023

*Recognition of Changes in Actuarial Assumptions*

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a five-year period. This phase-in provides time to adjust to a higher level of contributions, but for a System in which the unfunded liability is already expected to continue to grow for more than a decade; such delays allow the unfunded liability to increase even more if the assumption change is an increase in cost, adding additional risks to the System.

Public Act 100-0023 states:

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

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

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

We have verified the arithmetic calculations made by Segal to develop the phase-in of assumption changes in the June 30, 2019 valuation.

*Optional Hybrid Plan*

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

Segal has not reflected the Tier 3 optional hybrid plan in the June 30, 2019 valuation. We understand that TRS will not implement the optional hybrid plan until clarifying legislation is passed. Given the need for additional legislation, we believe it is reasonable not to reflect the optional hybrid plan in the current valuation.

## SECTION III – SUPPORTING ANALYSIS

*Earnings That Exceed the Governor's Salary*

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

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

## Conformance to Changes of Public Act 100-0587

*Final Average Salary Increase Threshold*

Public Act 100-0587 (P.A. 100-0587), enacted on June 4, 2018, required School Districts to pay the present value of any increase in benefits due to any salary increases affecting a member's Final Average Salary in excess of 3%. Previously, the threshold was 6%. However, Public Act 101-0010 repealed the 3% cap, restoring it to 6%.

We have verified that Segal has reflected the repeal of the 3% cap in the development of the net State contribution.

*Accelerated Pension Benefit Payments*

P.A. 100-0587 created two accelerated pension benefit payment options. Inactive vested members have the option of receiving a lump sum equal to 60% of the present value of their benefits in lieu of their annuity benefits, and Tier 1 members have the option upon retirement of accepting a reduced automatic increase in exchange for a lump-sum equal to 70% of the present value of the reduced annuity benefits. Eligible members must make an election by June 30, 2024 if they want to receive the accelerated pension benefit payments. PA 101-0010 extended the time period to June 30, 2024 provided that bond proceeds (limited to $1 billion for all systems) are still available to fund the buyouts.

There is very little experience on which to base an assumption as to who is likely to elect one of the accelerated pension benefit payments. Segal has opted to use the same assumptions as the Illinois Legislature that 22% of inactive vested members will elect the accelerated pension benefit payment in lieu of their annuity benefits, but reduced the assumption to 15% (from 25% used by the Legislature) of eligible retiring Tier 1 members will elect the accelerated pension benefit payment for a reduction in their automatic annual increases. Segal notes that this assumption change is "Based upon actual experience to date and future expectation," but there is no disclosure of the actual experience or how the actual experience was adjusted for future expectations. Segal intends to monitor experience and may revise this assumption as experience emerges. We believe this approach is reasonable.

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# Assessment of Actuarial Assumptions Used in the 2019 Valuation

## A. Economic Assumptions

*1. The Interest Rate*

The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the required State contribution amount. This assumption, which is used to value liabilities for funding purposes, was lowered to 7.00% for the June 30, 2016 Actuarial Valuation. This change was recommended by Segal and supported by their report and presentation to the Board in August of 2016. This assumption was reviewed most recently at the June 2019 Board meeting. TRS' investment staff expects a 6.4% return over the next five to seven years. TRS' investment consultant, RVK, expects a 6.5% return over the next 10 to 20 years. Segal's analysis showed an expected return of 6.9%, highlighted reasons for being conservative and not adopting an assumption with less than a 50 percent probability of being achieved, and recommended an assumption of 6.75% or lower.

After reviewing all the materials (see Appendix B of the report) that were made available, Cheiron concurs with Segal's recommendation to reduce the interest rate assumption to 6.75% or lower. While the use of 7.00% as adopted by the Board may still be within a reasonable range for this valuation, we are concerned with the adoption of an assumption that under all of the analyses of the different advisors has less than a 50 percent probability of being achieved.

**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 #7).

*The items we considered and our rationale for this recommendation are as follows:*

- Segal's analysis of the expected return starts with the median 20-year capital market assumptions from the 2018 Horizon survey of capital market assumptions. We encourage Segal to supplement this analysis with the capital market assumptions used by TRS staff and TRS' investment consultant. While it is important to get a broader context of capital market assumptions, often the System's investment consultant knows the actual investments for the System in more detail and can develop more refined capital market assumptions, particularly for non-public asset classes.

- TRS staff develops capital market assumptions for a 5 to 7 year horizon. Based on those assumptions, TRS' target portfolio is expected to earn a 6.4% compound return.

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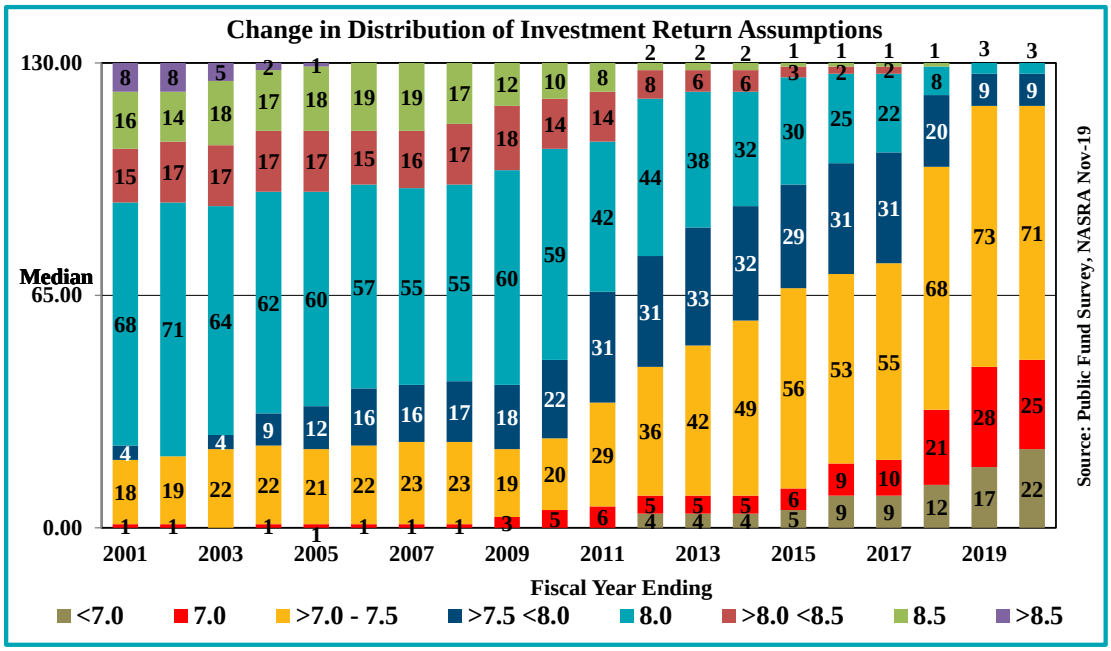
- TRS' investment consultant, RVK, develops capital market assumptions for a 10 to 20 year horizon. Based on those assumptions, TRS' target portfolio is expected to earn a 6.5% compound return.

- While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 130 large retirement plans. The following chart shows the distribution of discount rates for the plans in the Public Plans Database since 2001. Historically, TRS had one of the highest discount rates in the nation, but now the 7.0% assumption is below the median assumption. The latest data includes results collected through November 2019.




Over the period shown, there continues to be a pattern of reducing discount rates. Of the 130 plans shown for both 2019 and 2013, 114 have reduced their discount rate assumption since 2013. For these 114 plans, the average reduction is 0.57%. The data is consistent with the experience of other Cheiron clients, which have generally shown a significant trend of reducing their discount rate assumptions over the last several years.

- Declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, as shown in the following chart, in 2001 the yield on ten-year Treasury bonds (a proxy for a risk free investment) was 5.3%. To achieve TRS' assumed return

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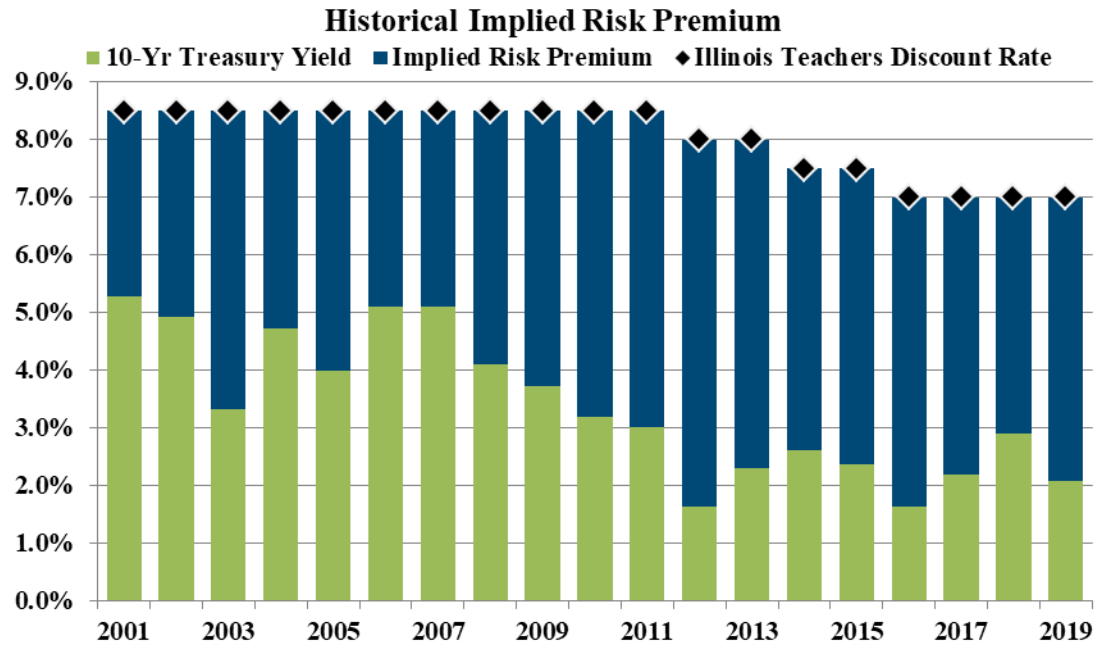
of 8.5%, the System's investments had to outperform the yield on the ten-year Treasury by 3.2%. As of June 30, 2019 the yield on the ten-year Treasury is now 2.1%, and to achieve TRS' assumed return of 7.0%, the System's investments need to exceed the ten-year Treasury yield by 4.9%. So, even though TRS reduced its assumption by 150 basis points, it still has to take more investment risk in 2019 to meet its assumption than it did in 2001. 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.




- As is the case with most maturing pension plans, TRS is experiencing negative cash flows measured as contributions less benefits and expenses. TRS' negative cash flow is currently 2.5% and projected to average about 2.2% of assets. When short-term returns are expected to be lower than the long-term expectations, which is the case with TRS, a plan with negative cash flows will have actuarial returns (i.e., dollar weighted returns) that are less than their "time weighted" returns. We concur with Segal's adjustments to reflect the impact of negative cash flow.

- While pension plans are long-term propositions, approximately 40% of the projected benefit payments for members as of the valuation date will be paid within the next 10 years and the System's assets will be affected by investment returns within the next 10-years. Consequently, in setting the interest rate assumption, we believe TRS should consider shorter time horizon estimates as well as the 20-year capital market assumptions. The likelihood of achieving 7.0% returns over the next 10-years is less

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than 50% under most capital market assumptions while over longer periods, the probability is higher.

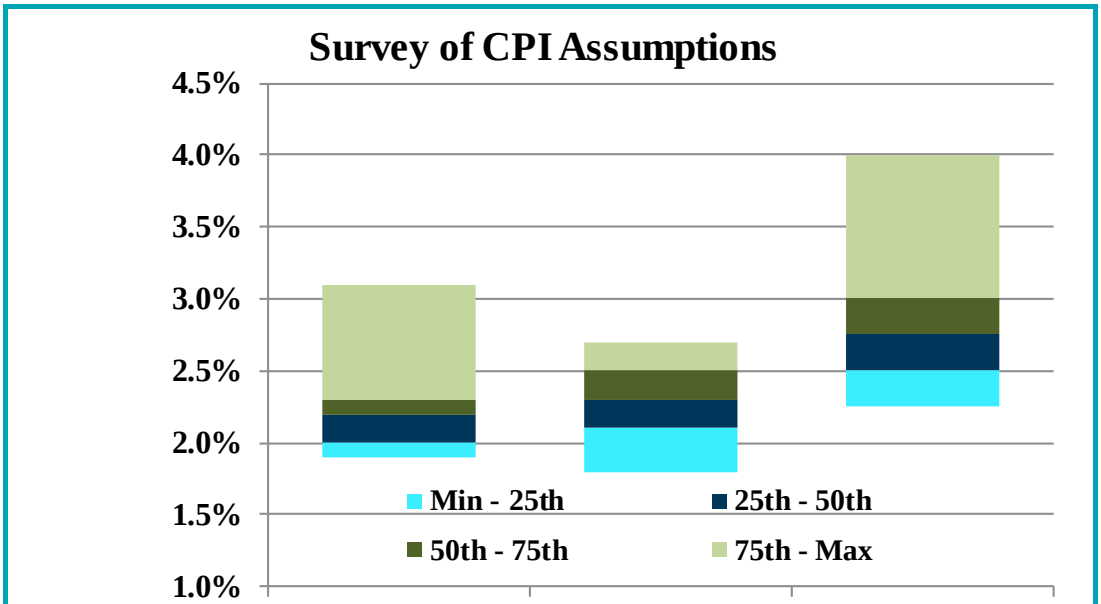
- Given the generally lower capital market expectations over the next 10 years, the lower expectations of TRS' investment consultant over 10 to 20 years, and the other issues identified above, reducing the discount rate as recommended by Segal is appropriate. However, the longer term capital market expectations from the Horizon survey indicate that 7.0% is within a reasonable range.

2. *Inflation Assumption*

TRS assumes annual inflation of 2.50%. **We find the 2.50% inflation assumption to be reasonable.**

*The items we considered and our rationale for concurring with the assumption are as follows:*

- The following chart shows the distribution of inflation expectations for the Third Quarter 2019 survey of professional economic forecasters published by the Philadelphia Federal Reserve, the 2019 Horizon survey of investment consultant capital market assumptions over a 20-year horizon, and the 2018 inflation assumptions used by plans in the Public Plans Database. While the assumption of 2.50% is higher than the middle of the range projected by professional economic forecasters and investment consultants, it is below the median rate used by other public plans.




| | Economic Forecasters | Horizon Survey | Public Plans Database |
|---|---|---|---|
| Minimum | 1.90% | 1.80% | 2.25% |
| 25th Percentile | 2.00% | 2.10% | 2.50% |
| 50th Percentile | 2.20% | 2.30% | 2.75% |
| 75th Percentile | 2.30% | 2.50% | 3.00% |
| Maximum | 3.10% | 2.70% | 4.00% |

- The April 2019 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), inflation will average between 2.0% and 3.2% (http://www.ssa.gov/oact/tr/2019/tr2019.pdf). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.6%.

*3. Salary (Annual Compensation) Increase Assumption*

The salary increase assumption was increased for the June 30, 2018 Actuarial Valuation and remains the same for the June 30, 2019 draft of the Actuarial Valuation. The salary assumption, which is service based, ranges from 9.50% (at one-year of service) to 4.00% (at 20 or more years of service) and includes an inflation component of 2.50% and a real wage growth component of 1.50%.

We are concerned that the analysis performed for the salary increase assumptions results in an assumption for salary increases that is at the very high end of a reasonable range. There was no additional analysis performed since the last valuation except to note that actual salary increases were lower than expected, resulting in an experience gain on the

actuarial liability. However, lower salary increases also produce lower contributions than expected that may partially or fully offset the gain on the actuarial liability. **We recommend the TRS Board consider reducing the salary increase assumption in future valuations or provide additional analysis to support the increased assumption** (Recommendation #5)**.**

*The items we considered and our rationale for recommending a reduction in the salary increase assumption are as follows:*

- Based on the actuarial valuation reports, actual salaries have been lower than expected in nine of the last ten years. Based on the pattern of experience, the salary increase assumption was reduced in 2015. Since that reduction, salary increases have still been lower than expected in three of the last four years.

- To develop this assumption, Segal analyzed the real wage increase experience of the System over the prior three years, subtracting actual inflation of 1.0% from the actual salary increases. Segal developed an assumed real rate of increase for each service group that was generally between the prior assumption and the three-year experience. Then, Segal added its assumed inflation of 2.5% to develop the nominal salary increase assumption. The table below summarizes the data used by Segal on a nominal and real basis.

**TRS Salary Increase Data**

| | Salary Data | | Nominal Increase | | Real Increase | |
|---|---|---|---|---|---|---|
| Service | Prior Year | Actual | Actual | Assumed | Actual | Assumed |
| 1 | 706,056 | 769,129 | 8.93% | 9.50% | 7.85% | 7.00% |
| 2 | 826,270 | 875,521 | 5.96% | 7.50% | 4.91% | 5.00% |
| 3 | 831,249 | 879,062 | 5.75% | 7.00% | 4.70% | 4.50% |
| 4 | 798,158 | 841,830 | 5.47% | 6.75% | 4.43% | 4.25% |
| 5-9 | 4,945,488 | 5,174,008 | 4.62% | 6.50% | 3.58% | 4.00% |
| 10-14 | 5,945,144 | 6,179,374 | 3.94% | 5.50% | 2.91% | 3.00% |
| 15-19 | 5,099,385 | 5,278,375 | 3.51% | 4.75% | 2.49% | 2.25% |
| 20+ | 6,842,940 | 7,056,843 | 3.13% | 4.00% | 2.10% | 1.50% |

Source: Cheiron calculations based on Segal Actuarial Experience Review dated September 18, 2018.

- Over the long-term, salaries will generally increase with inflation, productivity and merit or longevity increases. However, average real salary increases can vary significantly from year to year, and we are concerned that a three-year study period is not sufficient to capture the relationship between nominal and real salary increases. One factor driving this dynamic is how the collective bargaining process impacts the level and pattern of salary increases. Salary increases are usually negotiated in collective bargaining for three to five year periods. Actual inflation during the period of the collective bargaining agreement does not affect the salary increases that have

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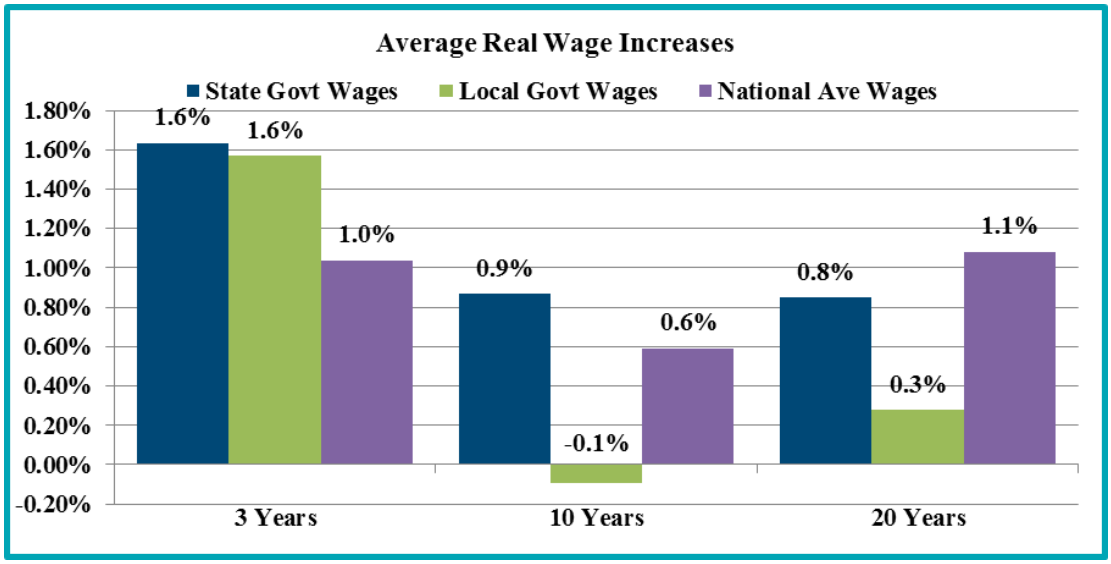
already been negotiated. For example, the Champaign Unit 4 School District has negotiated 2.5% across-the-board increases to their Teacher salary schedule for the 2018-2019, 2019-2020, and 2020-2021 school years[1]. If actual inflation during this period turns out to be 1.0%, it would imply real salary increases of 1.5% under Segal's analysis, but if actual inflation turns out to be 2.5%, it will imply 0.0% real salary increases under Segal's analysis. The negotiated increases are not adjusted for actual inflation during the period, but future negotiations may be affected by the degree to which salaries have kept up with inflation. As a result, the relationship between inflation and salary increases does not hold on a year-to-year basis. We are concerned that the experience study used a relatively short period (three years) with particularly low inflation (1.0%) to conclude that real salary increases in the future will be significantly higher.

- We expect the relationship between inflation and wage increases to be more stable over longer periods. The chart below shows the average real increases in wages over the 3, 10 and 20 years ending June 30, 2018 for State governments, local governments, and National Average Wages. State and local government data is from the Quarterly Census of Employment and Wages as published by the Bureau of Labor Statistics. National Average Wages is published by the Social Security Administration.




- Real wage increases vary significantly from year to year and were relatively high during the three-year period studied for TRS as well as for all State and local governments. However, over longer periods, real wage growth has not been nearly as high, and we would not expect it to be as high in the future as it was the last

1 Champaign Federation of Teachers contract, page 33.

three years. On a nominal basis, the last three-years still produced salary increases that were lower than the current assumption.

- The April 2019 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (between 2028 and 2093) real wage differential will average somewhere between 0.60% and 1.84%.

- There are offsetting impacts of a high salary increase assumption. Salaries used to project benefits will be higher, resulting in a greater Actuarial Liability. However, payroll used to project contributions will also be higher, resulting in a lower contribution rate to fund the benefits.

*4.* Cost of Living for Tier 2 Assumption

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

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

*5. Tier 2 Capped Pay Assumption*

Benefits for members hired after January 1, 2011, are calculated using pay that is capped under 40 ILCS 5/1-160. The pay cap increase assumption is 1.25%.
**We find the assumption and the basis for setting it reasonable.**

*6. Severance Pay Assumption*

Twenty percent of retirees are expected to receive additional pay of 10% of compensation in the final year before retirement.

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

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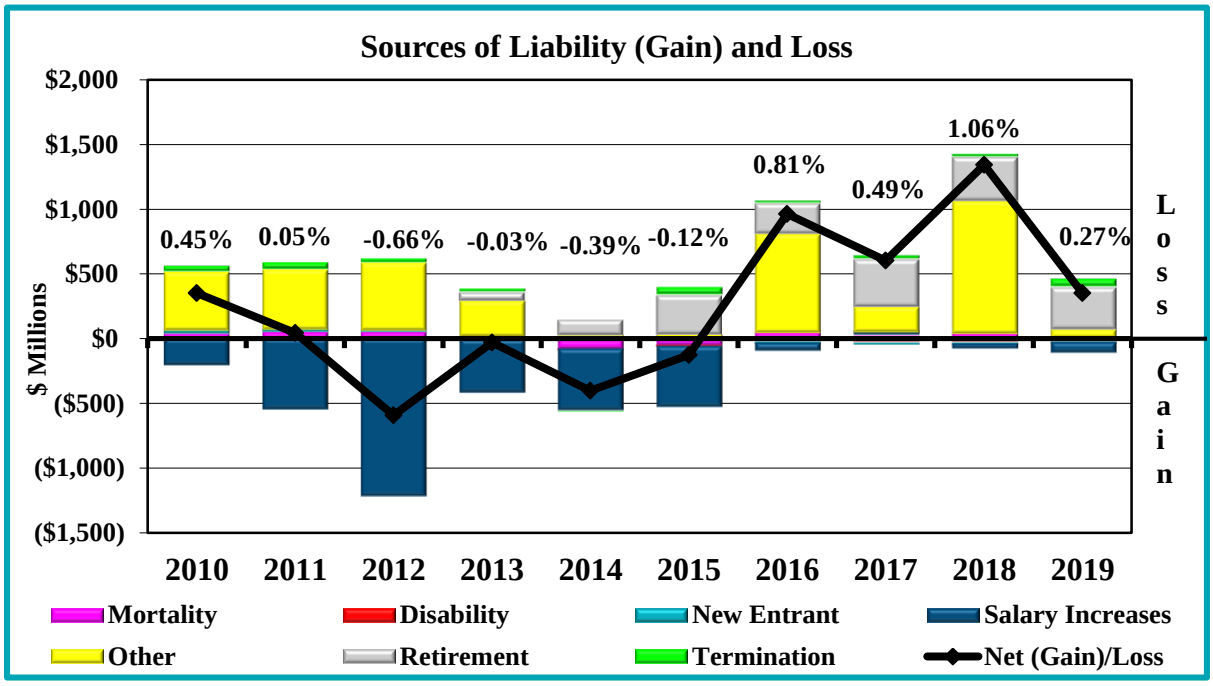
### B. Demographic Assumptions

All demographic assumptions were reviewed as part of an experience study with appropriate assumption changes adopted by the Board in August 2018.

In its annual actuarial valuation reports, TRS regularly reports sources of liability gains and losses. In the 2019 report, these are shown in Section 2 on page 29. The following chart shows the pattern of historical gains and losses attributable to seven different sources as shown in the legend. When the colored bar slices appear above zero on the Y axis, they 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.




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

As a result of the experience study and assumption changes implemented in the June 30, 2015 Actuarial Valuation, a number of the consistent trends over this time period have been addressed. However, retirement experience continues to generate consistent losses, even after the changes made in 2018. The "other" loss for 2016 is primarily due to the change in actuary, and the significant "other" loss for 2018 is due to "programming enhancements" that affected a subgroup of members. Salary increases continue to generate gains on the liability, but these gains may be partially or wholly offset by the lower contributions received due to the lower-than-expected salaries.

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**The demographic assumptions are summarized below. We reviewed the development of these assumptions based on the experience study dated September 18, 2018, and we have concluded all of the demographic assumptions are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4. We have noted comments on specific assumptions below, but do not believe they would have a material effect.**

### 1. Rates of Termination

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

| | Under 5 Years of Service | | 5 or More Years of Service | |
|---|---|---|---|---|
| Age | Male | Female | Male | Female |
| 25 | 7.0% | 6.5% | 3.0% | 5.0% |
| 30 | 6.5% | 7.0% | 3.0% | 4.8% |
| 35 | 8.0% | 7.5% | 1.5% | 3.0% |
| 40 | 10.0% | 8.0% | 1.8% | 1.5% |
| 45 | 11.0% | 8.0% | 1.3% | 1.3% |
| 50 | 12.0% | 8.0% | 1.3% | 1.5% |
| 55 | 11.5% | 11.8% | 2.0% | 2.0% |
| 60 | 15.0% | 14.0% | 3.0% | 2.5% |
| 65 | 30.0% | 30.0% | 3.0% | 3.0% |

**Comment:** We support Segal's recommendation of rates that partially reflect the significant drop in termination rates indicated by the most recent experience. If this trend persists, further reductions in termination rates may be warranted.

### 2. Rates of Mortality

Healthy Post-Retirement: RP-2014 White Collar Annuitant Tables projected generationally with Scale MP-2017, with female rates multiplied by 70% for ages under 78 and 110% for ages 78 to 114 and male rates multiplied by 94% for ages under 81 and 110% for ages 81 to 114.

Disabled Post-Retirement: RP-2014 Disabled Retiree Tables projected generationally with Scale MP-2017, with female and male rates multiplied by 117% for ages 45 to 99.

Beneficiary Post-Retirement: RP-2014 Annuitant Tables projected generationally with Scale MP-2017, with female and male rates multiplied by 96% and 116%, respectively, for ages 50 to 114.

Pre-Retirement: RP-2014 White Collar Employee Tables projected generationally with Scale MP-2017, with female and male rates multiplied by 104% for all ages.

**Comment:** Normally a published mortality table is adjusted for a system's individual experience by multiplying the mortality rate for each age by a constant factor such that the shape of the curve of mortality rates from the published table is maintained. Segal, however,

applied different factors for different groups of ages. TRS has sufficient data and there appears to be evidence that different factors would be appropriate for certain ages, but Segal did not provide an explanation or rationale for the different factors. We suggest that in future studies, Segal provide the analysis used to develop the separate factors and consider a transition period between the factors so that mortality rates do not jump abruptly when switching from one factor to another.

### 3. Rates of Disability

| Age | Males | Females |
|---|---|---|
| 25 | 0.01% | 0.03% |
| 30 | 0.01% | 0.04% |
| 35 | 0.02% | 0.06% |
| 40 | 0.03% | 0.07% |
| 45 | 0.05% | 0.10% |
| 50 | 0.10% | 0.18% |
| 55 | 0.14% | 0.20% |
| 60 | 0.18% | 0.27% |
| 65 | 0.25% | 0.30% |

**Comment:** Due to the limited data, we support Segal's recommendation of rates that partially reflect the decrease in disability rates indicated by the most recent experience. If this trend persists, further reductions in disability rates may be warranted.

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### 4. Rates of Retirement

### a. For Members Hired before January 1, 2011:

| | Service | | | | |
|---|---|---|---|---|---|
| **Age** | **5 – 18** | **19 - 29** | **30-31** | **32-33** | **34+** |
| 54 | 0% | 7% | 8% | 40% | 45% |
| 55 | 0% | 7% | 8% | 40% | 45% |
| 56 | 0% | 7% | 8% | 40% | 45% |
| 57 | 0% | 7% | 10% | 40% | 45% |
| 58 | 0% | 7% | 10% | 40% | 40% |
| 59 | 0% | 30% | 35% | 60% | 40% |
| 60 | 20% | 30% | 40% | 60% | 40% |
| 61 | 17% | 30% | 40% | 50% | 40% |
| 62 | 15% | 30% | 40% | 50% | 40% |
| 63 | 15% | 30% | 40% | 50% | 40% |
| 64 | 22% | 40% | 45% | 50% | 40% |
| 65-66 | 25% | 40% | 45% | 50% | 40% |
| 67 | 20% | 40% | 45% | 50% | 45% |
| 68 | 20% | 40% | 40% | 50% | 45% |
| 69 | 25% | 40% | 40% | 50% | 45% |
| 70-73 | 100% | 100% | 100% | 50% | 30% |
| 74 | 100% | 100% | 100% | 100% | 30% |
| 75 | 100% | 100% | 100% | 100% | 100% |

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

| | Service | | | | |
|---|---|---|---|---|---|
| **Age** | **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% |

**Comment:** Since the experience study, the retirement rates for members with 30-31 years of service were changed to smooth the oscillation of high and low rates of assumed retirement between ages 59 and 64 as suggested in our prior audit.

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### 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. Inactive Vested Buyout

22% of eligible inactive vested members are assumed to receive a lump sum buyout now in lieu of an annuity at retirement.

### 7. Automatic Annual Increase Buyout

15% of eligible retiring Tier 1 members are assumed to receive a lump sum buyout and a retirement annuity with automatic annual increases of 1.5% of the originally granted retirement benefit starting at the later of January 1 following age 67 and the first anniversary of retirement.

### 8. Optional Service Purchases

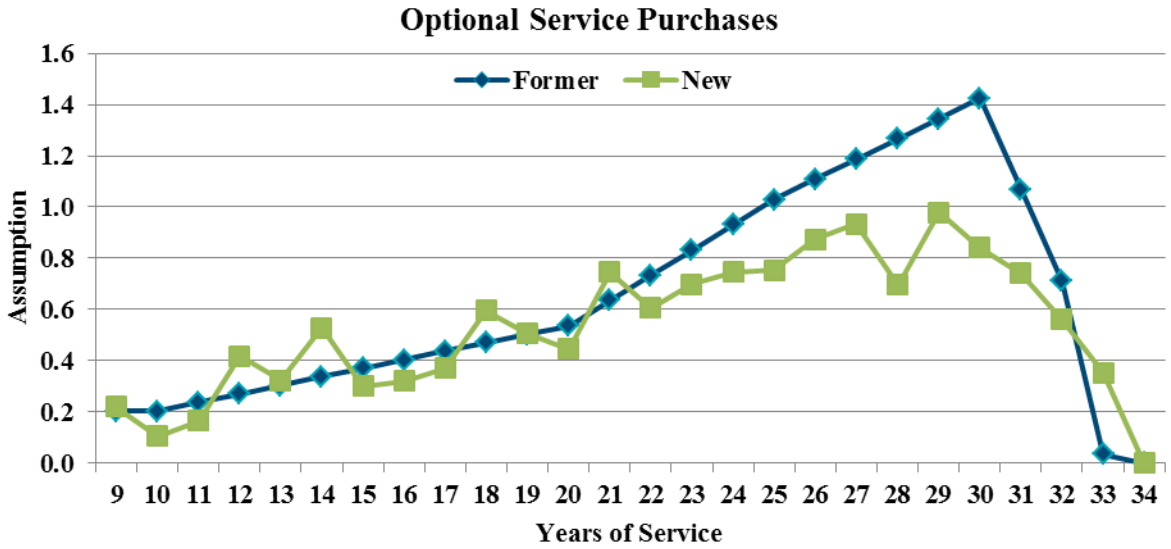
The liability for retirement benefits for active members who have not previously purchased optional service is increased to cover the employer cost of out-of-system service purchased in the last two years prior to retirement. The amount purchased varies by the amount of regular service at retirement.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

| Regular Service at Retirement | Maximum Service Purchased |
|---|---|
| 10 years | 0.107 years |
| 20 years | 0.445 years |
| 25 years | 0.752 years |
| 30 years | 0.841 years |
| 34 or more | None |

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

## SECTION III – SUPPORTING ANALYSIS

**Comment:** We would expect the Optional Service Purchase assumption to increase with service in a relatively uniform manner. As shown in the chart below, the new assumption is more erratic in its rate of increase.




Source: Segal's experience study dated September 18, 2018

### 9. 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 | 0.953 years |
| 25 years | 1.137 years |
| 30 years | 1.376 years |
| 34 years | 1.387 years |
| 35 or more | None |

### 10. Administrative Expenses

$31,439,548 of administrative expenses is expected to be paid for the year beginning July 1, 2020. Each year thereafter, administrative expenses are assumed to increase by the rate at which payroll is expected to increase.

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### 11. 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.

### 12. Census and Assets

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

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### C. New Entrant Assumption for Projections

The State contribution is based on the projected Actuarial Liability as of June 30, 2045. A critical set of assumptions used in projecting the Actuarial Liability are the demographic characteristics of projected new entrants. Segal assumes that the active population will remain constant and describes the demographic characteristics of projected new hires on pages 107 and 108 of the report. The rationale provided for these demographic characteristics is just that they were "based on previous plan experience." It is unclear from the disclosure in the report if the number of full-time and substitutes each remain constant and how the salaries for new entrants change from year to year. For example, a full-time 27 year old female new entrant is assumed to have a salary of $50,763. We assume that is for a new entrant during FY 2020. Based on the salary increase assumption, we would expect the same new entrant in FY 2021 to start with a salary that is 4.0% higher, but there is no disclosure to confirm that assumption, and the projected payroll suggests that it may be lower.

Given the critical nature of these assumptions in developing the State contribution, **we recommend that Segal include a more detailed explanation of how the new entrant assumption was developed, whether the number of full-time and substitutes are each assumed to remain level, and how the assumed salaries for new entrants change from year to year** (Recommendation #2).

The additional detail recommended above provides confidence in the assumptions selected, but doesn't provide much information about how the population's demographic characteristics are assumed to change over time. These changes can have a material impact on the projections, and as a result, on the State's contribution. **We recommend that Segal provide additional information in the valuation report about the population used in the projection such as the average age and service of the population each year** (Recommendation #6)**.**

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### D. Funding Method

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and (3) the amortization method.

*1. Actuarial 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 5/16). **We have no objections with respect to using the PUC method, although we, as Segal does, would prefer the Entry Age Normal (EAN) cost method as it is more consistent with the requirement in 40 ILCS 5/16 -158 for level percentage of pay funding**.

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

*2. Asset Valuation Method*

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

The 2018 Public Retirement Systems Study by the National Conference on Public Employee Retirement Systems (NCPERS) survey of 167 public retirement funds found that the majority of plans responding to the survey have a five-year smoothing period.

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

## SECTION III – SUPPORTING ANALYSIS

*3. Amortization Method*

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2045. While not a traditional amortization method, this methodology effectively amortizes a portion of the unfunded actuarial liability over the remaining period until 2045, which is currently 26 years.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be "a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period." Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

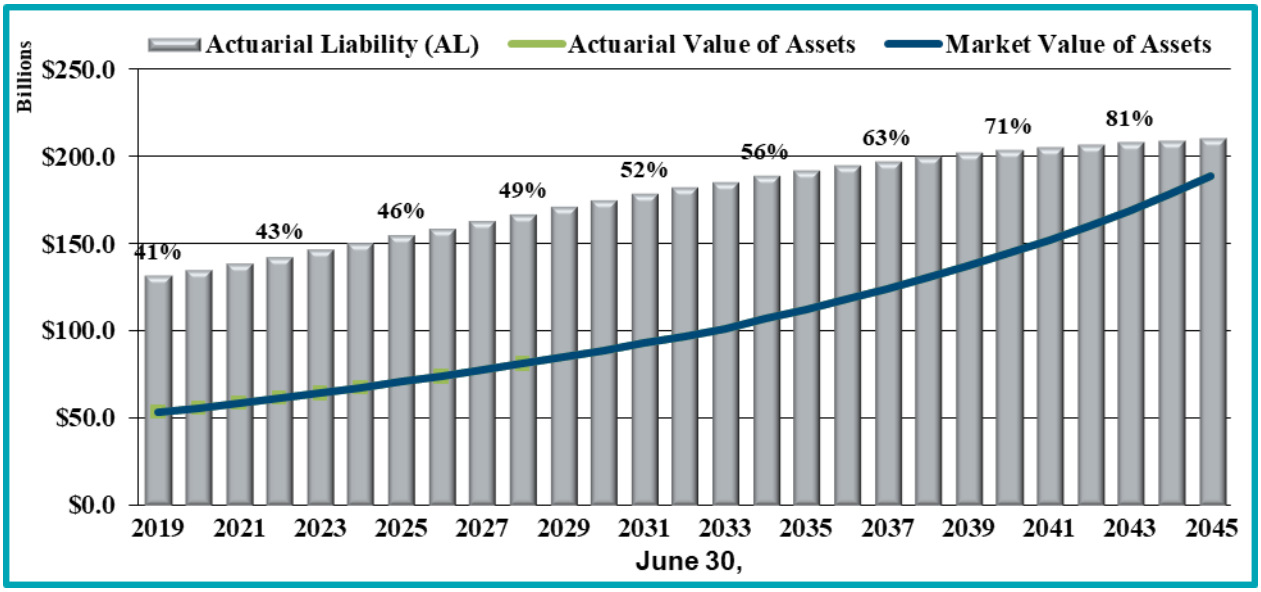
Typical public plan amortization methods are designed to increase each year by expected payroll growth. Under the State mandated method, however, the effective amortization payment increases each year by more than the expected growth in payroll. As a result, the State mandated method defers payments on the unfunded actuarial liability further into the future than under typical public plan amortization methods.

## SECTION IV – PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2019 Actuarial Valuation of TRS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

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

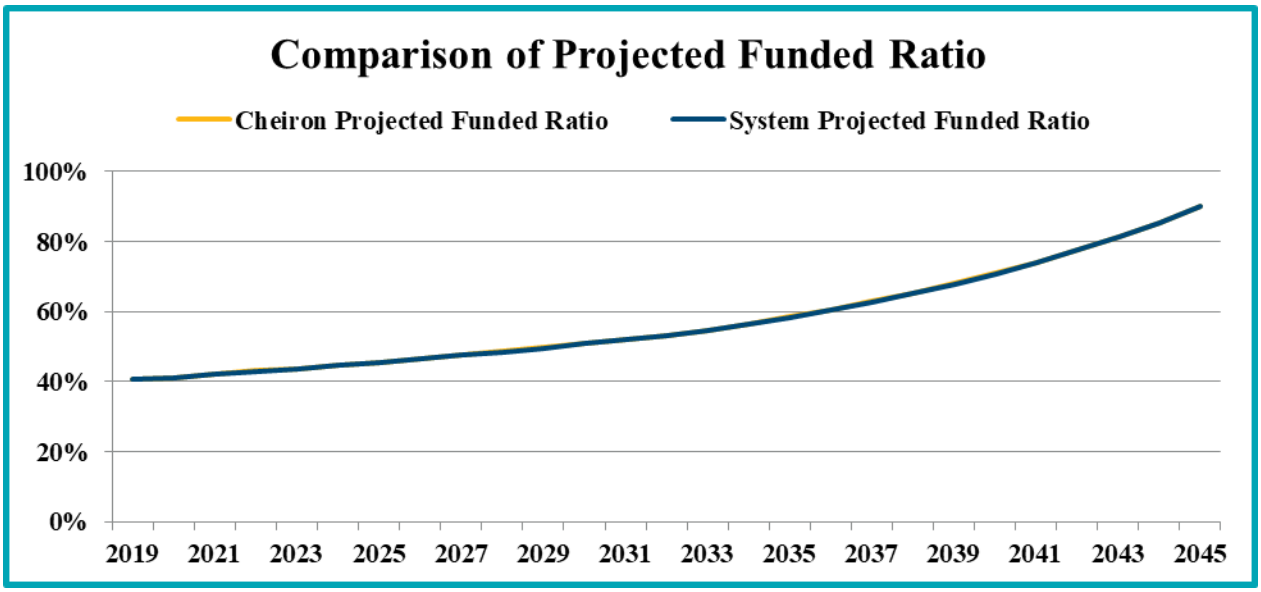
The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As seen in the graph on page 7 and the detailed figures in Section 5 of the draft June 30, 2019 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projections. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio is shown at the top of the bars. For example, in 2031, the funding ratio is projected to be approximately 52% with assets being approximately $93 billion and liabilities being approximately $178 billion.




Source: Cheiron projection analysis.

## SECTION IV – PROJECTION ANALYSIS

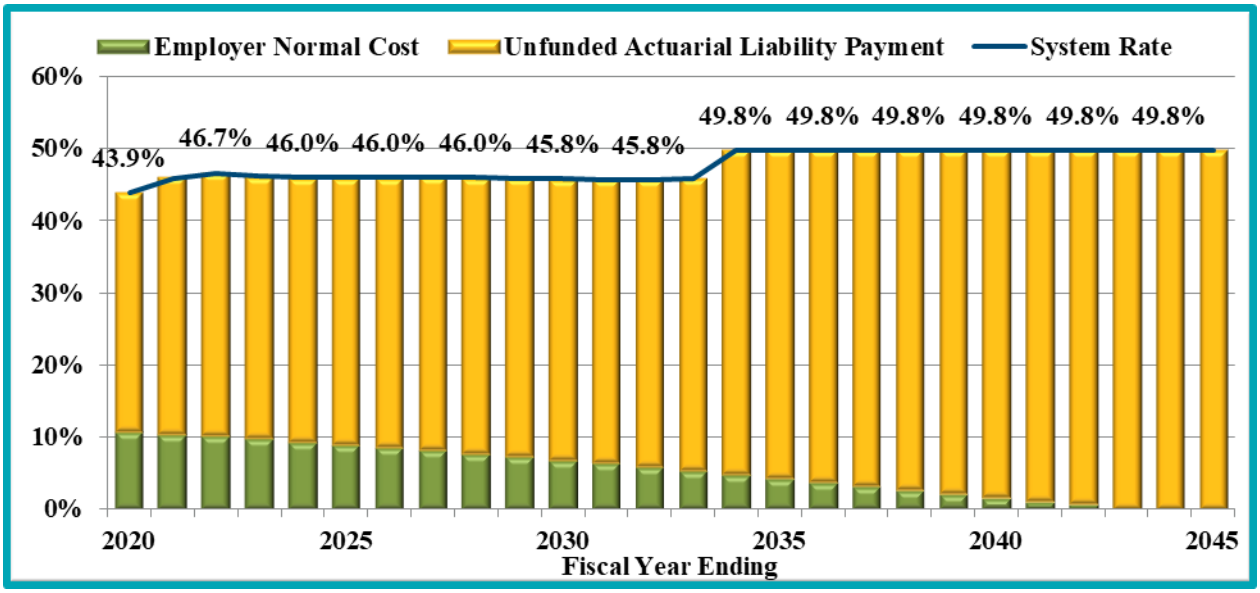
When we compare our projected funding ratio against the results shown in the draft June 30, 2019 Actuarial Valuation, **we find a very close match in expected funded ratio**. This close match of the funded ratio indicates that the projections done by the System's actuary are reasonable and the fact we show slightly different funded ratios is a function of Cheiron's approximation.




Source: Cheiron projection analysis.

## SECTION IV – PROJECTION ANALYSIS

The following graph shows the expected contributions calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for fiscal year ending 2020 was set based on the June 30, 2018 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2020 (Fiscal Year Ending June 30, 2021). The contribution requirement has two components: 1) the employer normal cost, which is the value of the amount of benefits to be accrued by participants in the upcoming year, less employee contributions; and 2) an amortization payment on the unfunded liability. The normal cost is shown by the green bars and the amortization of the unfunded actuarial liability (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, 2019 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. In this instance, there is virtually no difference. 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**.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

In this section, we examine the adequacy of the funding for the System, including funded status, the sources of changes in the unfunded actuarial liability (UAL), and projections of the UAL and statutory funding requirements compared to contributions needed to pay down the UAL.

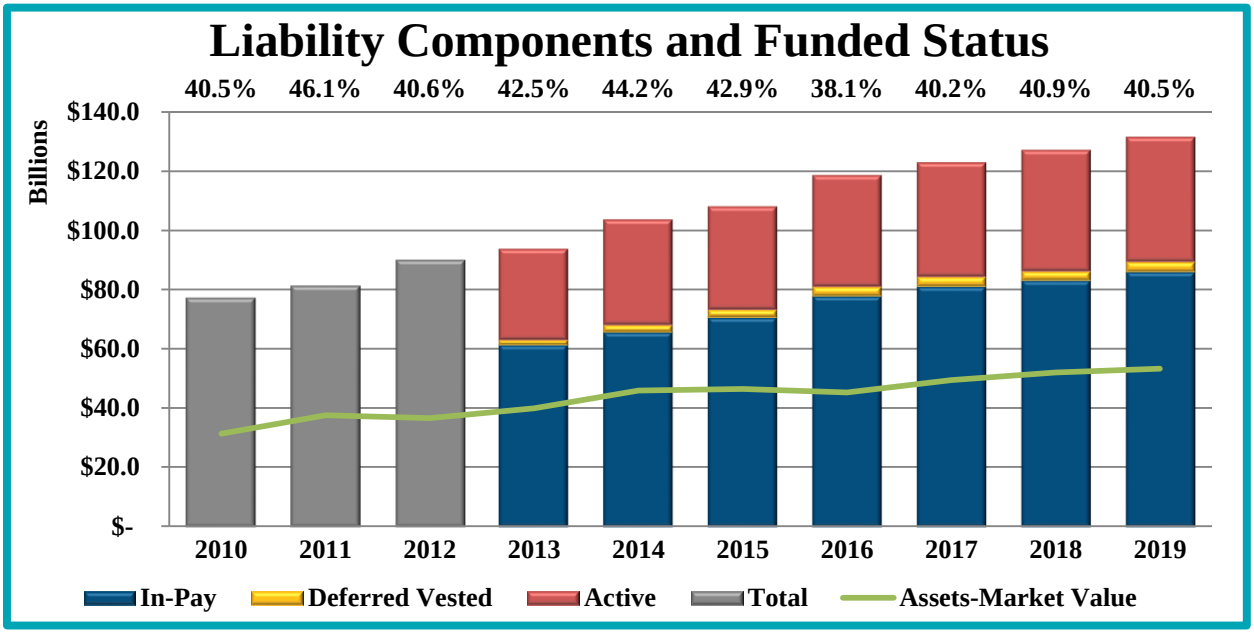
The actuarial valuation report prepared by Segal includes traditional actuarial measurements, that should be enhanced by the additional stress testing and projections that we suggested. Given the unique and substantial funding challenges faced by the Illinois pension systems, this section on funding adequacy supplements the information from the Segal report to better inform the legislature and other stakeholders about the adequacy of the System's funding.

### System Funded Status

The first funding adequacy measure is the historical trend of the System's funded status for the past ten years. Funded status for this measure is defined as the ratio of the market value of assets to the actuarial liability. The chart below shows that TRS' funded status has returned to the same level it was in 2010 – 40.5%. In addition to showing the funded status, for 2010 and later, this chart also shows the breakdown of the plan's liabilities by membership status for years after 2012 when the breakdown was provided in the valuation report:

- Active liability – the liability (attributable to service already performed) for future payments to members who are currently working in the System,
- Deferred Vested liability – the liability for future payments to members who are no longer working in the System, and
- In-Pay liability – the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown shows that today plan assets only cover about 62% of the liabilities for just those members currently in-pay status.

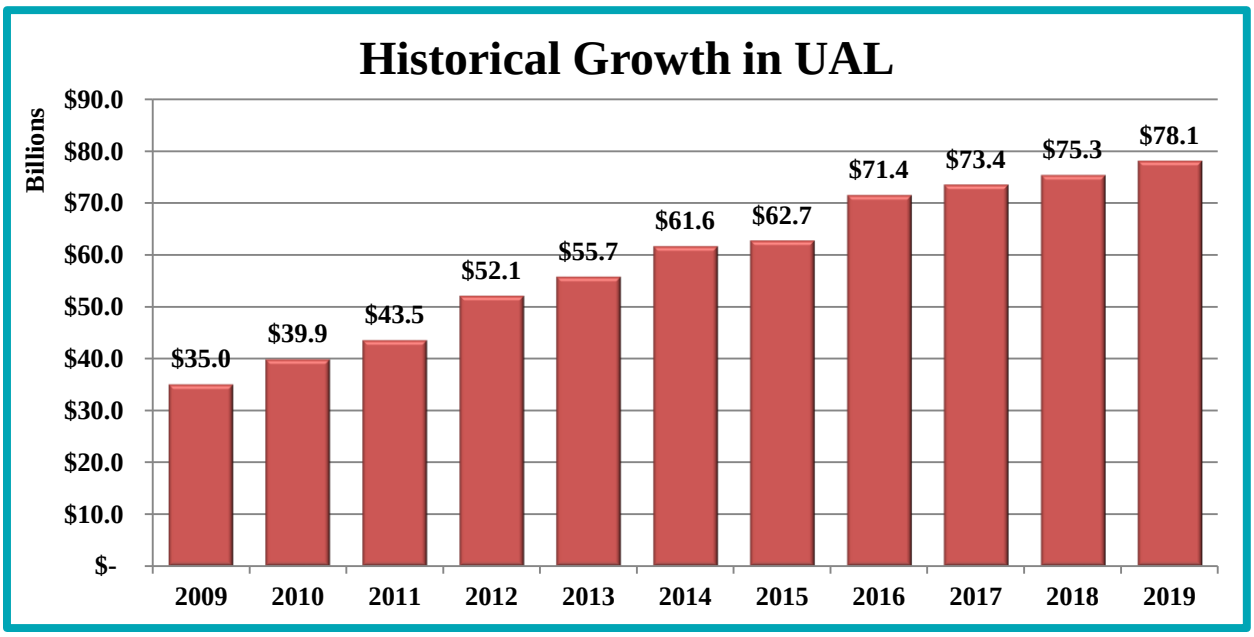



Source: Cheiron analysis of funding adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

### Sources of Changes in the UAL

As shown in the chart below, TRS' unfunded actuarial liability (UAL) has grown from about $35.0 billion in 2009 to $78.1 billion in 2019, an increase of $43.1 billion. In order to understand how to reverse this trend, it is important to understand the sources contributing to it.




Source: Cheiron analysis of funding adequacy.

The changes to the UAL from June 30, 2009 to June 30, 2019 can be separated into the following components:

- **Contribution Deficiencies** – Contributions that are less than the tread water contribution cause the UAL to increase. The tread water contribution consists of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability. This sum is referred to as the tread water contribution because it is the contribution necessary so that the UAL will remain constant, or "tread water" (absent experience gains or losses). The difference between actual contributions and the tread water contributions increased the UAL by $19.1 billion over this period.

- **Assumption Changes** – Changes to actuarial assumptions over this period increased the UAL by $16.6 billion. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations.

- **Plan Changes** – Modifications to the design of the plan had a negligible impact over this period, reducing the liability by $0.4 billion, as most of the changes only affected future benefits.

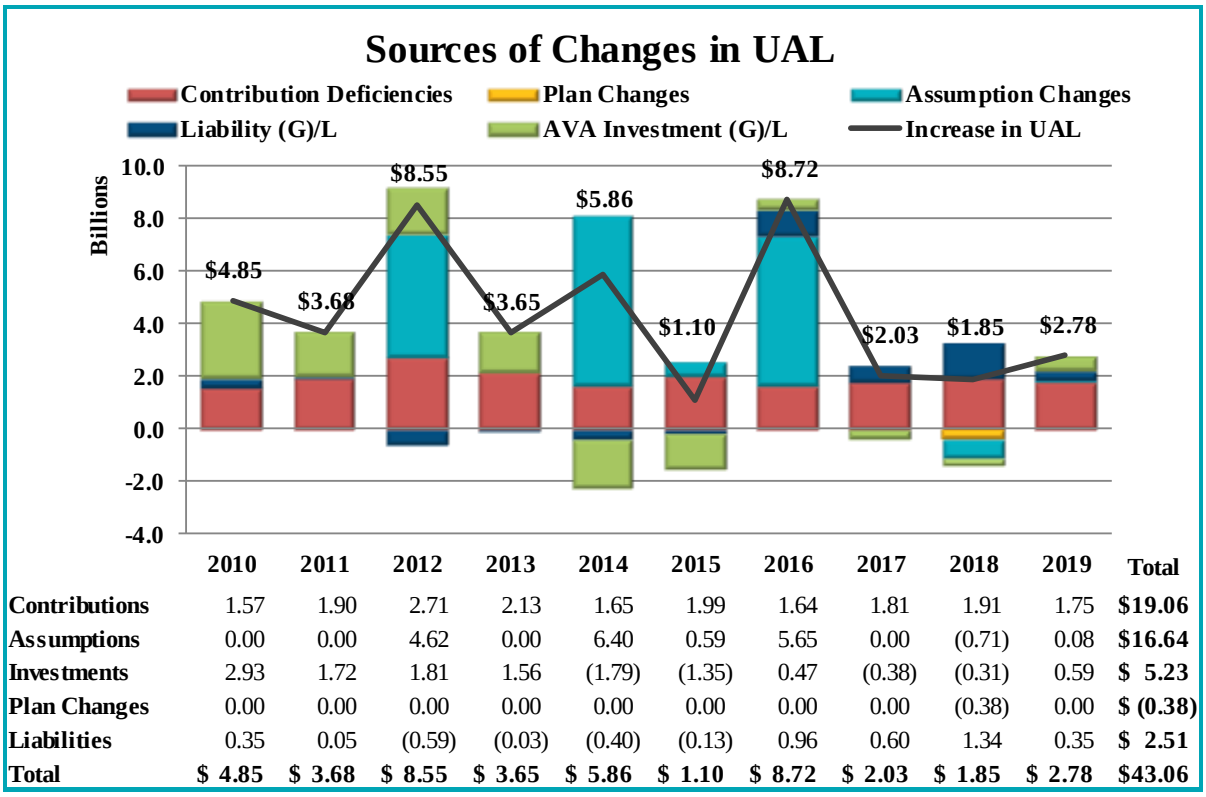
- **Liability (Gain) or Loss** – The changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.) were generally small, but increased the UAL by $2.5 billion over this period.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

- **AVA (Actuarial Value of Assets) Investment (Gain) or Loss** – The net investment gain or loss due to assets earning more or less than assumed increased the UAL over this period by $5.2 billion.

  The chart below shows the changes in UAL each year broken into these five components. The sum of all the components total change in UAL is shown as the black line.

  In the last 10-years, the UAL has increased every single year. Factors that would reduce the UAL have been infrequent and smaller than the factors increasing the UAL. The persistent contribution deficiencies compared to the tread water amount have been the largest contributor to the growth of the UAL in the last 10 years followed by assumption changes (primarily reducing the discount rate).




| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Contributions** | 1.57 | 1.90 | 2.71 | 2.13 | 1.65 | 1.99 | 1.64 | 1.81 | 1.91 | 1.75 | **$19.06** |
| **Assumptions** | 0.00 | 0.00 | 4.62 | 0.00 | 6.40 | 0.59 | 5.65 | 0.00 | (0.71) | 0.08 | **$16.64** |
| **Investments** | 2.93 | 1.72 | 1.81 | 1.56 | (1.79) | (1.35) | 0.47 | (0.38) | (0.31) | 0.59 | **$ 5.23** |
| **Plan Changes** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | (0.38) | 0.00 | **$ (0.38)** |
| **Liabilities** | 0.35 | 0.05 | (0.59) | (0.03) | (0.40) | (0.13) | 0.96 | 0.60 | 1.34 | 0.35 | **$ 2.51** |
| **Total** | **$ 4.85** | **$ 3.68** | **$ 8.55** | **$ 3.65** | **$ 5.86** | **$ 1.10** | **$ 8.72** | **$ 2.03** | **$ 1.85** | **$ 2.78** | **$43.06** |

Source: Cheiron analysis of funding adequacy.

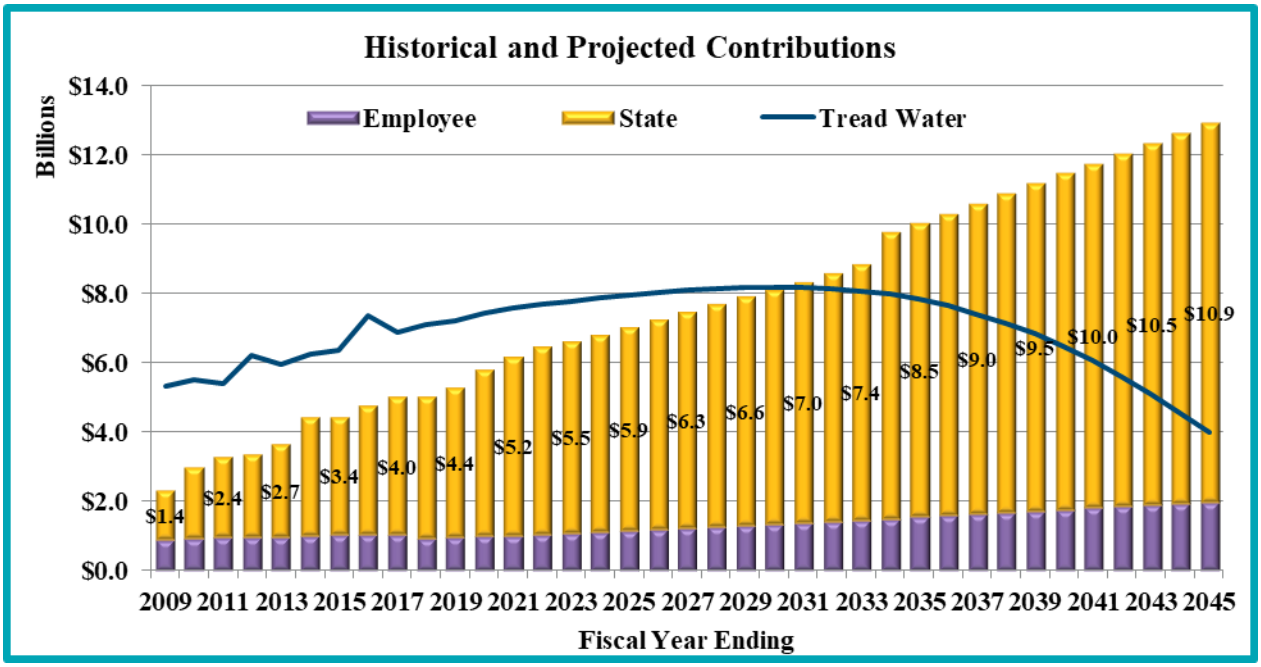
We expect that this chart will help stakeholders understand the sources of growth in the UAL over the past decade and inform discussions about the current funding requirements and adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

## Actual Contributions Compared to Tread Water Contribution

One of the persistent sources of the increase in UAL is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the UAL from increasing if all assumptions are met). These contribution deficiencies have added between $1.6 and $2.7 billion to the UAL each year.

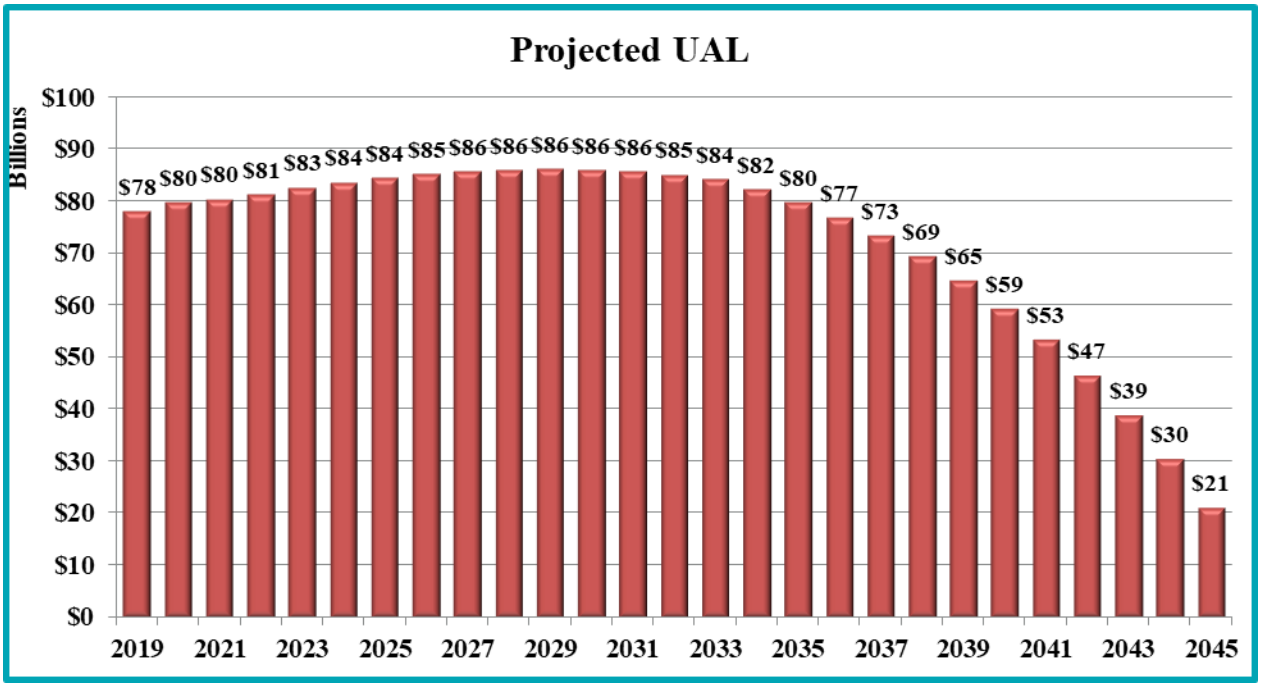
As the chart below shows, actual contributions have been significantly less than the tread water cost, and this trend is projected to continue until 2030. Each year that total contributions remain below the tread water cost (blue line), the UAL is expected to grow. As shown in the graph below the contributions from the State will need to increase significantly before the total contribution reaches the tread water contribution and begins to pay down the UAL.




Source: Cheiron analysis of funding adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

The next chart shows that if the minimum required contributions continue to be made each year and all other assumptions are met, the UAL is projected to grow from $78 billion in 2019 to $86 billion in 2029 before contributions are sufficient to start paying the UAL down. Note that the UAL is not projected to get below its current level until 2036.



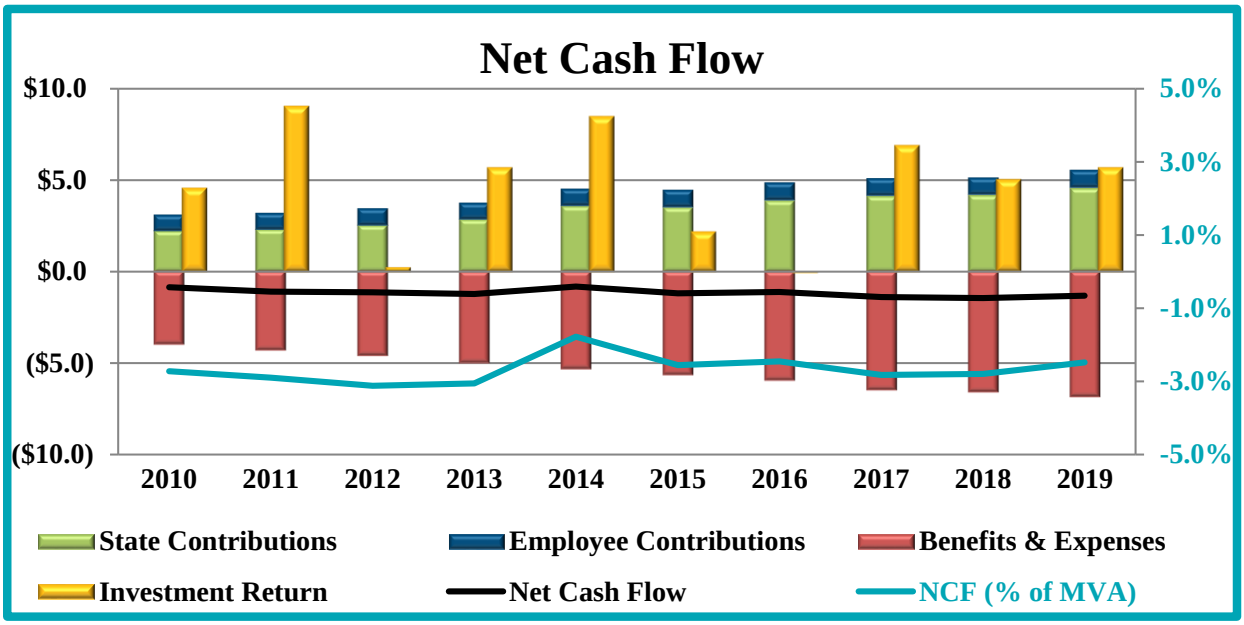

Source: Cheiron analysis of funding adequacy

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

### Net Cash Flow Analysis

The plan's net cash flow is defined as State and Member contributions less benefit payments and administrative expenses. The more negative net cash flow is as a percentage of the plan's assets, the more vulnerable the plan is to market downturns. When a pension plan has more payouts than contributions and suffers an investment loss, it is left with fewer assets to invest and recapture during a recovery.

Looking at the chart below, TRS has mildly negative net cash flow (black line). If contributions increase as quickly as benefit payments, the net cash flow will remain stable. But if contributions do not continue to grow either because the plan has become better funded or because the expected contributions are not made, negative net cash flow may become a more significant issue, therefore it should continue to be monitored. The teal line shows net cash flow as a percent of Market Value of Assets on the right side axis. The greater the negative cash flows are relative to plan assets the more vulnerable a plan is to market downturns. This is because once there is a market downturn, the plan assets loses both on the return and the negative cash flow, leaving it with a lower asset base from which to recover from the loss.




Source: Cheiron analysis of funding adequacy.

## STATUS OF RECOMMENDATIONS FROM THE 2018 STATE ACTUARY'S REPORT

## Response to Recommendations in 2018

In the State Actuary's Preliminary Report on the Teachers' Retirement System of Illinois dated December 19, 2018, 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, 2019 Actuarial Valuation.

| Recommendations to Retirement System from 2018 State Actuary Report | Status | Comments |
|---|---|---|
| 1. We recommend that Federal funds contributions be treated in the same manner as other School District contributions when calculating the FY 2020 State contribution rate. | **Implemented** | Exhibit II in the 2019 Preliminary Actuarial Valuation Report reflects the recommended change.<br><br>**Recommendation removed** |
| 2. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of TRS. Continuing the practice of underfunding future accruals such that the unfunded liability is expected to continue to grow and targeting a funded percentage less than 100% 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. | **Partially Implemented** | The System has adopted a funding policy referred to as the *Board-Adopted Actuarial 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.<br><br>The *Board-Adopted Actuarial Funding Policy* targets full funding after 20 years and is considered actuarially sound.<br><br>**Recommendation repeated.** |
| 3. We recommend that Segal add an explanation of the primary sources of the $983 million experience loss that is currently unexplained. We understand from conversations that this loss is primarily attributable to programming changes that affected a subgroup of members. A footnote to that effect similar to what was done for 2016 would be sufficient. | **Implemented** | The experience loss was supported by a footnote added to chart 14 on page 30 of the final 2018 valuation report, describing how the 'other" experience loss was primarily due to programming enhancements<br><br>**Recommendation removed.** |
| 4. We recommend that Segal include a more detailed explanation of how the new entrant assumption was developed and how the assumed | **Not Implemented** | Segal indicated that they would expand the description in the 2019 report, but the description remains the same in the 2019 preliminary valuation report. It is still not |

## STATUS OF RECOMMENDATIONS FROM THE 2018 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2018 State Actuary Report | Status | Comments |
|---|---|---|
| salaries for new entrants change from year to year. | | clear how the new entrant assumption was developed or how the assumed salaries for new entrants change from year to year.<br><br>**Recommendation Repeated** |
| 5. 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. | **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 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.<br><br>The System's response stated that " (t)he TRS investment consultant, RVK, and Segal will be updating the asset-liability over the next few months" and that "board meetings provide better opportunities for TRS trustees to comprehend insolvency risk and develop strategies to guide the system's response to this threat."<br><br>**Recommendation Repeated** |
| 6. We are concerned that the analysis performed for the salary increase assumptions results in an assumption for salary increases that is at the very high end of a reasonable range. We recommend the TRS Board consider reducing the salary increase assumption in future valuations or provide additional analysis to support the increased assumption. | **Not Implemented** | TRS Response referred to the analysis in their experience study and stated that "(a)ctual salary increase experience over a relatively short period of time (such as three years used in the experience study analysis) is largely driven by prevailing inflation around that time period."<br><br>**Recommendation Repeated** |

## STATUS OF RECOMMENDATIONS FROM THE 2018 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2018 State Actuary Report | Status | Comments |
|---|---|---|
| 7. We recommend that Segal provide additional information in the valuation report about the population used in the projection such as the average age and service of the population each year. | **Not Implemented** | Segal and TRS indicated that they will consider adding this information in the 2019 valuation, but the additional information has not been added.<br><br>**Recommendation Repeated** |
| 8. 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, as they did for this valuation. | **Implemented** | The economic assumptions were reviewed at the August 2018 Board meeting. The Board decided to continue use of a 7.00% rate of return.<br><br>We will continue to include this recommendation each year.<br><br>**Recommendation continued.** |

**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 3, 2019. The preliminary report was based on Cheiron's review of actuarial assumptions included in SURS' 2019 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the State Universities Retirement System. SURS' written response, provided on December 13, 2019, can be found in Appendix C.

**OVERVIEW**
**STATE UNIVERSITIES RETIREMENT SYSTEM**
as of June 30, 2019

| | |
|---|---|
| Actuarial accrued liability | $46,443,937,000 |
| Actuarial value of assets | $19,661,891,301 |
| Unfunded liability | $26,782,045,699 |
| Funded ratio | 42.3% |
| | |
| Employer normal cost | $450,200,000 |
| State contribution (FY21) | $2,001,296,000 |
| | |
| Active members | 75,120 |
| Inactive members | 93,077 |
| Current benefit recipients | 67,842 |
| Total membership | 236,039 |
| | |
| Interest rate assumption | 6.75% |
| Inflation assumption | 2.25% |
| Actuarial cost method | Projected Unit Credit |
| Asset valuation method | 5-year Smoothing |
| | |
| Executive Director | Martin Noven |
| Actuarial Firm | Gabriel, Roeder, Smith & Company |

Source: June 30, 2019 SURS actuarial valuation report.

December 17, 2019

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

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

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS), of the required State contribution to the State Universities Retirement System of Illinois (SURS or System) for Fiscal Year 2021.

**In summary, we believe that the assumptions and methods used in the draft June 30, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, 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 2021. 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 minimum funding requirements for the System. **In our opinion, the statutory mandated minimum funding requirements are inadequate, producing contribution amounts that are expected to result in an increase to the unfunded actuarial liability for several years.** Section IV reviews the projections contained in the draft June 30, 2019 Actuarial Valuation. Finally, Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by SURS and GRS. This information includes actuarial assumptions and methods adopted by the SURS Board, plan provisions, the draft June 30, 2019 Actuarial Valuation, the 2018 Experience Review Report, the NEPC 2019 Capital Market Assumptions report, 2019 minutes of the SURS Board of Trustee meetings, and various memos prepared by the System's advisors, staff, and

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

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. 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, MAAA, EA
Principal Consulting Actuary

SIGNED ORIGINAL ON FILE

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

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE STATE 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) 2021. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the SURS Board to consider before finalizing its certification of the required State contribution for FY 2021.

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, 2019 Actuarial Valuation prepared by GRS, the 2018 Experience Review Report, the NEPC 2019 Capital Market Assumptions report, 2019 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, 2019 Actuarial Valuation.

## SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2019 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 2021 required State contribution calculated under the current statutory funding plan is $2,001,296,000. 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.

## State Mandated Funding Method

1. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SURS. Continuing the practice of underfunding future accruals such that the unfunded liability is expected to continue to grow, and targeting a funded percentage less than 100% increases the risk of the System becoming unsustainable. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

## Conformance to Statutory Funding Changes of Public Act 100-0023

*Recognition of Changes in Actuarial Assumptions*

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes be phased-in over a five-year period. This phase-in provides time to adjust to a higher level of contributions, but for a System in which the unfunded liability is already expected to continue to grow for several years, such delays allow the unfunded liability to increase even more if the assumption change is an increase in cost, adding additional risk to the system.

The Act requires that the impact of assumption changes "be implemented in equal annual amounts over a five-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution." This amount is then implemented "at the resulting annual rate in each of the remaining fiscal years in that five-year period." GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of payroll, and reflecting one-fifth of that percentage change over five years. The method used by GRS will result in the cost impact due to assumption changes being recognized as increasing dollar amounts. This is because the recognition as an equal percentage of pay gets applied to an increasing payroll over a five-year period.

## SECTION II – SUMMARY OF RECOMMENDATIONS

*Optional Hybrid Plan*

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

GRS reflected the hybrid plan in the June 30, 2017 valuation and Cheiron commented that this was appropriate since the State mandated funding method requires projecting the liabilities of the System to 2045. However, in their draft June 30, 2018 and June 30, 2019 valuations, GRS did not reflect provisions related to the optional hybrid plan because SURS will not implement the plan until clarifying legislation is passed to enable SURS to implement the plan.

*Earnings that Exceed the Governor's Salary*

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

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

## Conformance to Changes of Public Act 100-0587

*Accelerated Pension Benefit Payments*

P.A. 100-0587 created two accelerated pension benefit payment options. Inactive vested members have the option of receiving a lump sum equal to 60% of the present value of their benefits in lieu of their annuity benefits, and Tier 1 members have the option upon retirement of accepting a reduced automatic increase in exchange for a lump sum equal to 70% of the present value of the reduced annuity benefits. Eligible members must make an election by June 30, 2024 if they want to receive the accelerated pension benefit payments.

GRS continues to assume that no participant will elect to take an accelerated pension benefit payment option. In the prior year, there was no experience upon which to base this assumption on. While there was experience this year, no one elected the buyout option. In the future GRS will continue to monitor actual experience and may at some point have a basis for developing buyout election assumptions. We believe this approach is reasonable.

## SECTION II – SUMMARY OF RECOMMENDATIONS

## Assessment of Actuarial Assumptions Used in the 2019 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, 2019 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

## Recommended Additional Disclosures for the 2019 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 illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made.

3. GRS introduced a new risk disclosure section in the June 30, 2019 valuation in which GRS states on page 15 "Additional risk assessment is outside the scope of the annual actuarial valuation." In our opinion, GRS should have recommended to the SURS Board that such an assessment be performed and included in this report. The failure to make such a recommendation in our opinion is not consistent with the requirements of ASOP 51.

## Recommended Changes for Future Valuations

4. We continue to recommend that the SURS Board annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly. We do not see evidence this was done for the current valuation.

A new Actuarial Standard of Practice became effective for this valuation on the Assessment and Disclosure of Risk (ASOP 51). GRS made a good faith effort to comply with the new requirements, but the risk section in the valuation report (see pages 13, 14, and 15) could be improved to better comply with the new requirements.

5. For future risk disclosure we recommend:
   - An assessment should be provided for each risk that is identified by GRS.
   - An explanation should be provided as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified by GRS.
   - Historical values that are significant to understanding the risks identified by GRS should be disclosed along with an explanation of how they help the reader understand the risks identified by GRS.

## SECTION II – SUMMARY OF RECOMMENDATIONS

## GASB 67 and 68

The 2019 SURS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2019 SURS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

## 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 the required State contribution, reviewed the assumptions on which it is based, and accepted GRS's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

## State Mandated Methods

The Illinois Pension Code (40 ILCS 5/15-155) establishes a method that does not adequately fund the System. This law requires the actuary to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the actuarial accrued liability in the year 2045 if all assumptions are met. This contribution level does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the actuarial accrued liability, not 90%. In addition, the State mandated method produces a contribution that results in an increase in the unfunded actuarial liabilities over the next decade if all assumptions are met.

**We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SURS** (Recommendation #1). The funding method should target 100% of the actuarial accrued liability, and contributions should ramp up as quickly as possible to a level that is expected to prevent the unfunded actuarial accrued liability from growing. Continuing the practice of underfunding the System increases the risk of needing even larger contributions in the future that may make the System unsustainable.

The GRS draft June 30, 2019 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 by the year 2045. Under this recommendation, GRS calculated a fiscal year 2021 State contribution amount of $2,529,332,000 (including SMP and Employer contributions). We concur with GRS's recommendation and demonstration of an alternative funding approach. It conforms to a goal of full funding within a reasonable time period and with generally accepted actuarial principles and practices.

Based on the draft June 30, 2019 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 42.33%. The unfunded actuarial liability is currently about $27 billion and is not expected to drop below that level for 12 years. The required State contribution rate is currently 37.69% of payroll and scheduled to increase to 43.98% of payroll in 2034 and remain level thereafter until 2045. However, if there is

a significant market downturn, the unfunded actuarial liability and the required State contribution rate would increase, putting the sustainability of the system further into question. Stress testing should be performed to better understand these risks and the potential advantages of additional contributions in the near term to maintain the sustainability of the system.

**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 illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made** (Recommendation #2).

As mentioned in Section II, a new Actuarial Standard of Practice (ASOP) has been introduced, ASOP 51, and is effective for SURS actuarial valuation starting June 30, 2019. ASOP 51 provides guidance to actuaries on the assessment and disclosure of risks to help readers of the actuarial valuation report "*understand the effects of future experience differing from the assumptions used*" and "*the potential volatility of future measurements resulting from such differences*".

ASOP 51's first requirement is to *"identify risks that, in the actuary's professional judgment, may reasonably be anticipated to significantly affect the plan's future financial condition."* GRS identified six sources of risk to SURS: investment risk, asset/liability mismatch risk, contribution risk, salary and payroll risk, longevity risk and other demographic risks. With the exception of the contribution risk due to the statutorily-required amount of contributions, the risks SURS identified are relatively generic and would apply to most pension plans.

ASOP 51 requires the actuary to assess each of the risks identified. While the assessment does not have to be quantitative, it does have to take into account the specifics of the individual plan. ASOP 51 also describes several quantitative methods that may be used to assess risk.

- Investment Risk. GRS describes the impact of a variation in the investment return in the next year from the assumed rate, but do not provide any additional assessment. The stress testing we recommend adding to the report is one method that may be used to assess the investment risk of the plan.

- Asset/Liability Mismatch Risk. GRS does not appear to provide an assessment of asset/liability mismatch risk other than to indicate that a mismatch may alter the funded status and contribution requirements.

- Contribution Risk. GRS discusses several issues with the statutorily required contribution method throughout the Summary section. It would be useful to reference the other analyses of contribution risk that are in the report in the risk section.

## SECTION III – SUPPORTING ANALYSIS

- Salary and Payroll Risk. GRS does not appear to provide an assessment of salary and payroll risk other than to indicate that experience that differs from the assumptions will either increase or decrease costs.

- Longevity Risk. GRS does not appear to provide an assessment of longevity risk other than to indicate that experience that differs from the assumptions will either increase or decrease costs.

- Other Demographic Risk. GRS provides an explanation of demographic risks, but does not appear to provide any assessment of these risks.

GRS adequately identified the primary drivers of these risks, provided background information about these identified risks, but did not in our opinion adequately communicate the significance of these risks to this plan. That could have been achieved if GRS recommended that additional risk assessment, such as stress testing, be included in the report. GRS states that additional risk assessment is outside the scope of the annual actuarial valuation.

ASOP 51 Section 3.6 has this to say about additional assessment of risk; "*If, in the actuary's professional judgement, a more detailed assessment would be significantly beneficial for the intended user to understand the risks identified by the actuary, the actuary should recommend to the intended user that such an assessment be performed*." In making that judgment, ASOP 51 lists a number of factors that the actuary should consider, such as the plan's size, its funded status, the plan's maturity, and unique factors related to the plan sponsor, in this case being the State. One of those factors is whether based on recent history or other known factors there are indications the plan sponsor may not make recommended contributions. SURS is a large and mature plan, with a poor funded status. Also, GRS has been recommending and continues to recommend in this year's report a higher contribution than the State is paying. **Therefore, in our opinion, GRS should have recommended to the SURS Board that such an assessment be performed and included in this report** (Recommendation #3). The failure to make such a recommendation in our opinion is not consistent with the requirements of ASOP 51.

ASOP 51 Section 3.7 requires the actuary to *"calculate and disclose plan maturity measures that … are significant to understanding the risks associated with the plan."* GRS calculates the current and prior year assets to payroll ratio, the actuarial liability to payroll ratio, actives to annuitant ratio, and the net cash flow to market value ratio all of which may provide significant information about the potential effects of investment risk and demographic risk. GRS describes each maturity measure, but there is no explanation of how these measures help to understand any of the risks identified. GRS doesn't provide any projections of any of these maturity measures even though they are all readily available given the projections required to determine the statutory contribution amounts.

ASOP 51 Section 3.8 says the actuary *"should identify and disclose relevant historical values of the plan's actuarial measurements"* if they are reasonably available and are significant to the risks identified. SURS historical values are readily available for funding status and plan maturity

measures. We believe adding historical values and commentary about the trends shown would enhance the understanding of risks within the plan. For example, showing how the historical ratio of Actuarial Accrued Liability to Covered Payroll has changed over the past 10 years would give insight into how the maturity of SURS is changing and therefore how the sensitivity to risks may be changing.

**Thus, we recommend that an assessment be provided for each risk that is identified by GRS, that an explanation be provided as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified, and that historical values that are significant to understanding the risks identified be disclosed along with an explanation of how they help the reader understand the risks identified by GRS** (Recommendation #5).

## Conformance to Statutory Funding Changes of Public Act 100-0023

*Recognition of Changes in Actuarial Assumptions*

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a five-year period. This phase-in provides time to adjust to a higher level of contributions. However, for a System in which the unfunded liability is already expected to continue to grow for several more years such delays allow the unfunded liability to increase even more if the assumption change is an increase in cost, adding additional risks to the System.

Public Act 100-0023 states:

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

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

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

GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of expected 2018 payroll, and reflecting one-fifth of that percentage change over five years. In the draft 2019 Actuarial Valuation report there is a clear demonstration of the dollar

## SECTION III – SUPPORTING ANALYSIS

amounts to be smoothed as a result of the assumption changes as disclosed in the 2014, 2015, and 2018 actuarial valuation reports and the calculation of the annual rate change based on appropriate payroll. This rate adjustment is then recognized over a five-year period as an adjustment to the contribution rate that would otherwise be required from the State. The method used by GRS will result in the cost impact due to assumption changes being recognized as increasing dollar amounts. This is because the recognition as an equal percentage of pay gets applied to an increasing payroll over a five-year period.

*Optional Hybrid Plan*

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

As stated in Section II of this report GRS reflected the hybrid plan in the June 30, 2017 valuation by anticipating that future participants elect the optional hybrid plan and adjusting last year's contribution requirement to reflect this information. However, in 2018 GRS did not reflect the hybrid plan because SURS does not intend to implement the hybrid plan until clarifying language is legislated. For SURS, it is assumed that the optional hybrid plan will be established by July 1, 2019 and members will be able to participate beginning in fiscal year 2020. Based on consultation with SURS staff, GRS has assumed that, when available, 0% of new members will elect the optional hybrid plan, 70% will elect the Tier 2 Plan, and 30% will elect the Self-Managed Plan. While not developed from direct experience since the plan is not yet available, these assumptions seem reasonable based on the plan design and the expectations of GRS and SURS staff.

*Earnings That Exceed the Governor's Salary*

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

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

## SECTION III – SUPPORTING ANALYSIS

# Conformance to Changes of Public Act 100-0587

*Accelerated Pension Benefit Payments*

P.A. 100-0587 created two accelerated pension benefit payment options. Inactive vested members have the option of receiving a lump sum equal to 60% of the present value of their benefits in lieu of their annuity benefits, and Tier 1 members have the option upon retirement of accepting a reduced automatic increase in exchange for a lump sum equal to 70% of the present value of the reduced annuity benefits. Eligible members must make an election by June 30, 2024 if they want to receive the accelerated pension benefit payments.

GRS continues to assume that no participant will elect to take an accelerated pension benefit payment option. There was no experience in the prior year upon which to base this assumption on. While there was experience this year, no one elected the buyout option. In the future GRS will continue to monitor actual experience and may at some point have a basis for developing buyout election assumptions. We believe this approach is reasonable.

## SECTION III – SUPPORTING ANALYSIS

# Assessment of Actuarial Assumptions Used in the 2019 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 6.75% for the draft June 30, 2019 Actuarial Valuation.

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

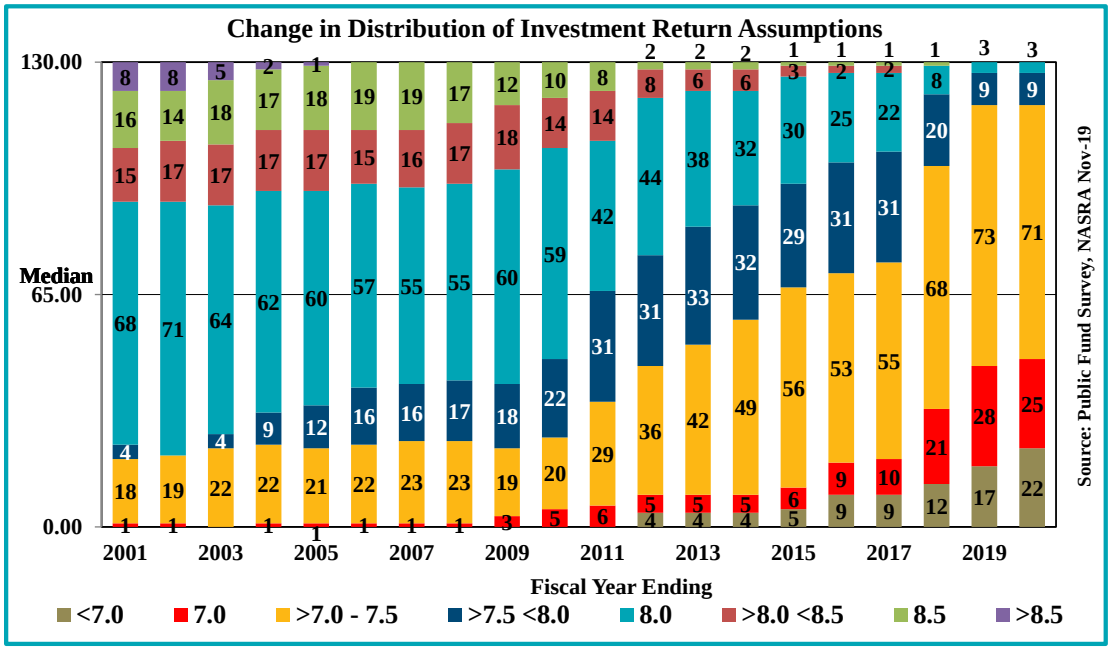
**We continue to recommend that the SURS Board annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly. We do not see evidence this was done for the current valuation.** (Recommendation #4).

*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.

- While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 130 large retirement plans. The following chart shows the distribution of discount rates for the plans in the Public Plans Database since 2001. Historically, SURS had one of the highest discount rates in the nation, but now the 6.75% assumption is below the median assumption. The latest data includes results collected through November 2019.

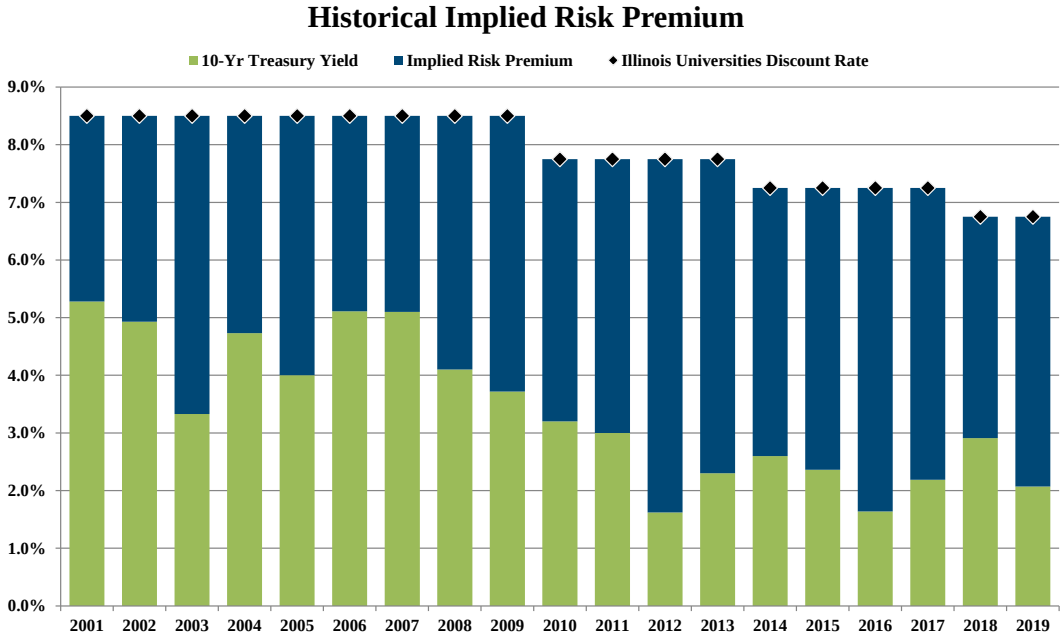
## SECTION III – SUPPORTING ANALYSIS




Over the period shown, there continues to be a pattern of reducing discount rates. Of the 130 plans shown for both 2019 and 2013, 114 have reduced their discount rate assumption since 2013. For these 114 plans, the average reduction is 0.57%. The data is consistent with the experience of other Cheiron clients, which have generally shown a significant trend of reducing their discount rate assumptions over the last several years.

- Declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, as shown in the following chart, in 2001 the yield on 10-year Treasury bonds (a proxy for a risk free investment) was 5.3%. To achieve SURS' then assumed return of 8.50%, the System's investments had to outperform the yield on the 10-year Treasury by 3.20%. As of June 2019, the yield on the 10-year Treasury is now 2.1%, and to achieve SURS' assumed return of 6.75%, the System's investments need to exceed the ten-year Treasury yield by 4.65%. So, even though SURS reduced its assumption by 175 basis points, it still has to take more investment risk in 2019 to meet its assumption than it did in 2001. 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.

## SECTION III – SUPPORTING ANALYSIS




2. *Inflation Assumption*

SURS maintained its inflation assumption at 2.25% in the draft June 30, 2019 valuation.

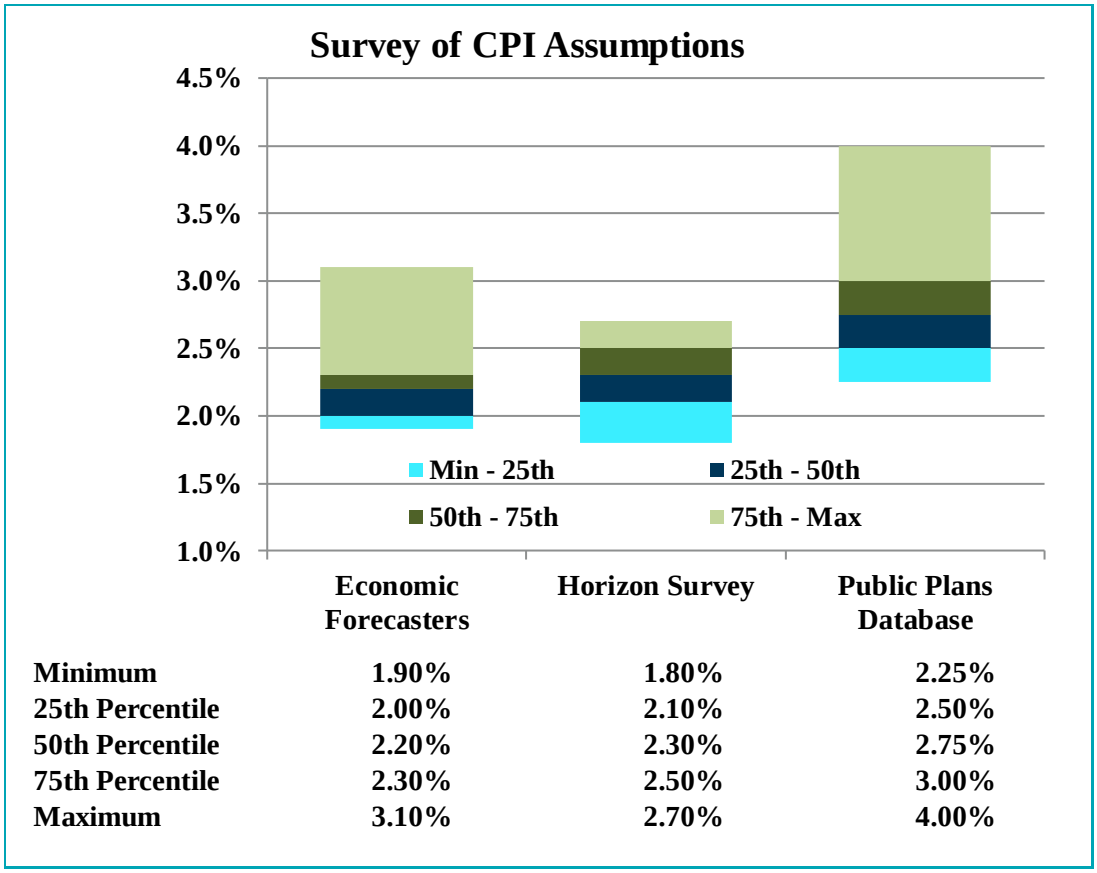
**We find the 2.25% inflation assumption to be reasonable.**

*Our rationale for concurring with the 2.25% assumption:*

6. The April 2019 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (next 75 years), inflation will average between 2.0% and 3.2% (http://www.ssa.gov/oact/tr/2019/tr2019.pdf). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.6%.

- The chart on the following page shows the distribution of inflation expectations for the Third Quarter 2019 survey of professional economic forecasters published by the Philadelphia Federal Reserve, the 2019 Horizon survey of investment consultant capital market assumptions (20-year), and the 2018 inflation assumptions used by plans in the Public Plans Database. The assumption of 2.25% is near the middle of the range projected by professional economic forecasters and investment consultants, and is on the low end of the range used by other public plans.

## SECTION III – SUPPORTING ANALYSIS




| | Economic Forecasters | Horizon Survey | Public Plans Database |
|---|---|---|---|
| Minimum | 1.90% | 1.80% | 2.25% |
| 25th Percentile | 2.00% | 2.10% | 2.50% |
| 50th Percentile | 2.20% | 2.30% | 2.75% |
| 75th Percentile | 2.30% | 2.50% | 3.00% |
| Maximum | 3.10% | 2.70% | 4.00% |

## SECTION III – SUPPORTING ANALYSIS

*3. Salary (Annual Compensation) Increase Assumption*

Salary Increases for the 2019 valuation and are shown below.

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

| Service Year | Total Increase |
|---|---|
| 0 | 12.25% |
| 1 | 12.25% |
| 2 | 8.75% |
| 3 | 7.00% |
| 4 | 6.25% |
| 5 | 5.50% |
| 6 | 5.50% |
| 7 | 5.50% |
| 8 | 4.75% |
| 9 | 4.50% |
| 10 | 4.50% |
| 11-14 | 4.00% |
| 15-18 | 3.75% |
| 19-33 | 3.50% |
| 34+ | 3.25% |

These increases include the wage inflation assumption of 3.25% comprised of an inflation assumption of 2.25% per annum and 1.00% per annum productivity or real wage growth assumption.

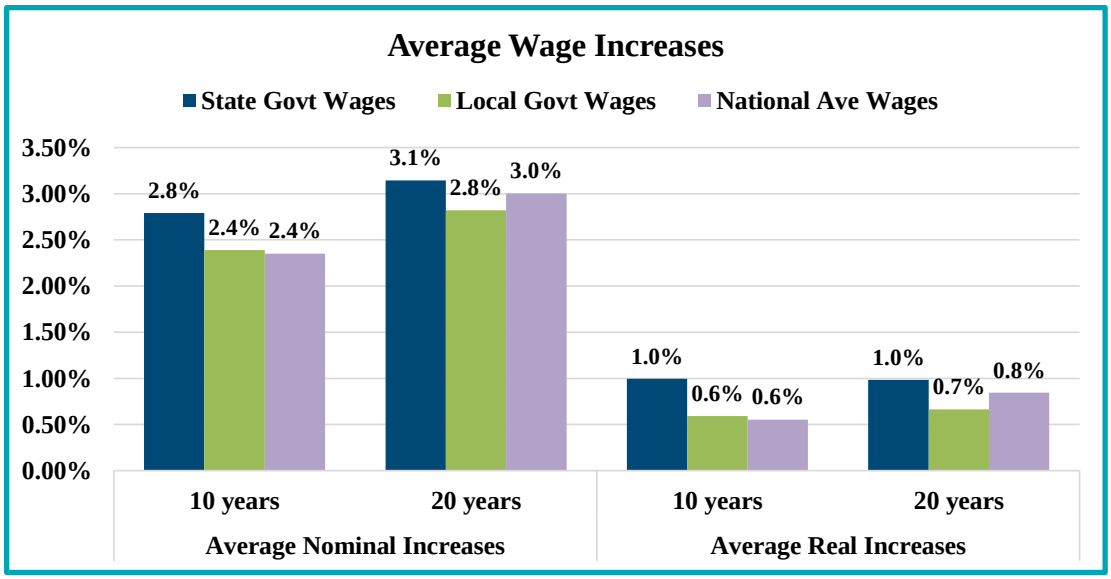
The assumed rate of total payroll growth is 3.25%.

**We find the assumption to keep real wage growth at 1.00% and the basis for setting it as reasonable and consistent with the inflation assumption.**

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

- The following chart shows the average nominal and real increases in wages over the last 10 and 20 years for State governments, local governments, and National Average Wages. State and local government data is from the Quarterly Census of Employment and Wages as published by the Bureau of Labor Statistics. National Average Wages is published by the Social Security Administration.

## SECTION III – SUPPORTING ANALYSIS




- The April 2019 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (between 2029 and 2093), real wage differential will average somewhere between 0.60% and 1.84%.

- Maintaining the total salary increase assumption of 3.25% is supported by credible data as shown on pages 22 and 23 of the 2018 Experience Review performed by GRS.

- During the year ending June 30, 2019, there was again an experience gain from this assumption (i.e., salary increases were less than assumed) as shown on page 26 of the draft June 30, 2019 Actuarial Valuation. The table on page 27 shows that there have been gains due to salary increases for the last four years.

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

4. *Cost-of-Living Adjustment Assumption*

Benefits are increased annually as described on page 69 of the draft June 30, 2019 Actuarial Valuation. Annual increases are 3.0% for those hired prior to January 1, 2011 and based upon ½ of the Consumer Price Index for those hired on or after January 1, 2011, which is 1.125% based on the inflation assumption of 2.25%.
**We find the assumption and the basis for setting it reasonable.**

## SECTION III – SUPPORTING ANALYSIS

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 63 of the draft June 30, 2019, Actuarial Valuation to be $114,951.83 for 2019. The optional hybrid plan pay cap is equal to the Social Security Wage Base, which is $132,900 for 2019.

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

6. *Effective Rate of Interest*

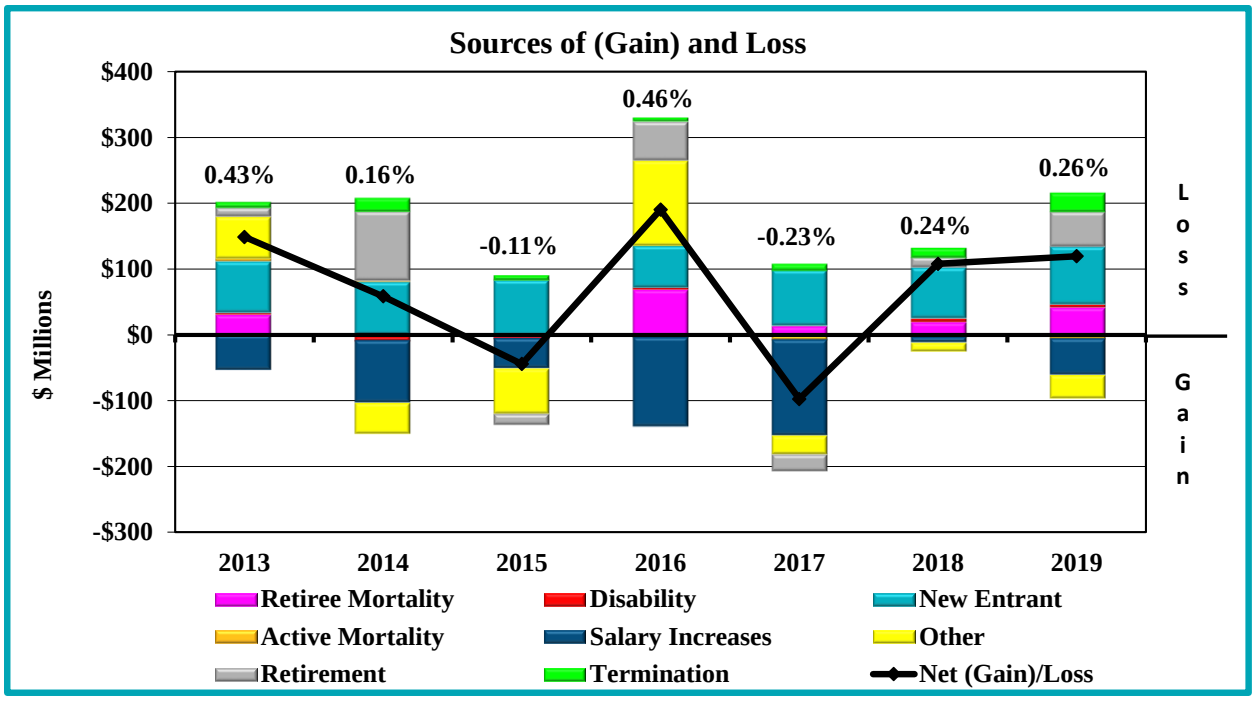
The Effective Rate of Interest ("ERI") is the interest rate that is applied to member contribution balances. The ERI, for the purpose of determining the money purchase benefit, is established by the State Comptroller annually. The ERI for other purposes such as the calculation of purchases of service 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 6.75%. **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 6.75% is generous given today's low interest rate environment.**

## SECTION III – SUPPORTING ANALYSIS

### B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2019 Actuarial Valuation, these are shown on page 27. In the chart below, we have collected similar data from GRS's past valuation reports dating back to 2013 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, it represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, it represents an experience gain for that year with liabilities less than expected. This net liability (gain)/loss is shown by the black line. This net (gain)/loss as a percent of liability is shown above the bars.




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

Key observations from this chart are as follows:

1. In every year since 2013, 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. However, there is also an offsetting asset gain to this loss due to contributions made on behalf of these new entrants.

## SECTION III – SUPPORTING ANALYSIS

2. Prior to 2014, there were consistent losses attributable to SURS retiree mortality. GRS addressed this with staff and determined that much of this loss was due to unexpected changes in benefit amounts paid. This may occur when initial benefits are based on estimates which are later adjusted based on finalized information. Starting in 2013, GRS has received additional data from SURS to better measure expected benefits. While these losses essentially disappeared in 2014 and 2015, a loss, similar in size to the earlier losses, occurred in 2016, but the losses in 2017, 2018, and 2019 have been smaller. 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. However, change in the salary increase assumption in 2018 should mean that these gains will be reduced in future years.

4. Since 2013, termination from employment experience has consistently shown losses, but they have been small since 2013. This assumption was reexamined in the recent GRS 2018 Experience Review and was slightly modified to produce fewer expected number of terminations. This change is better reflective of the actuarial experience of the System.

5. Disability and active mortality experience are too small to be noticed on the chart, given their insignificant size relative to other experience items. Since there have been both gains and losses in each of these areas during the period shown, they are not an immediate area of concern.

6. The net liability (gain)/loss is shown by the black line on the graph above. This net (gain)/loss as a percent of liability is shown above the bars. The percent is generally quite small and there is not a consistent pattern of either gains or losses.

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

### 1. Mortality

The mortality assumptions are as follows:

| Base Table with 2014 Base Year | Male Multiplier | Female Multiplier |
|---|---|---|
| RP-2014 White Collar Employee, sex distinct (pre-retirement) | 93% | 100% |
| RP-2014 White Collar Healthy Annuitant, sex distinct (non-disabled post-retirement) | 96% | 93% |
| RP-2014 Disabled Annuitant, sex distinct (disabled post-retirement) | 112% | 123% |

The provision for future mortality improvement is based on the generational application of the MP-2017 improvement scales.

## SECTION III – SUPPORTING ANALYSIS

| Sample Mortality Rates | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Future Life Expectancy (years) in 2019 | | | | Future Life Expectancy (years) in 2030 | | | |
| | Postretirement | | Disabled - Retiree | | Postretirement | | Disabled - Retiree | |
| Age | Male | Female | Male | Female | Male | Female | Male | Female |
| 35 | 52.27 | 54.43 | 32.77 | 38.27 | 53.34 | 55.44 | 34.52 | 39.88 |
| 40 | 47.07 | 49.23 | 29.18 | 33.96 | 48.12 | 50.23 | 30.74 | 35.45 |
| 45 | 41.96 | 44.10 | 25.99 | 30.02 | 42.97 | 45.08 | 27.41 | 31.40 |
| 50 | 36.92 | 39.01 | 22.92 | 26.21 | 37.91 | 39.97 | 24.26 | 27.51 |
| 55 | 31.99 | 33.96 | 19.93 | 22.62 | 32.96 | 34.91 | 21.19 | 23.83 |
| 60 | 27.20 | 29.05 | 17.05 | 19.33 | 28.12 | 29.95 | 18.16 | 20.40 |
| 65 | 22.58 | 24.34 | 14.34 | 16.17 | 23.43 | 25.18 | 15.27 | 17.07 |
| 70 | 18.19 | 19.84 | 11.75 | 13.02 | 18.96 | 20.61 | 12.51 | 13.81 |
| 75 | 14.11 | 15.58 | 9.26 | 10.08 | 14.80 | 16.30 | 9.91 | 10.79 |

### 2. Marriage Assumption

Members are assumed to be married in the following proportions:

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

### 3. Termination Rates

A table of termination rates based on based on the most recent experience study period. The assumption is a table of turnover rates by years of service.

## SECTION III – SUPPORTING ANALYSIS

A sample of these rates follows:

| Years of Service | All Members |
|---|---|
| 0 | 20.00% |
| 1 | 20.00 |
| 2 | 15.00 |
| 3 | 14.00 |
| 4 | 13.00 |
| 5 | 12.00 |
| 6 | 10.00 |
| 7 | 9.00 |
| 8 | 8.00 |
| 9 | 7.00 |
| 10 | 6.00 |
| 11 | 5.00 |
| 12 | 4.50 |
| 13 | 4.00 |
| 14 | 4.00 |
| 15 | 4.00 |
| 16 | 3.50 |
| 17 | 3.50 |
| 18 | 3.50 |
| 19 | 3.00 |
| 20 | 3.00 |
| 21 | 3.00 |
| 22 | 2.50 |
| 23 | 2.50 |
| 24 | 2.50 |
| 25 | 2.00 |
| 26 | 2.00 |
| 27 | 2.00 |
| 28 | 2.00 |
| 29 | 2.00 |

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

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

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

## SECTION III – SUPPORTING ANALYSIS

### 4. Retirement Rates

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

| Age | Members Hired before January 1, 2011 and Eligible for | | Members Hired on or After January 1, 2011 and Eligible for | |
|---|---|---|---|---|
| | Normal Retirement | Early Retirement | Normal Retirement | Early Retirement |
| Under 50 | 50.0% | - | - | - |
| 50 | 50.0 | - | - | - |
| 51 | 40.0 | - | - | - |
| 52 | 40.0 | - | - | - |
| 53 | 35.0 | - | - | - |
| 54 | 35.0 | - | - | - |
| 55 | 35.0 | 7.0% | - | - |
| 56 | 30.0 | 5.5 | - | - |
| 57 | 25.0 | 4.0 | - | - |
| 58 | 25.0 | 5.0 | - | - |
| 59 | 25.0 | 5.5 | - | - |
| 60 | 11.0 | - | - | - |
| 61 | 11.0 | - | - | - |
| 62 | 12.0 | - | - | 25.0% |
| 63 | 12.0 | - | - | 10.0 |
| 64 | 12.0 | - | - | 10.0 |
| 65 | 15.0 | - | - | 10.0 |
| 66 | 15.0 | - | - | 10.0 |
| 67 | 15.0 | - | 35.0% | - |
| 68 | 15.0 | - | 15.0 | - |
| 69 | 15.0 | - | 15.0 | - |
| 70-79 | 15.0 | - | 15.0 | - |
| 80+ | 100.0 | - | 100.0 | - |

A rate of 50 percent is used if a member has 40 or more years of service and is less than 80 years old. The rates shown above are for members with less than 40 years of service.

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.

For purposes of the projections in the actuarial valuation, members of the Self-Managed Plan are assumed to retire in accordance with the Tier 1 and Tier 2 retirement rates (based on hire date).

## SECTION III – SUPPORTING ANALYSIS

### 5. Disability Rates

A table of disability incidence with sample rates follows:

| Age | Males | Females | Age | Males | Females |
|---|---|---|---|---|---|
| 20 | 0.0247% | 0.0328% | 50 | 0.1214% | 0.1360% |
| 21 | 0.0253% | 0.0347% | 51 | 0.1287% | 0.1401% |
| 22 | 0.0259% | 0.0366% | 52 | 0.1361% | 0.1442% |
| 23 | 0.0265% | 0.0385% | 53 | 0.1435% | 0.1483% |
| 24 | 0.0271% | 0.0404% | 54 | 0.1508% | 0.1524% |
| 25 | 0.0277% | 0.0423% | 55 | 0.1552% | 0.1565% |
| 26 | 0.0283% | 0.0442% | 56 | 0.1552% | 0.1565% |
| 27 | 0.0289% | 0.0461% | 57 | 0.1552% | 0.1565% |
| 28 | 0.0295% | 0.0481% | 58 | 0.1552% | 0.1565% |
| 29 | 0.0300% | 0.0500% | 59 | 0.1552% | 0.1565% |
| 30 | 0.0315% | 0.0541% | 60 | 0.1552% | 0.1565% |
| 31 | 0.0330% | 0.0582% | 61 | 0.1552% | 0.1565% |
| 32 | 0.0345% | 0.0623% | 62 | 0.1552% | 0.1565% |
| 33 | 0.0359% | 0.0664% | 63 | 0.1552% | 0.1565% |
| 34 | 0.0374% | 0.0705% | 64 | 0.1552% | 0.1565% |
| 35 | 0.0395% | 0.0745% | 65 | 0.1552% | 0.1565% |
| 36 | 0.0415% | 0.0786% | 66 | 0.1552% | 0.1565% |
| 37 | 0.0436% | 0.0827% | 67 | 0.1552% | 0.1565% |
| 38 | 0.0457% | 0.0868% | 68 | 0.1552% | 0.1565% |
| 39 | 0.0477% | 0.0909% | 69 | 0.1552% | 0.1565% |
| 40 | 0.0536% | 0.0950% | 70 | 0.1552% | 0.1565% |
| 41 | 0.0595% | 0.0991% | 71 | 0.1552% | 0.1565% |
| 42 | 0.0654% | 0.1032% | 72 | 0.1552% | 0.1565% |
| 43 | 0.0713% | 0.1073% | 73 | 0.1552% | 0.1565% |
| 44 | 0.0772% | 0.1114% | 74 | 0.1552% | 0.1565% |
| 45 | 0.0845% | 0.1155% | 75 | 0.1552% | 0.1565% |
| 46 | 0.0919% | 0.1196% | 76 | 0.1552% | 0.1565% |
| 47 | 0.0993% | 0.1237% | 77 | 0.1552% | 0.1565% |
| 48 | 0.1066% | 0.1278% | 78 | 0.1552% | 0.1565% |
| 49 | 0.1140% | 0.1319% | 79 | 0.1552% | 0.1565% |

Disability rates apply during the retirement eligibility period.

Members are assumed to first receive disability benefits and then receive disability retirement annuity benefits.

## SECTION III – SUPPORTING ANALYSIS

### 6. Operational Expenses

The amount of operational expenses for administration incurred in the latest fiscal year are supplied by SURS staff and incorporated in the Normal Cost. Estimated administrative expenses for FY 2021 and after are assumed to increase by 3.25%.

### 7. Spouse's Age

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

### 8. Missing Data

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

### 9. Benefit Commencement Age

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

### 10. Load on Final Average Salary

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

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

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

### 12. Valuation of Inactives

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

## SECTION III – SUPPORTING ANALYSIS

### 13. 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 active members.

### 14. Projection Assumptions

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

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

- 30% elect to participate in the Self-Managed Plan.

- 70% elect to participate in the Tier 2 Plan.
  - 76% are assumed to elect the Traditional Plan (consistent with the current election split).
  - 24% are assumed to elect the Portable Plan (consistent with the current election split).

New entrants have an average age of 36.9 and average capped pay of $39,988 and average uncapped pay of $41,866 (2019 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 2019 dollars) of current active members with service between one and four years.

| | | Average Pay | | | Average Pay | | | Average Pay | |
|---|---|---|---|---|---|---|---|---|---|
| Age | Number Males | Capped Male | Uncapped Male | Number Females | Capped Female | Uncapped Female | Total Number | Capped Total | Uncapped Total |
| <20 | 59 | $18,316 | $18,316 | 60 | $17,416 | $17,416 | 119 | $17,862 | $17,862 |
| 20 - 24 | 649 | 30,264 | 30,264 | 1,112 | 29,195 | 29,195 | 1,761 | 29,589 | 29,589 |
| 25 - 29 | 1,445 | 41,284 | 41,661 | 2,105 | 38,665 | 38,941 | 3,550 | 39,731 | 40,048 |
| 30 - 34 | 1,313 | 47,706 | 50,717 | 1,799 | 43,179 | 44,887 | 3,112 | 45,089 | 47,347 |
| 35 - 39 | 942 | 47,102 | 50,701 | 1,376 | 41,440 | 43,236 | 2,318 | 43,741 | 46,270 |
| 40 - 44 | 636 | 45,983 | 49,788 | 1,028 | 40,876 | 42,474 | 1,664 | 42,828 | 45,269 |
| 45 - 49 | 525 | 44,644 | 48,405 | 865 | 36,525 | 37,533 | 1,390 | 39,592 | 41,640 |
| 50 - 54 | 459 | 44,548 | 49,752 | 698 | 35,673 | 38,096 | 1,157 | 39,194 | 42,720 |
| 55 - 59 | 352 | 42,786 | 50,369 | 553 | 33,375 | 35,592 | 905 | 37,036 | 41,340 |
| 60 - 64 | 202 | 34,386 | 39,531 | 242 | 32,861 | 36,244 | 444 | 33,555 | 37,739 |
| 65 - 69 | 11 | 21,418 | 33,106 | 12 | 19,715 | 19,715 | 23 | 20,530 | 26,119 |
| **Total** | 6,593 | $42,888 | 45,695 | 9,850 | $38,047 | $39,303 | 16,443 | $39,988 | $41,866 |

## SECTION III – SUPPORTING ANALYSIS

### 15. Self-Managed Plan (SMP) Contribution Assumptions

The projected SMP contributions are equal to 7.6% of SMP payroll, plus estimated SMP expenses minus SMP employer forfeitures. Estimated SMP expenses for FY 2020 are $596,786 and actual FY 2019 SMP employer forfeitures used to reduce the certified contributions for FY 2020 are $6,578,294. Estimated SMP expenses for FY 2021 and after are assumed to increase by 3.25%. Estimated SMP employer forfeitures used to reduce the certified contributions for FY 2022 and after are assumed to be 7.5% of the gross SMP employer contribution.

### 16. Pensionable Earnings Greater than 6%

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% for earnings used in the calculation of the final average salary. The projections include a component paid for by employers for earnings increases greater than 6.00% in the calculation of the final average salary.

### 17. Governor's Pay

The Governor's pay is $177,500 as of June 30, 2019, and is expected to increase each year by the assumed rate of total payroll growth of 1.125%.

### 18. Buyout Election Assumption.

0% of eligible Tier 1 active members are assumed to elect to receive a reduced and delayed AAI benefit at retirement and an accelerated pension benefit option in accordance with Public Act 100-0587. 0% of eligible inactive members are assumed to elect to receive an accelerated pension benefit option in lieu of an annuity at retirement in accordance with Public Act 100-0587.

### 19. Treatment of Benefits in Excess of the Internal Revenue Code Section 415 Limits.

The benefit amounts in excess of the IRC Section 415 limits for current retirees are paid through the Excess Benefit Arrangement (EBA) and are not reported in the actuarial valuation data. Therefore, the liabilities and the required contributions for these EBA benefits are not reflected in the actuarial valuation results. The amount of the estimated EBA payments for the upcoming fiscal year are provided by SURS Staff and included in the statutory contribution requirement.

## SECTION III – SUPPORTING ANALYSIS

### C. Funding Methods

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and (3) the amortization method.

*1. Actuarial 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) cost method as it is more consistent with the requirement in 40 ILCS 5/15 -155 requirement for level percentage of pay funding**.

Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date but not beyond) is taken into account in calculating these benefits. The present value of these benefits based on past service and future compensation is the actuarial accrued liability for a given active participant. Under the PUC cost method, the 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 cost method to mitigate this effect. It should also be noted that the EAN cost method is the required method to calculate liability for GASB 67 & GASB 68.

*2. Asset Valuation Method*

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

The 2018 Public Retirement Systems Study by the National Conference on Public Employee Retirement Systems (NCPERS) survey of 167 public retirement funds found that the majority of plans responding to the survey have a five-year smoothing period.

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

## SECTION III – SUPPORTING ANALYSIS

*3. Amortization Method*

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2045. While not a traditional amortization method, this methodology effectively amortizes a portion of the unfunded actuarial liability over the remaining period until 2045, which is currently 26 years.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be "a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period." Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

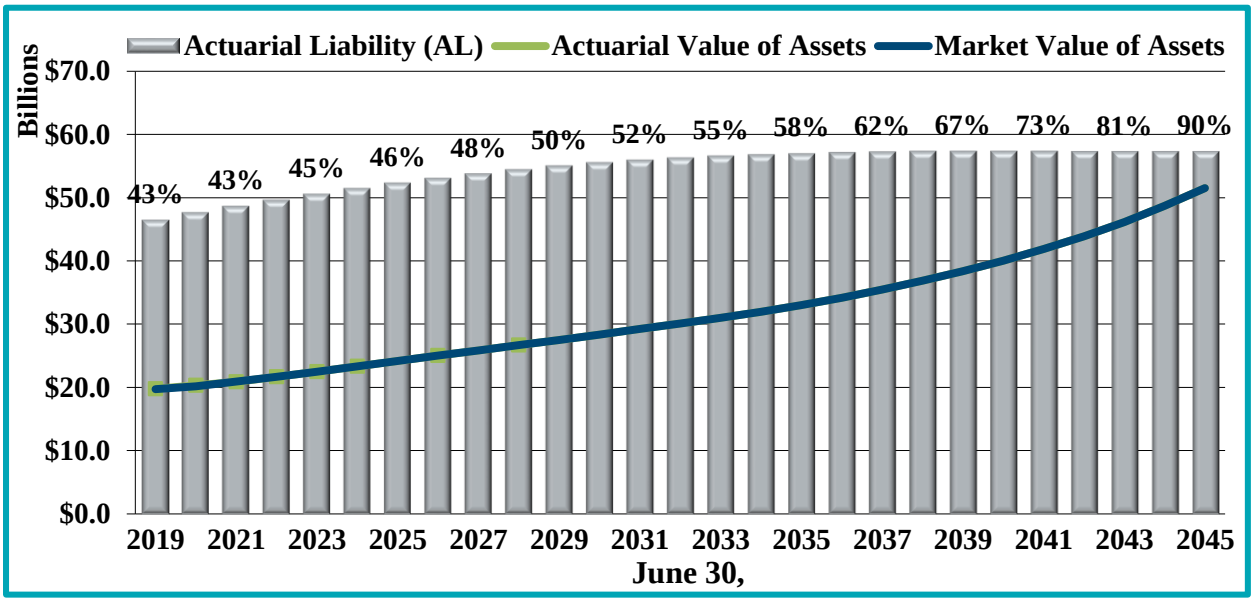
Typical public plan amortization methods are designed to increase each year by expected payroll growth. Under the State mandated method, however, the effective amortization payment increases each year by more than the expected growth in payroll. As a result, the State mandated method defers payments on the unfunded actuarial liability further into the future than under typical public plan amortization methods.

## SECTION IV– PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2019 Actuarial Valuation of SURS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

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

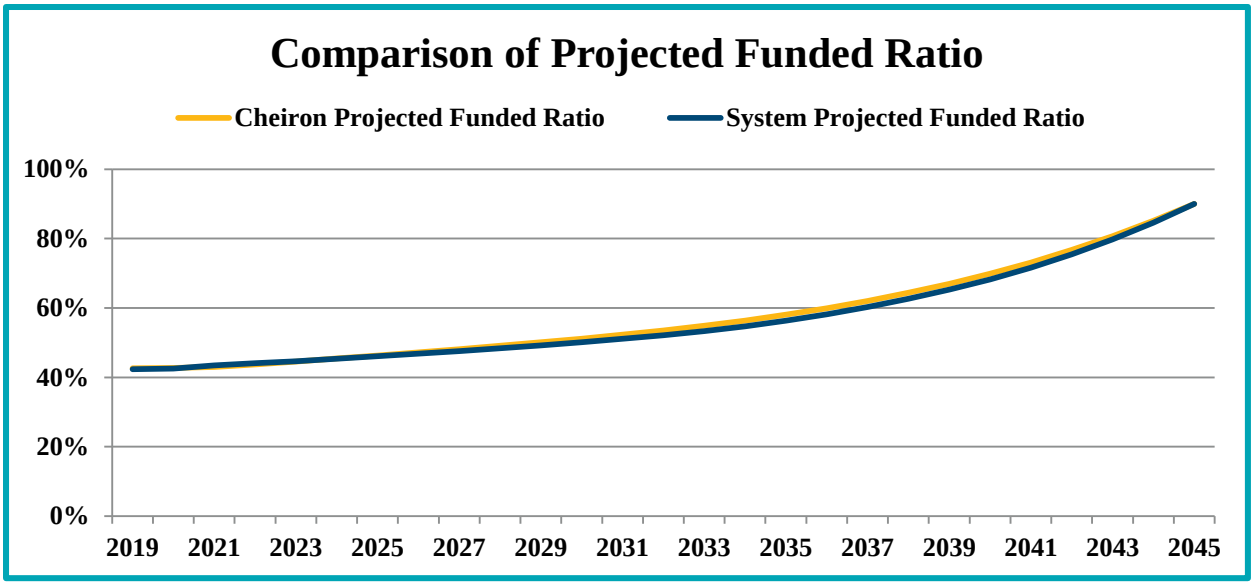
The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As pointed out on page 8 of the draft June 30, 2019 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projections. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio for each year is shown at the top of the graph. For example, in 2033, the funded ratio is projected to be approximately 55%, with assets being approximately $31 billion and liabilities being approximately $57 billion.




Source: Cheiron projection analysis.

## SECTION IV– PROJECTION ANALYSIS

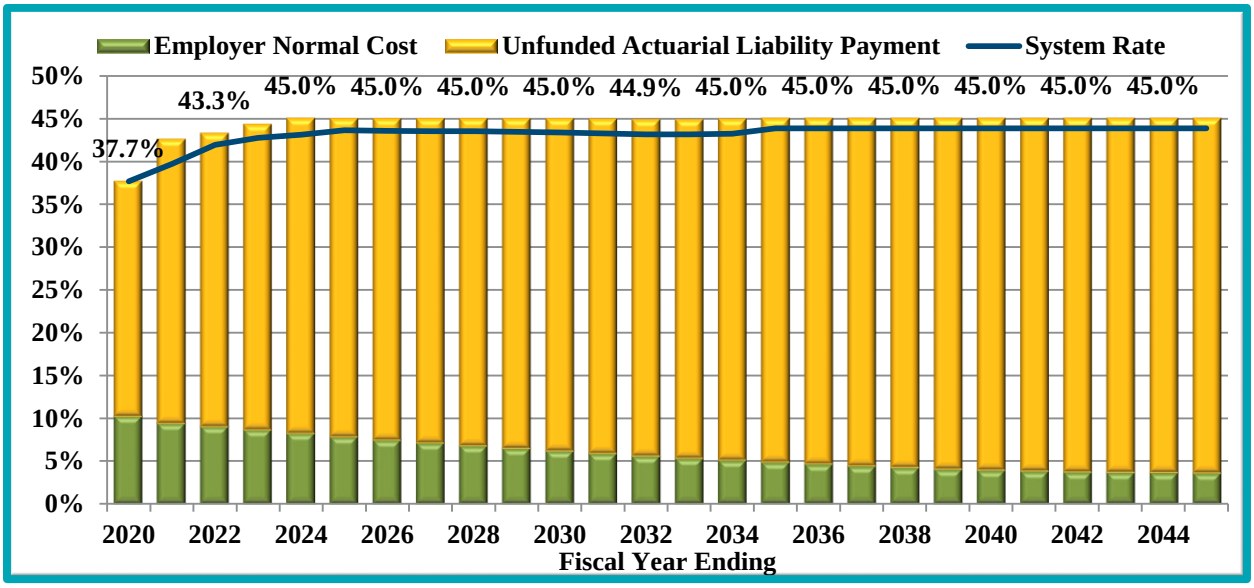
When we compare our projected funded ratio against the results shown in the draft June 30, 2019 Actuarial Valuation, **we find a very close match in expected funded ratio**. This close match of the funded ratio indicates that the projections done by the System's actuary are reasonable and the fact we show slightly higher funded ratios is a function of Cheiron's approximation.




Source: Cheiron projection analysis.

## SECTION IV– PROJECTION ANALYSIS

The following graph shows the expected contributions calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for the fiscal year ending 2020 year was set based on the June 30, 2018 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2020 (Fiscal Year Ending June 30, 2021). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by participants not covered by employee contributions based on the statutory funding method; and 2) an amortization of the unfunded liability. The normal cost amounts are shown by the green bars and the amortization of the unfunded actuarial liability (UAL) amounts by the yellow bars. The percentages shown are the total contribution rates calculated by Cheiron which are equal to the sum of the bars. The graph shows that a larger percentage of the total contribution is being made toward the UAL payment later in the period. The blue line shows the projected contribution rates as a percentage of payroll from the draft June 30, 2019 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.**

## SECTION V– ANALYSIS OF FUNDING ADEQUACY

In this section, we examine the adequacy of the funding for the System, including funded status, the sources of changes in the unfunded actuarial liability (UAL), and projections of the UAL and statutory funding requirements compared to contributions needed to pay down the UAL.

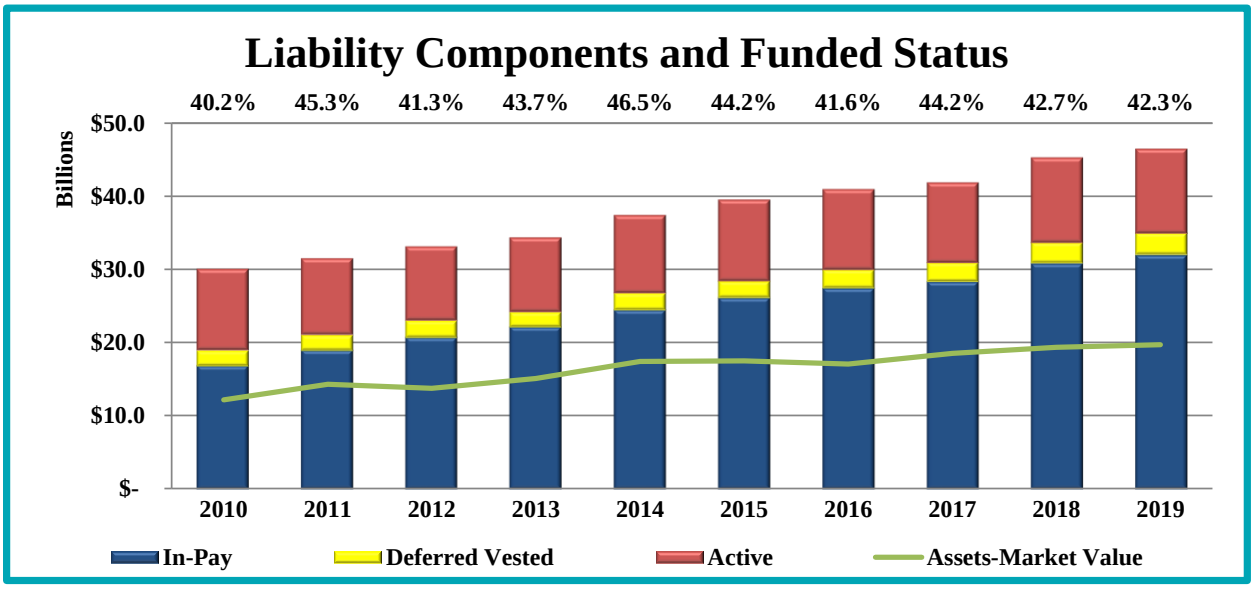
The actuarial valuation report prepared by GRS includes both traditional actuarial measurements, as well as additional risk measurements that are shown on pages 13, 14, and 15 in their draft 2019 valuation report. Given the unique and substantial funding challenges faced by the Illinois pension systems, this additional information is quite important and supplements the information we present here on funding adequacy to better inform the legislature and other stakeholders about the adequacy of the System's funding.

### System Funded Status

The first funding adequacy measure we present is a historical funded status trend for the past ten years. Funded status for this measure is defined as the ratio of the market value of assets to the actuarial liability. The chart below shows SURS' funded status since 2010 has gone from 40.2% funded to 42.3% funded in 2019, an increase in funded status of 2.1%. In addition to showing the funded status, this chart also shows the breakdown of the plan's liabilities by membership status:

- Active liability – the liability (attributable to service already performed) for future payments to members who are currently working in the System,
- Deferred Vested liability – the liability for future payments to members who are no longer working in the system, and
- In-Pay liability – the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown shows that today plan assets only cover about 60% of the liabilities for just those members currently in-pay status.

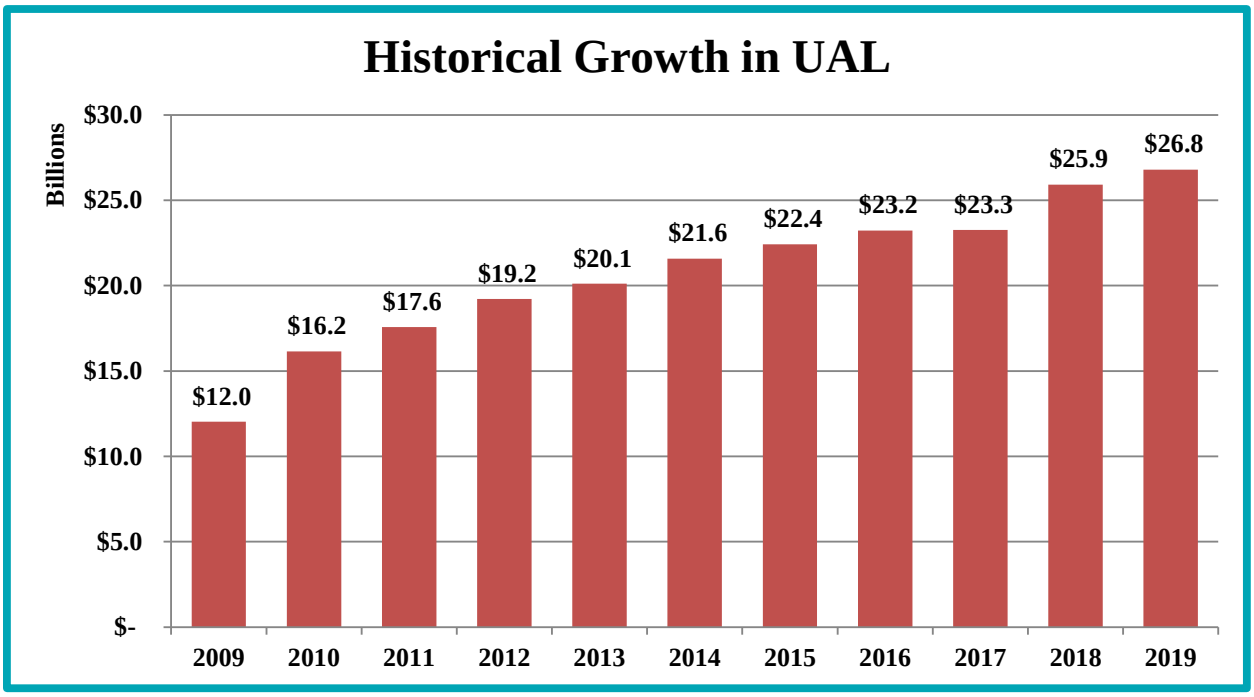



Source: Cheiron analysis of funding adequacy.

## SECTION V– ANALYSIS OF FUNDING ADEQUACY

## Sources of Changes in the UAL

As shown in the chart below, SURS' unfunded actuarial liability (UAL) has grown from about $12.0 billion in 2009 to $26.8 billion in 2019, an increase of $14.8 billion. In order to understand how to reverse this trend, it is important to understand the sources contributing to it.




Source: Cheiron analysis of funding adequacy.

The changes to the UAL from June 30, 2009 to June 30, 2019 can be separated into the following components:

- **Contribution Deficiencies** – Contributions that are less than the tread water contribution cause the UAL to increase. The tread water contribution consists of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability. This sum is referred to as the tread water contribution because it is the contribution necessary so that the UAL will remain constant, or "tread water" (absent experience gains or losses). The difference between actual contributions and the tread water contributions have increased the UAL by $5.7 billion over this period.

- **Assumption Changes** are changes to actuarial assumptions as the System updated expectations on future investment returns and life expectancy. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations. Over this period assumption changes have increased the UAL by $7.2 billion

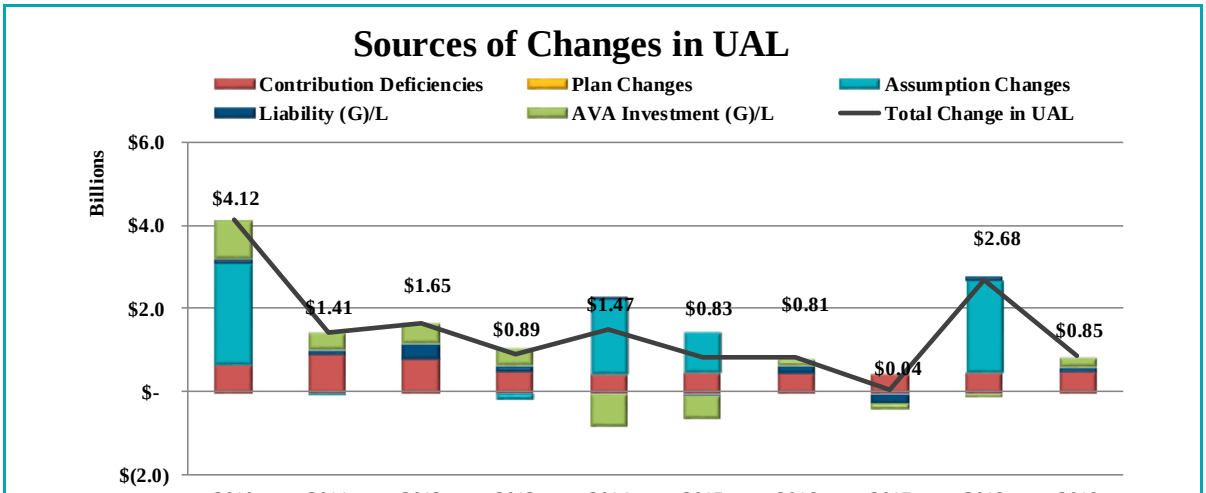
## SECTION V– ANALYSIS OF FUNDING ADEQUACY

- **Plan Changes** are any modifications of the design of the plan, which have affected benefits already accrued. Since most of the changes to the System's plan affect only future benefits the impact has been negligible during this period.

- **Liability (G)/L** are the changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.). These were generally small and had a net effect of increasing the UAL by $0.9 billion during this period.

- **AVA (Actuarial Value of Assets) Investment (G)/L** is the net investment gain or loss due to assets earning more or less than assumed. These have increased the UAL over this period by $1.0 billion.

The chart below shows the changes in UAL each year broken into these five components. The sum of all the components (total change in UAL) is shown as the black line.




| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Contributions | 0.67 | 0.93 | 0.80 | 0.51 | 0.43 | 0.46 | 0.46 | 0.43 | 0.48 | 0.49 | $ 5.66 |
| Assumptions | 2.41 | (0.02) | - | (0.16) | 1.79 | 0.97 | - | - | 2.18 | - | $ 7.17 |
| Investments | 0.94 | 0.43 | 0.48 | 0.39 | (0.80) | (0.56) | 0.15 | (0.14) | (0.09) | 0.25 | $ 1.04 |
| Plan Changes | - | - | - | - | - | - | - | - | - | - | $ - |
| Liabilities | 0.10 | 0.08 | 0.38 | 0.15 | 0.06 | (0.04) | 0.19 | (0.25) | 0.11 | 0.12 | $ 0.88 |
| **Total** | **$ 4.12** | **$ 1.41** | **$ 1.65** | **$ 0.89** | **$ 1.47** | **$ 0.83** | **$ 0.81** | **$ 0.04** | **$ 2.68** | **$ 0.85** | **$ 14.76** |

Source: Cheiron analysis of funding adequacy.

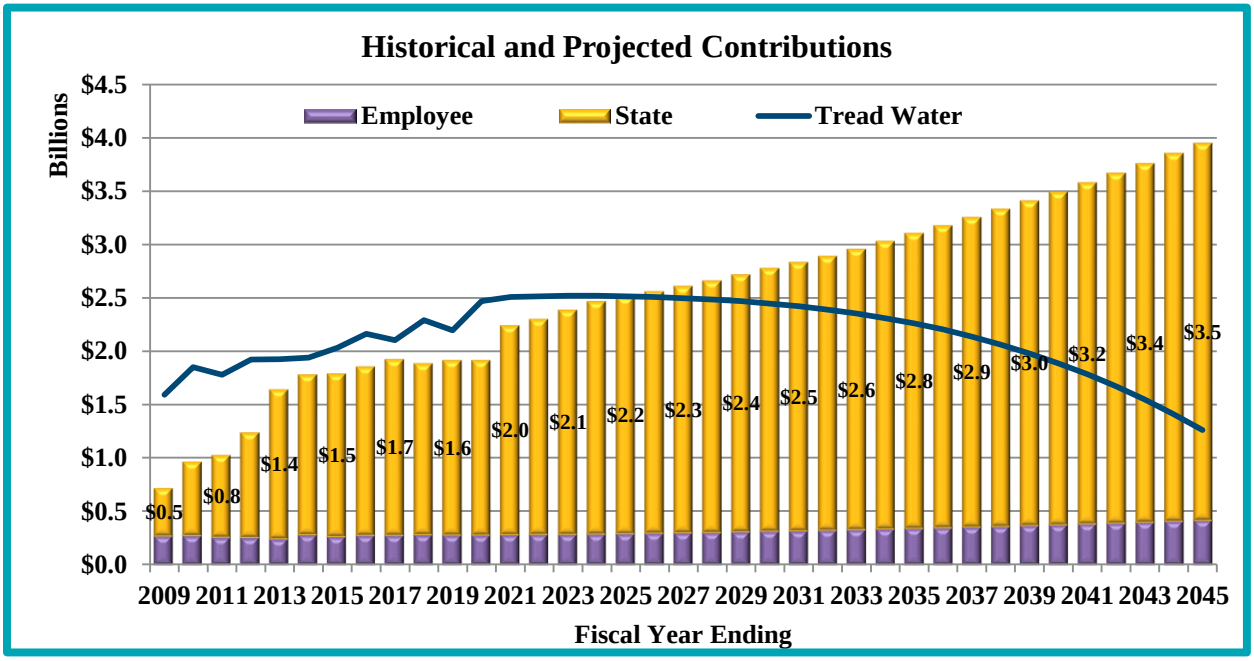
We expect that this chart will help stakeholders understand the sources of growth in the UAL over the past decade and inform discussions about the current funding requirements and adequacy.

## SECTION V– ANALYSIS OF FUNDING ADEQUACY

## Actual Contributions Compared to Tread Water Contribution

One of the persistent sources of the increase in UAL is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the UAL from increasing if all assumptions are met). These contribution deficiencies have added between $0.4 to $0.9 billion to the UAL each year.

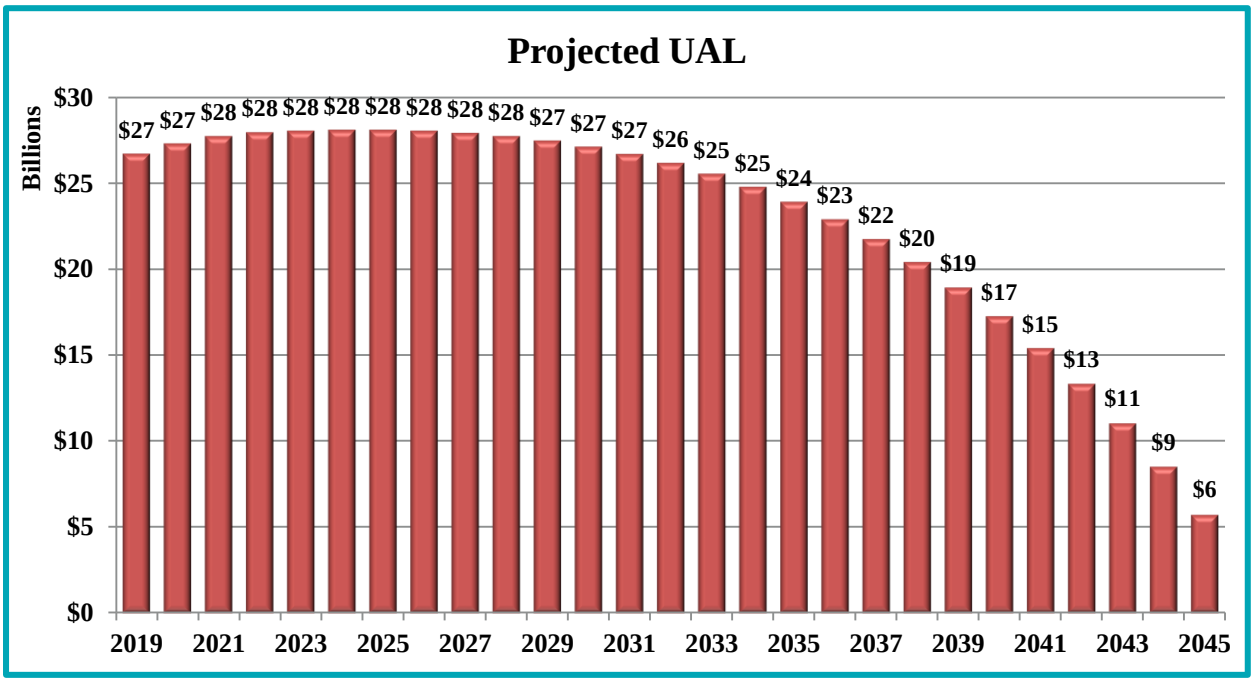
As the chart below shows, actual contributions have been significantly less than the tread water cost, and this trend is projected to continue for several years into the future. Each year that total contributions remain below the tread water cost (blue line), the UAL is expected to grow. As shown in the graph below the contributions from the State will need to increase significantly before the total contribution reaches the tread water contribution and begins to pay down the UAL.




Source: Cheiron analysis of funding adequacy.

## SECTION V– ANALYSIS OF FUNDING ADEQUACY

The next chart shows that if the minimum required contributions continue to be made each year and all other assumptions are met, the UAL is projected to grow from $26 billion in 2019 to $28 billion in 2021 through 2028 before contributions are sufficient to start paying the UAL down. Note, that the UAL is not projected to get below its current level until 2031.



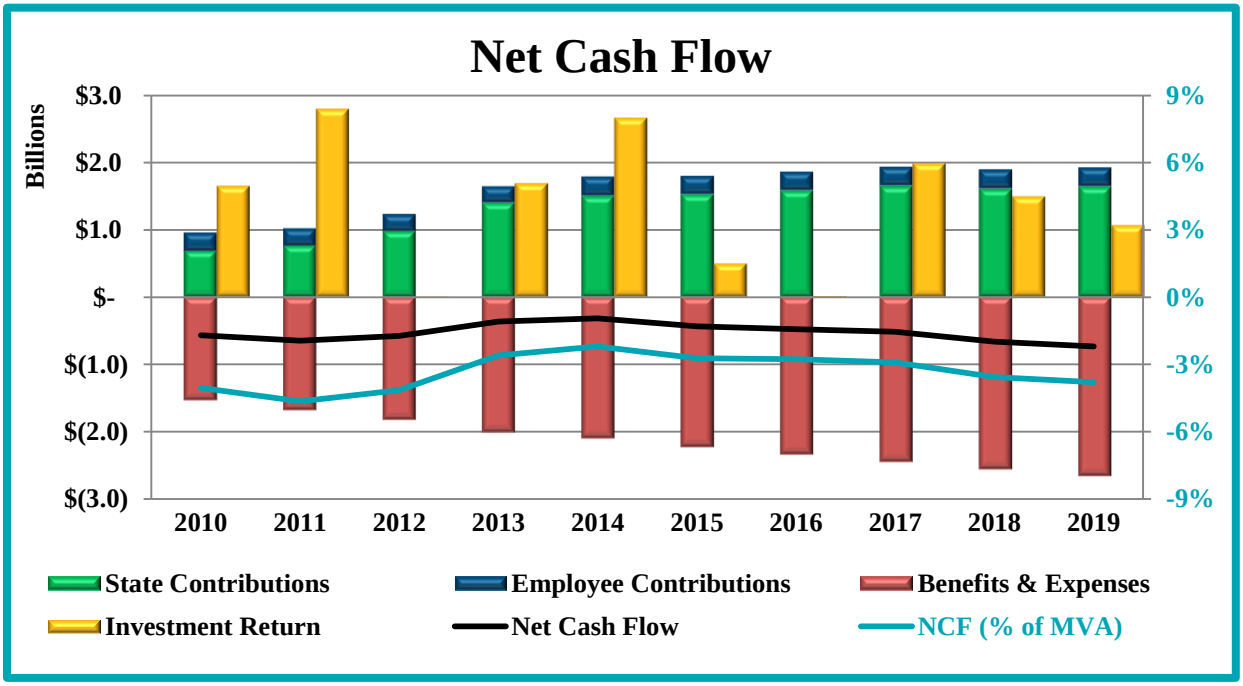

Source: Cheiron analysis of funding adequacy

## SECTION V– ANALYSIS OF FUNDING ADEQUACY

### Net Cash Flow Analysis

The plan's net cash flow is defined as State and Member contributions less benefit payments and administrative expenses. The more negative net cash flow is as a percentage of the plan's assets, the more vulnerable the plan is to market downturns. When a pension plan has more payouts than contributions and suffers an investment loss, it is left with fewer assets to invest and recapture during a recovery.

Looking at the chart below, SURS has mildly negative net cash flow (black line). If contributions increase as quickly as benefit payments, the net cash flow will remain stable. But if contributions do not continue to grow either because the plan has become better funded or because the expected contributions are not made, negative net cash flow may become a more significant issue, therefore it should continue to be monitored. The teal line shows net cash flow as a percent of Market Value of Assets on the right side axis. The greater the negative cash flows are relative to plan assets the more vulnerable a plan is to market downturns. This is because once there is a market downturn, the plan assets lose both on the return and the negative cash flow, leaving it with a lower asset base from which to recover from the loss.




Source: Cheiron analysis of funding adequacy.

## STATUS OF RECOMMENDATIONS FROM THE 2018 STATE ACTUARY'S REPORT

## Response to Recommendations in 2018

In the State Actuary's Preliminary Report on the State Universities Retirement System of Illinois presented December 19, 2018, 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, 2019 Actuarial Valuation.

| Recommendations to Retirement System from 2018 State Actuary Report | Status | Comments |
|---|---|---|
| 1. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SURS. Continuing the practice of underfunding future accruals such that the unfunded liability is expected to continue to grow, and targeting a funded percentage less than 100% 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. | **Partially Implemented** | The System has adopted a funding policy that would meet recommendation; however, the actual funding of the System is based on State statute and a change in the funding method and funding policy would require a statutory change.<br><br>GRS continues to include strong language throughout their report recommending the use of an actuarially sound method and stating clearly that the statutory method is not actuarially sound. We find these statements to be appropriate and support their continuation.<br><br>**Recommendation repeated.** |
| 2. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth), can have on future State costs. 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 well as illustrating different assumptions | **Partially Implemented** | GRS provided stress testing in a separate document dated December 12, 2018. Because the public may only look to the valuation report for this type of information, we believe it should be contained in the Actuarial Valuation report instead of any supplemental document to the Board that may potentially be overlooked.<br><br>**Recommendation repeated.** |

## STATUS OF RECOMMENDATIONS FROM THE 2018 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2018 State Actuary Report | Status | Comments |
|---|---|---|
| regarding future election rates to the Self-Managed Plan (SMP), but did not include such stress testing in this year's draft report. We recommend that stress testing be added into this year's report. Because the public may only look to the valuation report for this type of information, we believe it should be contained here instead of any supplemental document to the Board that may potentially be overlooked. | | |
| 3. 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, as they did for this valuation. | **Not Implemented** | We do not see that this was done for the current valuation.<br><br>We will continue to include this recommendation each year.<br><br>**Recommendation continued.** |

**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 3, 2019. The preliminary report was based on Cheiron's review of actuarial assumptions included in SERS' 2019 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the State Employees' Retirement System. SERS' written response, provided on December 13, 2019, can be found in Appendix C.

**OVERVIEW**
**STATE EMPLOYEES' RETIREMENT SYSTEM**
as of June 30, 2019

| | |
|---|---|
| Actuarial accrued liability | $48,731,439,198 |
| Actuarial value of assets | $18,429,185,637 |
| Unfunded liability | $30,302,253,561 |
| Funded ratio | 37.8% |
| | |
| Employer normal cost | $620,113,733 |
| State contribution (FY21) | $2,348,499,000 |
| | |
| Active members | 62,026 |
| Inactive members | 25,525 |
| Current benefit recipients | 74,589 |
| Eligible for deferred benefits | 181 |
| Total membership | 162,321 |
| | |
| Interest rate assumption | 6.75% |
| Inflation assumption | 2.25% |
| Actuarial cost method | Projected Unit Credit |
| Asset valuation method | 5-year Smoothing |
| | |
| Executive Director | Tim Blair |
| Actuarial Firm | Gabriel, Roeder, Smith & Company |

Source: June 30, 2019 SERS actuarial valuation report.

December 17, 2019

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

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

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution to the State Employees' Retirement System of Illinois (SERS or System) for Fiscal Year 2021.

**In summary, we believe that the assumptions and methods used in the draft June 30, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, 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 2021. Section III also includes comments on other issues impacting the funding of SERS, including the implications of Article 14 of the Illinois Pension Code, which establishes the statutory minimum funding requirements for the System. **In our opinion, the statutory mandated minimum funding requirements are inadequate, producing contribution amounts that are expected to result in an increase to the unfunded actuarial liability for several years.** Section IV reviews the projections contained in the draft June 30, 2019 Actuarial Valuation. Finally, Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by SERS and GRS. This information includes actuarial assumptions and methods adopted by the SERS Board, System provisions, the draft June 30, 2019 Actuarial Valuation, the draft 2019 GASB 67/68 Report, the 2018 Actuarial Experience Study, and minutes of the plan year 2019 SERS Board of Trustee meetings. A detailed description of all information provided for this review is contained in Appendix B.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. 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, MAAA, EA
Principal Consulting Actuary

SIGNED ORIGINAL ON FILE

William R. Hallmark, ASA, FCA, MAAA, EA
Consulting Actuary

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

## SECTION I – REPORT SCOPE

Illinois Public Act 097-0694 (the Act) amended the Illinois State Auditing Act (30 ILCS 5/2-8.1) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the State Employees' Retirement System of Illinois (SERS or System) and to issue to the SERS Board this preliminary report on the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contributions for Fiscal Year (FY) 2021. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the SERS Board to consider before finalizing its certification of the required State contributions for FY 2021.

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, 2019 Actuarial Valuation, the draft 2019 GASB 67/68 Report, the 2018 Experience Study, and minutes of the plan year 2019 Board of Trustees meetings. The materials we reviewed are listed in Appendix B.

In addition to reviewing the Actuarial Certification of the required State contribution to SERS, the Act requires the State Actuary to conduct a review of the "actuarial practices" of the Board. While the term "actuarial practices" was not defined in the Act, we continue to interpret this language to mean that we review: (1) the use of a qualified actuary (as defined by the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2019 Actuarial Valuation.

## SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2019 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 2021 required State contribution calculated under the current statutory funding plan is $2,348,499,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based. As such, we have accepted GRS's annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

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

## State Mandated Funding Method

2. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SERS. Continuing the practice of underfunding future accruals such that the Unfunded Liability is expected to continue to grow and targeting a funded percentage less than 100% increases the risk of the System becoming unsustainable. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

## Conformance to Statutory Funding Changes of Public Act 100-0023

*Recognition of Changes in Actuarial Assumptions*

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes be phased-in over a five-year period. As such, the Act delays the funding of the System. Assumption changes are intended to more accurately anticipate the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact of these changes are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a five-year period beginning at the date of adoption. This phase-in provides time to adjust to a higher level of contributions, but for a System in which the Unfunded Liability is already expected to continue to grow for several years, such delays allow the unfunded liability to increase even more, adding additional risk to the system.

## SECTION II – SUMMARY OF RECOMMENDATIONS

The Act requires that the impact of assumption changes "be implemented in equal annual amounts over a five-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution." This amount is then implemented "at the resulting annual rate in each of the remaining fiscal years in that five-year period." GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of payroll, and reflecting one-fifth of that percentage change over five years. The method used by GRS will result in the cost impact due to assumption changes being recognized as increasing dollar amounts. This is because the recognition as an equal percentage of pay gets applied to an increasing payroll over a five-year period.

*Optional Hybrid Plan*

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

GRS identified in the draft June 30, 2019 report that, given the uncertainty of the election behavior and the small population eligible for the optional hybrid plan, they have assumed all members will remain in Tier 2. In the assumptions used for projections, they have also assumed that future members will elect to remain in Tier 2.

## Conformance to Changes of Public Act 100-0587

*Accelerated Pension Benefit Payments*

P.A. 100-0587 created two accelerated pension benefit payment options. Inactive vested members have the option of receiving a lump sum equal to 60% of the present value of their benefits in lieu of their annuity benefits, and Tier 1 members have the option upon retirement of accepting a reduced automatic annual increase in exchange for a lump sum equal to 70% of the present value of the reduced annuity benefits. Eligible members must make an election by June 30, 2024 if they want to receive the accelerated pension benefit payments.

For the draft June 30, 2019 report, GRS has assumed that 5% of inactive participants will elect the "Total Buyout" of their pension benefit. Further, GRS has assumed that 21 percent of eligible Regular formula members and 28 percent of eligible Alternative formula members are assumed to elect the "COLA Buyout" at retirement. The election percentages are assumed to apply until the end of the Buyout Programs, which is May 31, 2024 inactive "Total Buyout" and June 1, 2024 for the Tier 1 "COLA Buyout". GRS notes these "COLA Buyout" assumptions are based upon experience through May 2019 provided by the system, but no information or discussion is provided on the actual experience. In addition, no explanation is provided for the 5% "Total Buyout" assumption. We recognize that there is very little experience on which to base these assumptions and as experience emerges, the assumptions may need to be revised. We will

monitor the accuracy of this assumption as experience emerges and comment on whether revisions should be made at that point.

## Assessment of Actuarial Assumptions Used in the 2019 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, 2019 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

## Recommended Additional Disclosures for the 2019 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 illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made. GRS did include stress testing in last year's final report, but did not include such stress testing in this year's draft report, or in any supplemental report provided to us.

4. We recommend the description of the mortality assumption in the valuation report include an indication that the mortality assumptions are fully generational and the mortality improvement scale used.

## Recommended Changes for Future Valuations

5. We recommend GRS provide additional explanation and justification for methods used to develop the mortality assumptions used in the valuation.

6. 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.

A new Actuarial Standard of Practice became effective for this valuation on the Assessment and Disclosure of Risk (ASOP 51). GRS made a good faith effort to comply with the new requirements, but the risk section in the valuation report (see pages 17, 18, and 19) could be improved to better comply with the new requirements.

7. For future risk disclosure we recommend:
   - An assessment should be provided for each risk that is identified by GRS.
   - An explanation should be provided as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified by GRS.

- Historical values that are significant to understanding the risks identified by GRS should be disclosed along with an explanation of how they help the reader understand the risks identified by GRS.

## GASB 67 and 68

The 2019 SERS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2019 SERS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

## 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 the required State contribution, reviewed the assumptions on which it is based, and accepted GRS's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

Given the size of SERS, the System's low funded ratio, the recent changes in legal requirements, and guidance issued by the Government Finance Officers Association, we are recommending again that the Board periodically undertake a full scope actuarial audit, utilizing the services of a reviewing actuary. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary. Results are compared in a detailed fashion to measure the liabilities for each benefit form and feature. A replication audit will uncover any potential problems in the processing and certification of valuation results. This recommendation was first made to SERS in our 2014 report. SERS has responded in the past that it would complete a full scope actuarial audit if budgetary resources allow. The response to last year's report stated that the SERS Board of Trustees and management would discuss the need for a full scope actuarial audit prior to the next valuation. We were provided no evidence that a discussion took place.

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

## State Mandated Funding Method

The Illinois Pension Code (40 ILCS 5/14-131) establishes a method that does not adequately fund the System. This law requires the actuary to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the actuarial accrued liability in the year 2045 if all assumptions were met. This contribution level does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the actuarial accrued liability, not 90%. In addition, the State mandated method produces a contribution that results in an increase in the Unfunded Actuarial Liabilities over the next decade if all assumptions are met.

**We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SERS** (Recommendation #2). The funding method should target 100% of the actuarial accrued liability, and contributions should ramp up

## SECTION III – SUPPORTING ANALYSIS

as quickly as possible to a level that is expected to prevent the unfunded actuarial accrued liability from growing. Continuing the practice of underfunding the System increases the risk of needing even larger contributions in the future that may make the System unsustainable.

The Board of Trustees has agreed with this recommendation in the adoption of a funding policy. We have reviewed the adopted policy. We agree that the policy is a reasonable method that conforms to the Actuarial Standards of Practice, and we agree with its use in the GASB report as an Actuarially Determined Contribution (ADC). The funding policy calls for a funding amount equal to the normal cost plus a closed 25-year amortization as a level percentage of uncapped payroll of the Unfunded Actuarial Liability. This policy defines a method that would ultimately fully fund the plan and falls within generally accepted actuarial funding methods currently in use for public plans. As of June 30, 2019, the remaining amortization period is 21 years. According to this methodology, the State's contribution amount would be $ 2,918,467,212 for FY 2021. It is important though to recognize that this change does not affect the actual funding of the System. The board adopted funding policy conforms to a goal of full funding within a reasonable time period and with generally accepted actuarial principles and practices.

Based on the draft June 30, 2019 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the Actuarial Liability, is currently at 37.82%. The Unfunded Actuarial Liability is currently about $30.3 billion and is expected to increase to nearly $32 billion before contributions start to reduce it. The required State contribution rate is currently 52.15% of payroll and is scheduled to increase to 57.65% of payroll. However, if there were a significant market downturn, the Unfunded Actuarial Liability and the required State contribution rate would increase, putting the sustainability of the system further into question. Stress testing should be performed to better understand these risks and the potential advantages of additional contributions in the near term to maintain the sustainability of the system

**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 illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made** (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 most stakeholders of the System look to for assessing the System's financial conditions.

As mentioned in Section II, a new Actuarial Standard of Practice (ASOP) has been introduced, ASOP 51, and is effective for SERS actuarial valuation starting June 30, 2019. ASOP 51 provides guidance to actuaries on the assessment and disclosure of risks to help readers of the actuarial valuation report "*understand the effects of future experience differing from the*

## SECTION III – SUPPORTING ANALYSIS

*assumptions used*" and "*the potential volatility of future measurements resulting from such differences*".

ASOP 51's first requirement is to "*identify risks that, in the actuary's professional judgment, may reasonably be anticipated to significantly affect the plan's future financial condition.*" GRS identified six sources of risk to SERS: investment risk, asset/liability mismatch risk, contribution risk, salary and payroll risk, longevity risk and other demographic risks. With the exception of the contribution risk due to the statutorily-required amount of contributions, the risks SERS identified are relatively generic and would apply to most pension plans.

ASOP 51 requires the actuary to assess each of the risks identified. While the assessment does not have to be quantitative, it does have to take into account the specifics of the individual plan. ASOP 51 also describes several quantitative methods that may be used to assess risk.

- Investment Risk. GRS describes the impact of a variation in the investment return in the next year from the assumed rate, but do not provide any additional assessment.

- Asset/Liability Mismatch Risk. GRS does not appear to provide an assessment of asset/liability mismatch risk other than to indicate that a mismatch may alter the funded status and contribution requirements.

- Contribution Risk. GRS discusses several issues with the statutorily-required contribution method in the Observations on Actuarial Funding and Statutory Funding section. This includes observing that the population has been decreasing and suggesting that the Board consider an update to the assumption that the active population remain constant. It would be useful to reference how this analysis impacts contribution risk in the risk section.

- Salary and Payroll Risk. GRS does not appear to provide an assessment of salary and payroll risk other than to indicate that experience that differs from the assumptions will either increase or decrease costs.

- Longevity Risk. GRS does not appear to provide an assessment of longevity risk other than to indicate that experience that differs from the assumptions will either increase or decrease costs.

- Other Demographic Risk. GRS provides an explanation of demographic risks, but does not appear to provide any assessment of these risks.

ASOP 51 requires the actuary to recommend a more detailed assessment of risks if it *"would be significantly beneficial."* GRS adequately identified the primary drivers of these risks, provided background information about these identified risks, but did not in our opinion adequately assess or communicate the significance of these risks to this plan. That could have been achieved if GRS included additional risk assessments, such as stress testing, in the report. GRS indicated

that an additional risk assessment was performed. However, there is no communication about the findings from the additional risk assessment or any indication of where to find the additional risk assessment.

ASOP 51 requires the actuary to *"calculate and disclose plan maturity measures that … are significant to understanding the risks associated with the plan."* GRS calculates the current and prior year assets to payroll ratio, the actuarial liability to payroll ratio, actives to annuitant ratio, and the net cash flow to market value ratio all of which may provide significant information about the potential effects of investment risk and demographic risk. GRS describes each maturity measure, but there is no explanation of how these measures help to understand any of the risks identified. GRS does not provide any projections of any of these maturity measures even though they are all readily available given the projections required to determine the statutory contribution amounts.

ASOP 51 Section 3.8 says the actuary *"should identify and disclose relevant historical values of the plan's actuarial measurements"* if they are reasonably available and are significant to the risks identified. SERS historical values are readily available for funding status and plan maturity measures. We believe adding historical values and commentary about the trends shown would enhance the understanding of risks within the plan. For example, showing how the historical ratio of Actuarial Accrued Liability to Covered Payroll has changed over the past 10 years would give insight into how the maturity of SERS is changing and therefore how the sensitivity to risks may be changing.

**Thus, we recommend that an assessment be provided for each risk that is identified by GRS, that an explanation be provided as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified, and that historical values that are significant to understanding the risks identified be disclosed along with an explanation of how they help the reader understand the risks identified by GRS** (Recommendation #7).

## Conformance to Statutory Funding Changes of Public Act 100-0023

*Recognition of Changes in Actuarial Assumptions*

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a five-year period. This phase-in provides time to adjust to a higher level of contributions. However, for a System in which the Unfunded Liability is already expected to continue to grow for several more years such delays allow the Unfunded Liability to increase even more if the assumption change is an increase in cost, adding additional risks to the System.

## SECTION III – SUPPORTING ANALYSIS

Public Act 100-0023 states:

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

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

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

GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of expected 2019 payroll, and reflecting one-fifth of that percentage change over five years. In the draft 2019 Actuarial Valuation Report, there is a clear demonstration of the dollar amounts to be smoothed as a result of the assumption changes as disclosed in the 2014, 2016, 2018, and 2019 actuarial valuation reports and the calculation of the annual rate change based on the appropriate payroll. This rate adjustment is then recognized over a five-year period as an adjustment to the contribution rate that would otherwise be required from the State. The method used by GRS will result in the cost impact due to assumption changes being recognized as increasing dollar amounts because the recognition as an equal percentage of pay gets applied to an increasing payroll over a five-year period.

*Optional Hybrid Plan*

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

As stated in Section II of this report GRS has reflected the hybrid plan in the June 30, 2019 valuation by anticipating that 0% of future participants elect the optional hybrid plan. SERS does not intend to implement the plan until clarifying language is legislated, which has not been done as of the valuation date. While not developed from direct experience since the Plan is not yet available and there are questions about its design, the assumption to defer recognition seems reasonable based on the Plan design and the expectations of GRS and SERS staff.

## SECTION III – SUPPORTING ANALYSIS

# Conformance to Changes of Public Act 100-0587

*Accelerated Pension Benefit Payments*

P.A. 100-0587 created two accelerated pension benefit payment options. Inactive vested members have the option of receiving a lump sum equal to 60% of the present value of their benefits in lieu of their annuity benefits, the "Total Buyout". This program is available until May 31, 2024. The "COLA Buyout" program provides Tier 1 members the option upon retirement of accepting the reduced Tier 2 automatic annual increase (AAI) provision instead of their current 3% automatic annual increases. In exchange for taking electing reduced AAI, members will receive a lump-sum equal to 70% of the present value of the reduced annuity benefits. The State finances the program by issuing bonds up to certain limits. Lump-sum payments will be made directly from the bond proceeds. This program expires June 30, 2024, or earlier if funds are no longer available.

For the draft June 30, 2019 report, GRS has assumed that 5% of inactive participants will elect the "Total Buyout" of their pension benefit. Further, GRS has assumed that 21 percent of eligible Regular formula members and 28 percent of eligible Alternative formula members are assumed to elect the "COLA Buyout" at retirement. The election percentages are assumed to apply until the end of the Buyout Programs. GRS notes the "COLA Buyout" assumptions are based upon experience through May 2019 provided by the System, but no information or discussion is provided on the actual experience. In addition, in the 2018 Experience Study the recommendation for the Total Buyout was 10% of all inactive members would elect the total buyout, and no explanation is provided for the change from 10% to 5%. It is unclear what experience was used as the basis is for this assumption, and thus we cannot evaluate its appropriateness. We recognize that there is very little experience on which to base an assumption and as experience emerges, the assumption may need to be revised. We will monitor the accuracy of this assumption as experience emerges and comment on whether revisions should be made at that point.

## SECTION III – SUPPORTING ANALYSIS

# Assessment of Actuarial Assumptions Used in the 2019 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 reduced from 7.00% to 6.75% for the draft June 30, 2019 Actuarial Valuation.

**After reviewing all the materials (see Appendix B of this report) that were made available, Cheiron concludes that reducing the interest rate from 7.00% to 6.75% for this valuation is reasonable.**

**We recommend that the SERS Board continue to annually review the economic assumptions (interest rate and inflation), as was done for this valuation, prior to commencing the valuation work and adjust assumptions accordingly** (Recommendation #6).

*The items we considered and our rationale for this recommendation are 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 June 17, 2019 report on the 2018 Experience Study, they presented the expectations for SERS portfolio based on the shorter-term capital market assumptions of eleven independent investment consultants and concluded that, adjusting for GRS's assumed rate of inflation, the average 10-year expected geometric return of the SERS portfolio is 6.11% (See page C-9 of the GRS June 17, 2019 report on the 2018 Experience Study). This analysis estimated SERS has a 43.29% chance of meeting or exceeding the updated 6.75% assumption over a 10-year time horizon.

- GRS also presented the distribution of the 20-year average geometric net nominal return for three consultants with long-term capital market assumptions. Based on these longer term assumptions the average 20-year geometric mean for the SERS portfolio was 6.71% and SERS is estimated to have a 49.34% chance of meeting or exceeding the updated 6.75% assumption (See page C-9 of the GRS June 17, 2019 report on the 2018 Experience Study). This supports the Board reducing this assumption for the current valuation.

## SECTION III – SUPPORTING ANALYSIS

### Distribution of 20-year Average Geometric Net Nominal Return

| Investment Consultant | Distribution of 20-Year Average Geometric Net Nominal Return | | | Probability of exceeding 7.00% | Probability of exceeding 6.75% | Probability of exceeding 6.50% |
|---|---|---|---|---|---|---|
| | 40th | 50th | 60th | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1 | 5.84% | 6.49% | 7.14% | 42.06% | 45.90% | 49.78% |
| 2 | 6.21% | 6.89% | 7.58% | 48.40% | 52.09% | 55.76% |
| 3 | 6.04% | 6.75% | 7.47% | 46.51% | 50.02% | 53.54% |
| **Average** | **6.03%** | **6.71%** | **7.40%** | **45.66%** | **49.34%** | **53.03%** |

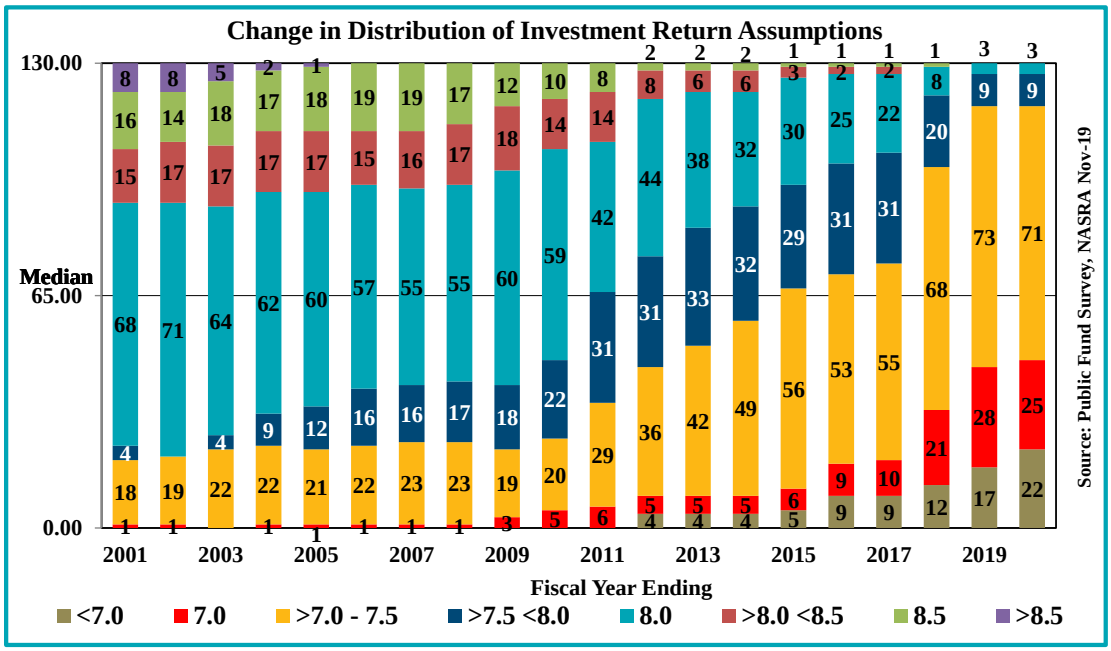
The 20-year geometric average return is 6.71%.

- GRS's June 17, 2019 report on the 2018 Experience Study also presented the expectation of the Illinois State Board of Investment's investment consultant Meketa Investment Group. Meketa's expected 20-year geometric average return of the SERS portfolio is 7.06% (See page C-9 of the GRS June 17, 2019 report on the 2018 Experience Study). Based on the capital market assumptions provided by Meketa, SERS has a 54.26% chance of meeting or exceeding the updated assumption of 6.75%. Given that SERS is only 37.92% funded on a market asset value, an expectation of achieving the investment return only 50% of the time could result in cost increases following years that the returns are below the assumption. This analysis supports the reasonableness of assuming a 6.75% interest rate for the current year.

- SERS is projected to have a negative cash flow (contribution income less benefit and expense payouts) in Fiscal Year Ending 2019. The cash flow is expected to grow increasingly negative over time to nearly a billion dollars per year by 2029 as shown in the graph on page 14 and table 4d on pages 30 and 31 of the draft 2019 Actuarial Valuation Report. When short-term returns are expected to be lower than the long-term expectations, which is the current case with SERS, a plan with negative cash flows will have dollar-weighted returns that are less than their "time-weighted" returns.

- While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 130 large retirement plans. The following chart shows the distribution of investment return assumptions for the plans in the Public Plans Database since 2001. Historically, SERS has had higher discount rates in the past, but now the 6.75% assumption is below the median assumption. The latest data includes results collected through November 2019.

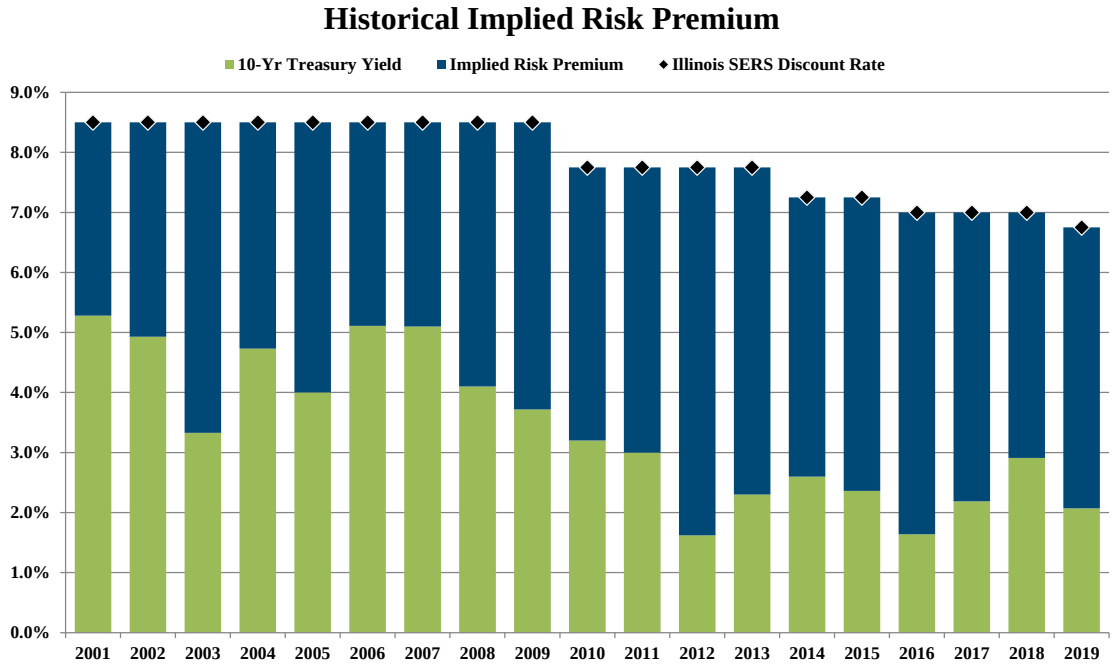
## SECTION III – SUPPORTING ANALYSIS




Over the period shown, there continues to be a pattern of reducing discount rates. Of the 130 plans shown for both 2019 and 2013, 114 have reduced their discount rate assumption since 2013. For these 114 plans, the average reduction is 0.57%. The data is consistent with the experience of other Cheiron clients, which have generally shown a significant trend of reducing their discount rate assumptions over the last several years.

- Declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, as shown in the following chart, in 2001 the yield on 10-year Treasury bonds (a proxy for a risk free investment) was 5.3%. To achieve SERS' assumed return of 8.50%, the System's investments had to outperform the yield on the 10-year Treasury by 3.2%. As of June 2019, the yield on the 10-year Treasury is now 2.1%, and to achieve SERS' assumed return of 6.75%, the System's investments need to exceed the ten-year Treasury yield by 4.65%. Even though SERS reduced its assumption by 175 basis points, it still has to take more investment risk in 2019 to meet its assumption than it did in 2001. 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.

## SECTION III – SUPPORTING ANALYSIS




*2. Inflation Assumption*

As recommended in the GRS June 17, 2019 report on the 2018 Experience Study, the inflation assumption was decreased from 2.50% to 2.25% in the draft June 30, 2019 valuation.

**We find the 2.25% inflation assumption to be reasonable.**

*Our rationale for concurring with the 2.25% assumption:*

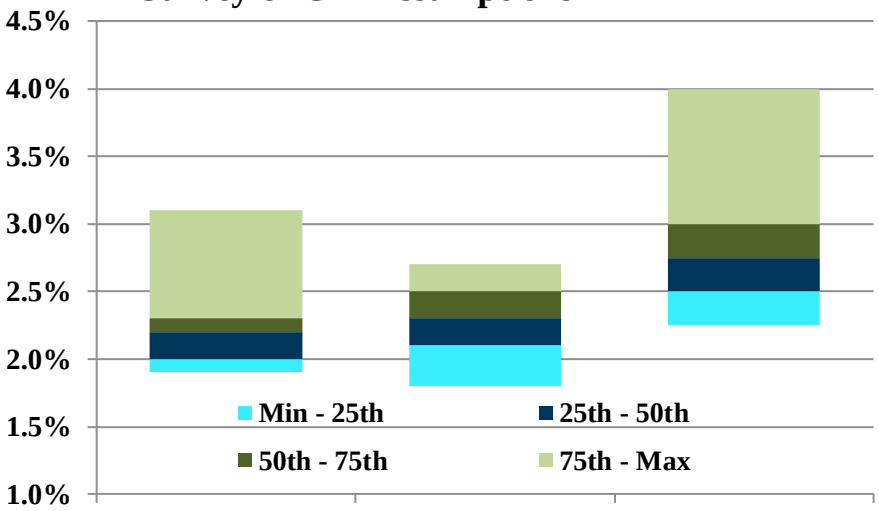
- GRS's report on the 2018 Experience Study included a survey of the inflation assumptions of independent investment consultants and found they ranged from 1.95% to 2.75%. The eleven firms with a shorter time horizon reported an average of 2.20% and the three independent investment consultants with longer time horizon averaged 2.42%.

- The April 2019 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (next 75 years), inflation will average between 2.0% and 3.2% (http://www.ssa.gov/oact/tr/2019/tr2019.pdf). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.6%.

- The chart on the following page shows the distribution of inflation expectations for the Third Quarter 2019 survey of professional economic forecasters published by the

## SECTION III – SUPPORTING ANALYSIS

Philadelphia Federal Reserve, the 2019 Horizon survey of investment consultant capital market assumptions (20-year), and the 2018 inflation assumptions used by plans in the Public Plans Database. The assumption of 2.25% is near the middle of the range projected by professional economic forecasters and investment consultants, and is on the low end of the range used by other public plans.




| | Economic Forecasters | Horizon Survey | Public Plans Database |
|---|---|---|---|
| **Minimum** | **1.90%** | **1.80%** | **2.25%** |
| **25th Percentile** | **2.00%** | **2.10%** | **2.50%** |
| **50th Percentile** | **2.20%** | **2.30%** | **2.75%** |
| **75th Percentile** | **2.30%** | **2.50%** | **3.00%** |
| **Maximum** | **3.10%** | **2.70%** | **4.00%** |

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*3. Salary (Annual Compensation) Increase Assumption*

The salary increase assumption is shown in the table below. It was lowered this year to reflect the reduction in the inflation assumption.

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

| Age | Annual Increase |
|---|---|
| 25 | 7.17% |
| 30 | 5.70% |
| 35 | 4.80% |
| 40 | 4.47% |
| 45 | 4.08% |
| 50 | 3.76% |
| 55 | 3.55% |
| 60 | 3.35% |
| 65 | 2.97% |
| 70 | 2.75% |

These increases include the wage inflation assumption of 2.75% comprised of an inflation assumption of 2.25% per annum and 0.50% per annum productivity or real wage growth assumption.

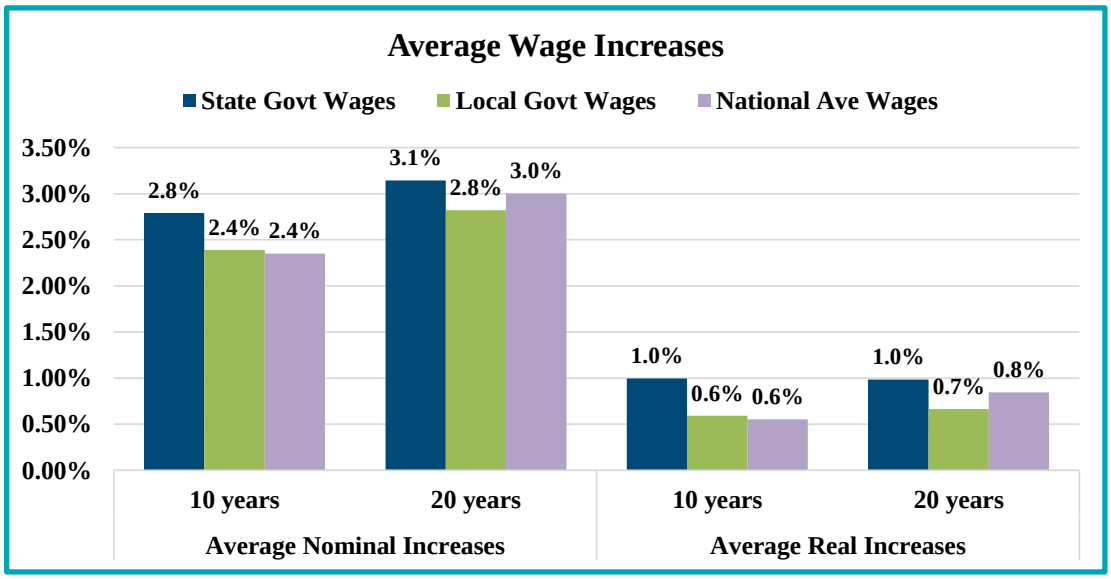
**We find the assumption to keep real wage growth at 0.50% and thus reduce the salary increase assumption to 2.75% and the basis for setting it as reasonable and consistent with the inflation assumption.**

*Our rationale for concurring with GRS's recommendation to keep real wage growth at 0.50% and thus reduce the salary increase assumption to 2.75%:*

- The following chart shows the average nominal and real increases in wages over the last 10 and 20 years for State governments, local governments, and National Average Wages. State and local government data is from the Quarterly Census of Employment and Wages as published by the Bureau of Labor Statistics. National Average Wages is published by the Social Security Administration.

- The April 2019 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (between 2029 and 2093) real wage differential will average somewhere between 0.60% and 1.84%.

## SECTION III – SUPPORTING ANALYSIS




- The reduction in the salary increase assumption is supported by credible data as shown on pages C-15 and C-16 of the 2018 Actuarial Experience Study performed by GRS.

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

4. *Cost of Living Adjustment Assumption*

   Benefits are increased annually as described on pages 55 and 57 through 61 of the draft June 30, 2019 Actuarial Valuation. Annual increases are three percent for those hired prior to January 1, 2011 and based on ½ of the Consumer Price Index for those hired on or after January 1, 2011, which is 1.125% based on the inflation assumption of 2.25%.

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

5. *Expenses*

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

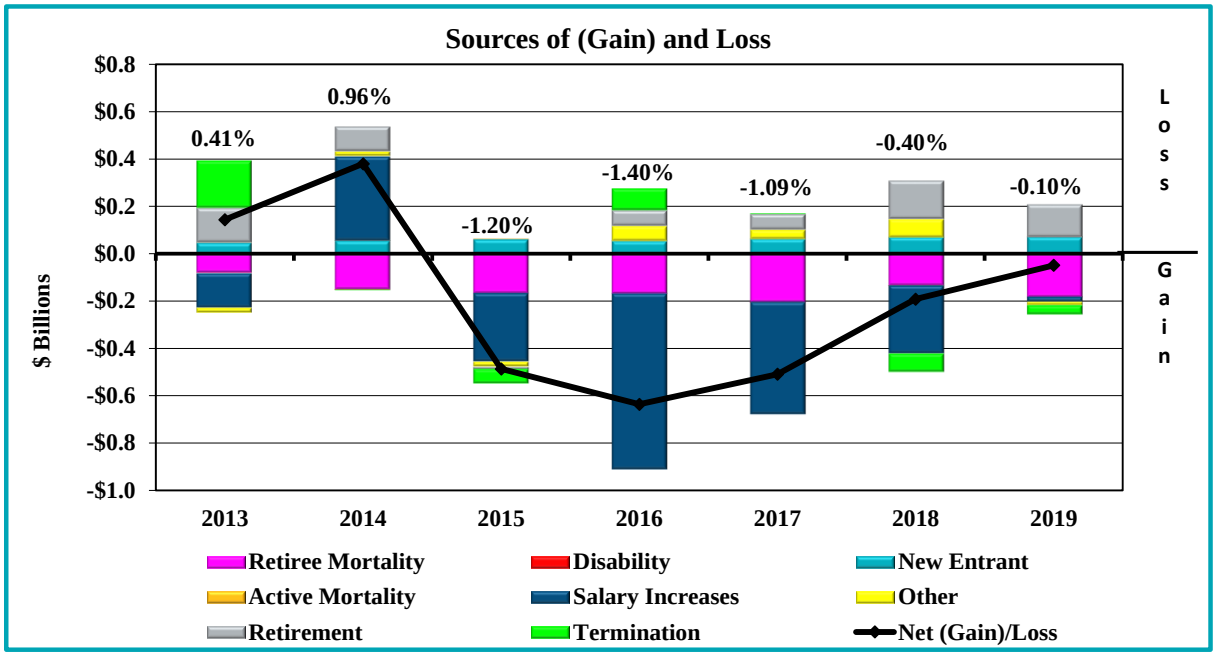
   **We find the assumption reasonable; however, more information on the expected expenses as a function of capped payroll would be a valuable additional disclosure.**

## SECTION III – SUPPORTING ANALYSIS

### B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2019 Actuarial Valuation, these are shown on page 23. In the chart below, we have collected similar data from GRS's past valuation reports dating back to 2013 and use these to present a historical review of past demographic and salary increase experience gains and losses.

The following chart 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, it represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, it represents an experience gain for that year with liabilities less than expected. The net liability (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. After 2014, when the assumptions were changed, there has been a net gain on the valuation. These are consistently due primarily from gains in salary, which means actual salary increases are less than the assumed increases. The change this year to the salary increase assumption should mean that these gains will be reduced in future years.

## SECTION III – SUPPORTING ANALYSIS

2. During this period, there have been consistent losses for retirement which is an indication that the retirement assumption should be reviewed as was done in the 2018 Actuarial Experience Study.

3. There have also been consistent gains due to retiree mortality reflecting additional conservatism in the expected longevity of retirees.

4. In every year since 2013, there have been small experience losses attributable to new entrants joining SERS. This continuing source of losses due to new entrants is expected for most pension plans. This is because members who are hired after the valuation date may earn a partial year of service credit that does not show up until the following valuation, at which point the extra liabilities for their initial partial year are treated as a liability loss. These losses could be anticipated in future assumptions through a load developed in anticipation that new entrants will begin on average with some past service credits.

**The demographic assumptions are summarized below. We reviewed the development of these assumptions based on a full experience study for the three-year period ending June 30, 2018, and we have concluded all are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.**

### 1. Mortality

*Post-Retirement Mortality*

The mortality basis was updated with the June 30, 2019 Actuarial Valuation and uses different tables for general retirees covered under the Regular Benefit Formula and Public Safety retirees covered under the Alternative Benefit Formula.

The mortality assumption for general retirees is based on the Pub-2010 General Healthy Retiree Mortality tables, sex distinct, set forward zero years for males and one year for females multiplied by 111 percent for males and females. Generational mortality improvement is applied using the MP-2018 two-dimensional mortality improvement scales.

In the 2018 Experience Study, the analysis of mortality by GRS begins with the mortality tables from the Pub-2010 Public Retirement Plans Mortality Tables Report published by the Society of Actuaries and the Retirement Plans Experience Committee. For General Healthy Retirees, GRS modifies the published table to use as a baseline table before performing its analysis by setting the mortality rates forward one year for males and two years for females. There is no explanation or justification for why this alteration is made to the published table before developing scaling factors based on the Plan's actual experience and level of credibility. We recommend GRS provide an explanation and

justification for modifying the published General Healthy Retiree table for use as a baseline table to develop the scaling factor for the proposed mortality table.

In addition, once the scaling factors have been developed, they appear to be applied to a different modified version of the published table with no set forward for males and one year set forward for females. No explanation is given as to why the set forward amounts are different from the table used to develop the scaling factors or why the scaling factors would still be appropriate for a different table. The result of this adjustment after the analysis is that the actual-to-expected ratios are 111% and 112% for male and female retirees respectively. Ideally, when using a generational mortality table, these ratios would target 100%.

The mortality assumption for Public Safety retirees is based on the Pub-2010 Public Safety Healthy Retiree Mortality tables, sex distinct, multiplied by 110 percent for males and 105 percent for females. Generational mortality improvement is applied using the MP-2018 two-dimensional mortality improvement scales. The base table is based on an appropriate published mortality table, with scaling factors developed reflecting the plan's experience and credibility. Mortality improvement is projected on a generational basis using the most recent mortality improvement scale published by the Society of Actuaries. In our opinion, the mortality assumption for Public Safety retirees is reasonable.

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

The mortality basis was updated with the June 30, 2019 Actuarial Valuation and uses different tables for general employees covered under the Regular Benefit Formula and Public Safety employees covered under the Alternative Benefit Formula.

The mortality assumption for general active members is based on the Pub-2010 General Employee Mortality headcount-weighted tables, sex distinct, and set back two years for males and one year for females, multiplied by 89 percent for males and 95 percent for females. Generational mortality improvement is applied using the MP-2018 two-dimensional mortality improvement scales. The base table is a published mortality table, and scaling factors were developed reflecting the plan's experience and credibility. It is not clear why the published mortality table GRS selected is headcount-weighted as opposed to salary-weighted. An explanation should be provided.

Similar to the recommended mortality table for retirees, the pre-retirement mortality table proposed by GRS has setbacks of two years for males and one year for females. However, there is no explanation of why the proposed table has setbacks. The scaling factors are developed on the published table with no setback and there is no analysis of why these factors would be appropriate for the altered proposed table, or how the setbacks were determined. The effect of applying these setbacks for pre-retirement mortality is to assign greater credibility to the plan's experience than the credibility analysis GRS performed indicates is warranted. We recommend GRS provide an

explanation and justification for using the setbacks that were applied after the development of the scaling factors in the proposed tables for post decrement and pre decrement mortality.

The mortality assumption for Public Safety employees is based on the Pub-2010 Public Safety Healthy Employee Mortality headcount-weighted tables, sex distinct, multiplied by 96 percent for males and 108 percent for females. Generational mortality improvement is applied using the MP-2018 two-dimensional mortality improvement scales. The base table is a published mortality table, and scaling factors were developed reflecting the plan's experience and credibility. It is not clear why the published mortality table GRS selected is headcount-weighted as opposed to salary-weighted. An explanation should be provided. In our opinion, the mortality assumption for Public Safety retirees is reasonable.

**We recommend GRS provide additional explanation and justification for the methods used to develop the mortality assumptions used in the valuation** (Recommendation #5).

Specifically an explanation and justification should be provided for:

1. Modifying the published General Healthy Retiree table for use as a baseline table to develop the scaling factor for the proposed mortality table is needed.
2. Selecting a headcount-weighted as opposed to salary-weighted published mortality table for the pre-retirement mortality analysis.
3. Using additional setbacks to the baseline table that were applied after the development of the scaling factors in the proposed tables for post decrement and pre decrement mortality.

Also, we note that in the description of mortality in the draft 2019 valuation report on page 39, there is no indication that the assumption is fully generational or that a mortality improvement projection scale is used. The projection scale used is described in the narrative on page 3 and on page C-19 of the June 17, 2019 report on the 2018 Experience Study. **We recommend the description of the mortality assumption in the valuation report include an indication that the mortality assumptions are fully generational and the mortality improvement scale used** (Recommendation #4).

## SECTION III – SUPPORTING ANALYSIS

### 2. Termination

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

| Service (Beginning of Year) | Service Based Withdrawal<br>Regular Formula Employees | | Alternate Formula Employees | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| 0 | 0.2400 | 0.2200 | 0.0525 | 0.0700 |
| 1 | 0.0900 | 0.0900 | 0.0425 | 0.0700 |
| 2 | 0.0750 | 0.0650 | 0.0425 | 0.0650 |
| 3 | 0.0650 | 0.0550 | 0.0425 | 0.0600 |
| 4 | 0.0600 | 0.0450 | 0.0425 | 0.0600 |
| 5 | 0.0460 | 0.0450 | 0.0300 | 0.0500 |
| 6 | 0.0450 | 0.0400 | 0.0300 | 0.0400 |
| 7 | 0.0400 | 0.0400 | 0.0300 | 0.0300 |
| 8 | 0.0300 | 0.0350 | 0.0200 | 0.0200 |
| 9 | 0.0300 | 0.0350 | 0.0200 | 0.0200 |
| 10 | 0.0300 | 0.0300 | 0.0150 | 0.0200 |
| 11 | 0.0250 | 0.0300 | 0.0150 | 0.0175 |
| 12 | 0.0250 | 0.0250 | 0.0150 | 0.0175 |
| 13 | 0.0250 | 0.0250 | 0.0150 | 0.0175 |
| 14 | 0.0200 | 0.0250 | 0.0150 | 0.0175 |
| 15 | 0.0200 | 0.0250 | 0.0150 | 0.0175 |
| 16 | 0.0200 | 0.0200 | 0.0150 | 0.0150 |
| 17 | 0.0200 | 0.0200 | 0.0150 | 0.0150 |
| 18 | 0.0200 | 0.0200 | 0.0150 | 0.0150 |
| 19 | 0.0200 | 0.0200 | 0.0125 | 0.0125 |
| 20 | 0.0200 | 0.0150 | 0.0125 | 0.0125 |
| 21 | 0.0200 | 0.0150 | 0.0125 | 0.0125 |
| 22 | 0.0200 | 0.0150 | 0.0125 | 0.0125 |
| 23 | 0.0200 | 0.0150 | 0.0125 | 0.0125 |
| 24 | 0.0150 | 0.0150 | 0.0100 | 0.0100 |
| 25 | 0.0150 | 0.0100 | 0.0100 | 0.0100 |
| 26 | 0.0150 | 0.0100 | 0.0100 | 0.0100 |
| 27 | 0.0150 | 0.0100 | 0.0100 | 0.0100 |
| 28 | 0.0150 | 0.0100 | 0.0100 | 0.0100 |
| 29 | 0.0150 | 0.0100 | 0.0100 | 0.0100 |
| 30+ | 0.0150 | 0.0100 | 0.0100 | 0.0100 |

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.

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

## SECTION III – SUPPORTING ANALYSIS

| Service (Beginning of Year) | Service Based Withdrawal | | | |
|---|---|---|---|---|
| | Regular Formula Employees | | Alternate Formula Employees | |
| | Males | Females | Males | Females |
| 0 | 0.3000 | 0.2700 | 0.0800 | 0.1100 |
| 1 | 0.1650 | 0.1600 | 0.0700 | 0.0800 |
| 2 | 0.0700 | 0.0900 | 0.0575 | 0.0700 |
| 3 | 0.0700 | 0.0800 | 0.0550 | 0.0600 |
| 4 | 0.0650 | 0.0750 | 0.0325 | 0.0500 |
| 5 | 0.0550 | 0.0650 | 0.0300 | 0.0500 |
| 6 | 0.0500 | 0.0600 | 0.0300 | 0.0500 |
| 7 | 0.0500 | 0.0500 | 0.0300 | 0.0325 |
| 8 | 0.0300 | 0.0350 | 0.0200 | 0.0200 |
| 9 | 0.0300 | 0.0350 | 0.0200 | 0.0200 |
| 10 | 0.0300 | 0.0300 | 0.0150 | 0.0200 |
| 11 | 0.0250 | 0.0300 | 0.0150 | 0.0175 |
| 12 | 0.0250 | 0.0250 | 0.0150 | 0.0175 |
| 13 | 0.0250 | 0.0250 | 0.0150 | 0.0175 |
| 14 | 0.0200 | 0.0250 | 0.0150 | 0.0175 |
| 15 | 0.0200 | 0.0250 | 0.0150 | 0.0175 |
| 16 | 0.0200 | 0.0200 | 0.0150 | 0.0150 |
| 17 | 0.0200 | 0.0200 | 0.0150 | 0.0150 |
| 18 | 0.0200 | 0.0200 | 0.0150 | 0.0150 |
| 19 | 0.0200 | 0.0200 | 0.0125 | 0.0125 |
| 20 | 0.0200 | 0.0150 | 0.0125 | 0.0125 |
| 21 | 0.0200 | 0.0150 | 0.0125 | 0.0125 |
| 22 | 0.0200 | 0.0150 | 0.0125 | 0.0125 |
| 23 | 0.0200 | 0.0150 | 0.0125 | 0.0125 |
| 24 | 0.0150 | 0.0150 | 0.0100 | 0.0100 |
| 25 | 0.0150 | 0.0100 | 0.0100 | 0.0100 |
| 26 | 0.0150 | 0.0100 | 0.0100 | 0.0100 |
| 27 | 0.0150 | 0.0100 | 0.0100 | 0.0100 |
| 28 | 0.0150 | 0.0100 | 0.0100 | 0.0100 |
| 29 | 0.0150 | 0.0100 | 0.0100 | 0.0100 |
| 30+ | 0.0150 | 0.0100 | 0.0100 | 0.0100 |

## SECTION III – SUPPORTING ANALYSIS

### 3. Unused Sick Leave and Optional Service Purchases

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

### 4. Marriage Assumption

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

### 5. Social Security Offset for Survivor Benefits

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

### 6. Disability

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

## SECTION III – SUPPORTING ANALYSIS

### 7. Retirement

Employees are assumed to retire in accordance with the rates shown below. The rates apply only to employees who have fulfilled the service requirement necessary for retirement at any given age. Based on the 2018 Actuarial Experience Study, these rates were updated to reflect recent plan experience. This should reduce the losses on retirement seen recently in the analysis of Actuarial Liability gain and loss.

| Retirement Rates for Regular Formula Employees | | |
|---|---|---|
| **Age** | **Males** | **Females** |
| 50 | 15.00% | 27.50% |
| 51 | 25.00% | 27.50% |
| 52 | 25.00% | 35.00% |
| 53 | 25.00% | 27.50% |
| 54 | 25.00% | 22.50% |
| 55 | 25.00% | 25.00% |
| 56 | 18.00% | 24.00% |
| 57 | 18.00% | 19.00% |
| 58 | 18.00% | 19.00% |
| 59 | 18.00% | 19.00% |
| 60 | 13.00% | 17.00% |
| 61 | 12.00% | 13.50% |
| 62 | 20.00% | 23.00% |
| 63 | 17.50% | 19.00% |
| 64 | 17.50% | 20.00% |
| 65 | 25.00% | 25.00% |
| 66 | 25.00% | 29.00% |
| 67 | 25.00% | 27.00% |
| 68 | 25.00% | 27.00% |
| 69 | 25.00% | 22.00% |
| 70 | 25.00% | 22.00% |
| 71 | 20.00% | 22.00% |
| 72 | 20.00% | 22.00% |
| 73 | 20.00% | 22.00% |
| 74 | 20.00% | 22.00% |
| 75 | 100.00% | 100.00% |

## SECTION III – SUPPORTING ANALYSIS

| Early Retirement Rates for Regular Formula Employees | | |
|---|---|---|
| Age | Males | Females |
| 55 | 3.50% | 2.00% |
| 56 | 3.50% | 3.00% |
| 57 | 5.00% | 4.00% |
| 58 | 6.00% | 5.00% |
| 59 | 6.50% | 6.00% |

| Retirement Rates for Alternate Formula Employees | | | | |
|---|---|---|---|---|
| | Eligible for Alternate Formula Benefits Only | | Eligible for Regular Formula Benefits Only | |
| Age | Males | Females | Males | Females |
| 50 | 65.00% | 42.50% | N/A | N/A |
| 51 | 50.00% | 30.00% | N/A | N/A |
| 52 | 40.00% | 25.00% | N/A | N/A |
| 53 | 40.00% | 25.00% | N/A | N/A |
| 54 | 35.00% | 25.00% | N/A | N/A |
| 55 | 42.00% | 45.00% | N/A | N/A |
| 56 | 30.00% | 30.00% | N/A | N/A |
| 57 | 30.00% | 30.00% | N/A | N/A |
| 58 | 30.00% | 30.00% | N/A | N/A |
| 59 | 30.00% | 20.00% | N/A | N/A |
| 60 | 30.00% | 30.00% | 4.00% | 5.00% |
| 61 | 30.00% | 25.00% | 4.00% | 5.00% |
| 62 | 30.00% | 40.00% | 10.00% | 18.00% |
| 63 | 35.00% | 30.00% | 11.00% | 18.00% |
| 64 | 35.00% | 40.00% | 12.00% | 15.00% |
| 65 | 35.00% | 50.00% | 14.00% | 25.00% |
| 66 | 35.00% | 50.00% | 20.00% | 15.00% |
| 67 | 35.00% | 50.00% | 20.00% | 20.00% |
| 68 | 35.00% | 50.00% | 20.00% | 30.00% |
| 69 | 45.00% | 50.00% | 20.00% | 30.00% |
| 70 | 50.00% | 50.00% | 20.00% | 30.00% |
| 71 | 50.00% | 50.00% | 20.00% | 30.00% |
| 72 | 100.00% | 100.00% | 100.00% | 100.00% |

## SECTION III – SUPPORTING ANALYSIS

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 – Tier 2 Members | | | |
|---|---|---|---|
| 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 | 30.0 | 25.0 |
| 62 | 30.0 | 40.0 |
| 63 | 35.0 | 30.0 |
| 64 | 35.0 | 40.0 |
| 65 | 35.0 | 50.0 |
| 66 | 35.0 | 50.0 |
| 67 | 35.0 | 50.0 |
| 68 | 35.0 | 50.0 |
| 69 | 45.0 | 50.0 |
| 70 | 50.0 | 50.0 |
| 71 | 50.0 | 50.0 |
| 72 | 100.0 | 100.0 |

These rates were updated to be consistent with the Tier 1 rates for ages 61 and older as recommended in the GRS June 17, 2019 report on the 2018 Experience Study.

## SECTION III – SUPPORTING ANALYSIS

### 8. Spouse's Age

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

### 9. Children

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

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

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

### 10. Overtime and Shift Differentials

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

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

Load of 11 percent for Regular Formula members and 9 percent for Alternative Formula members 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. The change in this assumption is supported by analysis on page C-77 of the June 17, 2019 report on the 2018 Experience Study.

### 12. Missing Data

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

# SECTION III – SUPPORTING ANALYSIS

## 13. Decrement Timing

All decrements are assumed to occur mid-year.

## 14. Decrement Relativity

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

## 15. Decrement Operation

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

## 16. Eligibility Testing

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

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

No explicit assumption is made with respect to these items.

## 18. Buyout Election Assumption

With respect to the COLA Buyout, 21 percent of Regular Formula eligible Tier 1 active members and 28 percent of Alternative Formula eligible Tier 1 active members are assumed to elect to receive a reduced and delayed AAI benefit at retirement and an accelerated pension benefit option in accordance with Public Act 100-0587.

With respect to the Total Buyout, five percent of eligible inactive members are assumed to elect to receive an accelerated pension benefit option in lieu of an annuity at retirement in accordance with Public Act 100-0587. The election percentages apply until the end of each Buyout Program; i.e., June 1, 2024, for the COLA Buyout and May 31, 2024, for the Total Buyout.

## SECTION III – SUPPORTING ANALYSIS

### 19. 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 2.75% per annum. New entrants not covered by Social Security are assumed to participate in the Tier 2 defined benefit plan.

| | New Entrant Benefit Groups | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | New Entrants Eligible for Regular Formula Benefits who are Covered by Social Security | | New Entrants Eligible for Regular Formula Benefits who are not Covered by Social Security | | New Entrants in Positions Formerly Eligible for Alternate Formula Benefits who are Covered by Social Security and are now Eligible for Regular Formula Benefits | | New Entrants Eligible for Alternate Formula Benefits who are Covered by Social Security | | New Entrants in Positions Formerly Eligible for Alternate Formula Benefits who are not Covered by Social Security and are now Eligible for Regular Formula Benefits | | New Entrants Eligible for Alternate Formula Benefits who are not Covered by Social Security | | Total | |
| **Age Group** | **No.** | **Salary** | **No.** | **Salary** | **No.** | **Salary** | **No.** | **Salary** | **No.** | **Salary** | **No.** | **Salary** | **No.** | **Salary** |
| Under 20 | 107 | 3,467,106 | | | 70 | 3,087,903 | 20 | 899,602 | | | | | 197 | 7,454,611 |
| 20-24 | 2,340 | 89,896,000 | 14 | 573,273 | 1,665 | 76,696,614 | 390 | 19,035,748 | 299 | 19,059,814 | 5 | 155,406 | 4,713 | 205,416,855 |
| 25-29 | 4,264 | 189,630,010 | 29 | 1,488,543 | 1,908 | 91,779,003 | 494 | 25,848,452 | 444 | 29,167,700 | 6 | 169,233 | 7,145 | 388,082,941 |
| 30-34 | 3,767 | 182,629,462 | 20 | 1,164,670 | 1,035 | 52,685,593 | 370 | 21,123,541 | 190 | 13,126,925 | | | 5,382 | 270,730,191 |
| 35-39 | 3,238 | 165,836,007 | 6 | 295,704 | 674 | 36,678,476 | 309 | 18,070,299 | 72 | 5,116,806 | | | 4,299 | 225,997,292 |
| 40-44 | 3,085 | 161,170,605 | 8 | 496,889 | 553 | 31,869,496 | 231 | 14,091,502 | 32 | 2,282,806 | | | 3,909 | 209,911,298 |
| 45-49 | 2,682 | 144,162,169 | 7 | 454,181 | 423 | 24,318,375 | 194 | 11,870,774 | 10 | 736,763 | | | 3,316 | 181,542,262 |
| 50-54 | 2,219 | 119,995,100 | 9 | 642,834 | 272 | 16,011,951 | 111 | 7,113,127 | 11 | 826,979 | | | 2,622 | 144,589,991 |
| 55-59 | 1,439 | 74,742,248 | 7 | 497,474 | 142 | 8,279,311 | 61 | 3,514,353 | 11 | 787,657 | | | 1,660 | 87,821,043 |
| 60-64 | 503 | 25,911,618 | | | 44 | 2,615,363 | 19 | 1,347,230 | 3 | 255,428 | | | 569 | 30,129,639 |
| 65-69 | 31 | 1,795,974 | | | 4 | 214,472 | 1 | 56,274 | | | | | 36 | 2,066,720 |
| 70 & Over | | | | | | | | | | | | | | |
| **Total** | **23,675** | **$1,159,236,299** | **100** | **$5,613,568** | **6,790** | **$344,236,557** | **2,200** | **$122,970,902** | **1,072** | **$71,360,878** | **11** | **$324,639** | **33,848** | **$1,703,742,843** |
| Avg. Salary | | 48,965 | | 56,136 | | 50,698 | | 55,896 | | 66,568 | | 29,513 | | 50,335 |
| Avg. Age | | 37.80 | | 34.83 | | 31.79 | | 33.97 | | 33.07 | | 27.14 | | 36.04 |
| Percent Male | | 42% | | 93% | | 72% | | 68% | | 89% | | 100% | | 52% |

## SECTION III – SUPPORTING ANALYSIS

### C. Funding Methods

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and (3) the amortization method.

*1. Actuarial 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) cost method as it is more consistent with the requirement in 40 ILCS 5/14-131 for level percentage of pay funding.**

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

*2. Asset Valuation Method*

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

The 2018 Public Retirement Systems Study by the National Conference on Public Employee Retirement Systems (NCPERS) survey of 167 public retirement funds found that the majority of plans responding to the survey have a five-year smoothing period.

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

## SECTION III – SUPPORTING ANALYSIS

*3. Amortization Method*

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2045. While not a traditional amortization method, this methodology effectively amortizes a portion of the Unfunded Actuarial Liability over the remaining period until 2045, which is currently 26 years.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be "a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period." Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

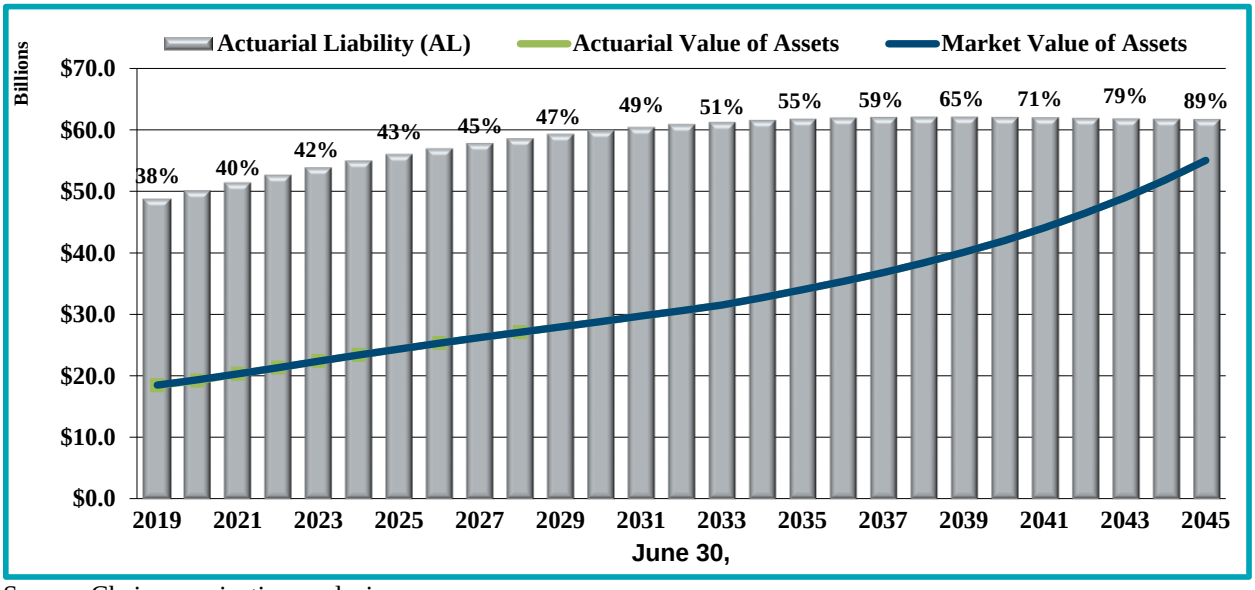
Typical public plan amortization methods are designed to increase each year by expected payroll growth. Under the State mandated method, however, the effective amortization payment increases each year by more than the expected growth in payroll. As a result, the State mandated method defers payments on the unfunded actuarial liability further into the future than under typical public plan amortization methods.

## SECTION IV – PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2019 Actuarial Valuation of SERS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

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

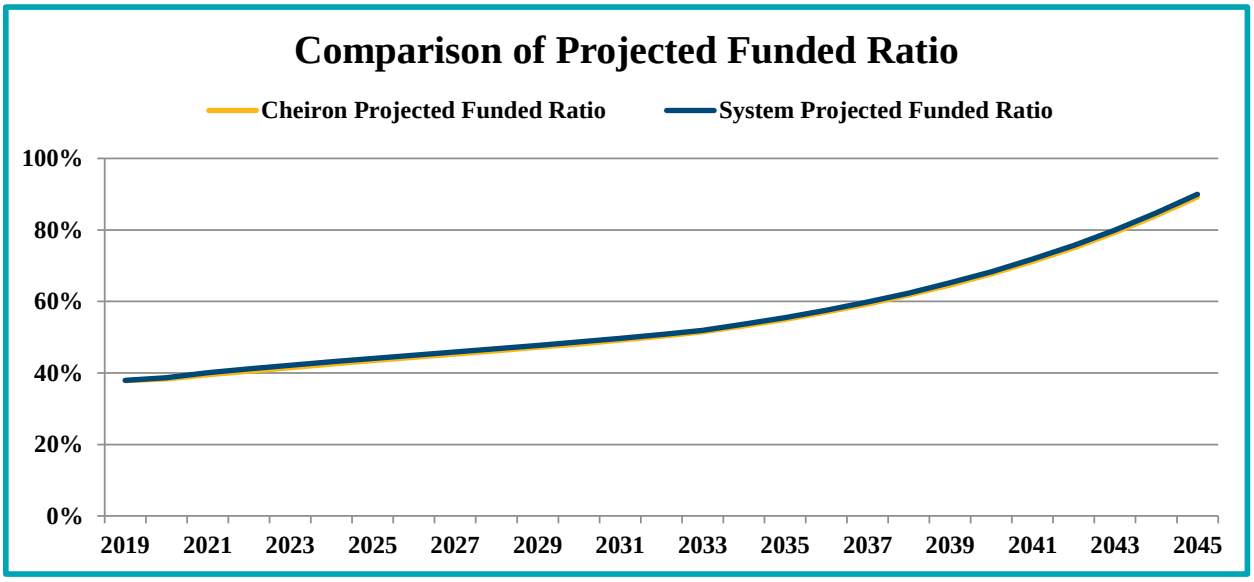
The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As pointed out on page 13 of the draft June 30, 2019 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projections. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio for each year is shown at the top of the graph. For example, in 2035, the funded ratio is projected to be approximately 55% with assets of approximately $35 billion and liabilities of approximately $62 billion.




Source: Cheiron projection analysis.

## SECTION IV – PROJECTION ANALYSIS

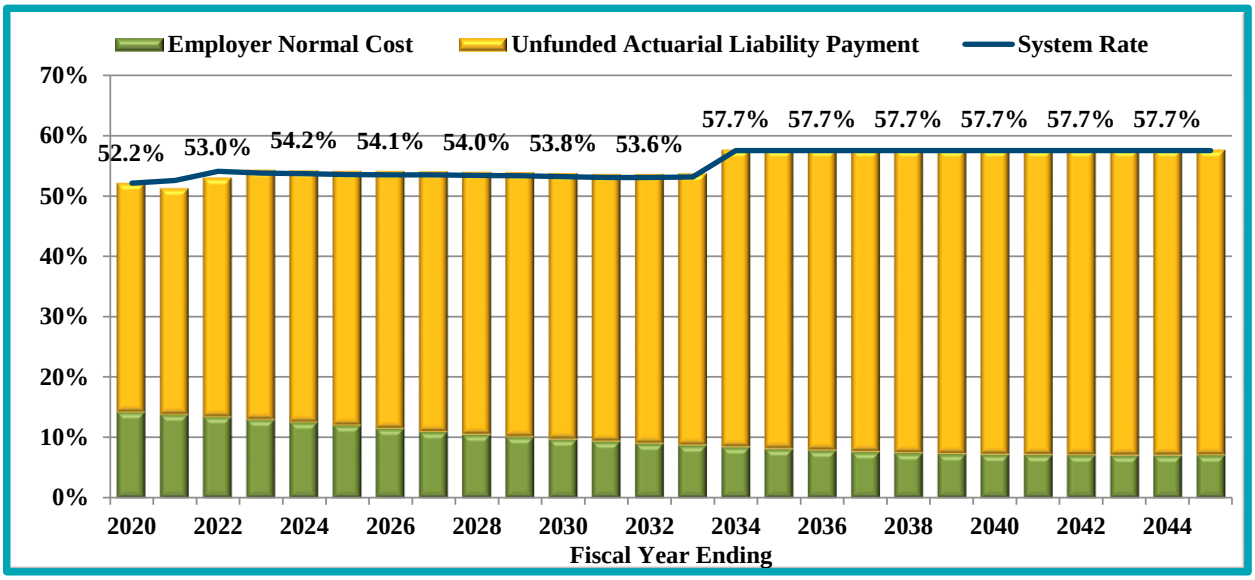
When we compare our projected funded ratio against the results shown in the draft June 30, 2019 Actuarial Valuation, **we find a close match in expected funded ratio**. This close match of the funded ratio indicates that the projections done by the System's actuary are reasonable.




Source: Cheiron projection analysis.

## SECTION IV – PROJECTION ANALYSIS

The following graph shows the expected contribution calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for the fiscal year ending 2020 was set based on the June 30, 2018 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2020 (Fiscal Year Ending June 30, 2021). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by participants not covered by employee contributions based on the statutory funding method; and 2) an amortization of the Unfunded Liability. The normal cost amounts are shown by the green bars and the amortization of the Unfunded Actuarial Liability (UAL) amounts by the yellow bars. The percentages shown are the total contribution rates calculated by Cheiron, which are equal to the sum of the bars. The graph shows that a larger percentage of the total contribution is being made toward the UAL payment later in the period. The blue line shows the projected contribution rates as percentages of payroll from the System's Actuary's draft June 30, 2019 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. In this instance there is virtually no difference. 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.**

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

In this section, we examine the adequacy of the funding for the System, including funded status, the sources of changes in the Unfunded Actuarial Liability (UAL), and projections of the UAL and statutory funding requirements compared to contributions needed to pay down the UAL.

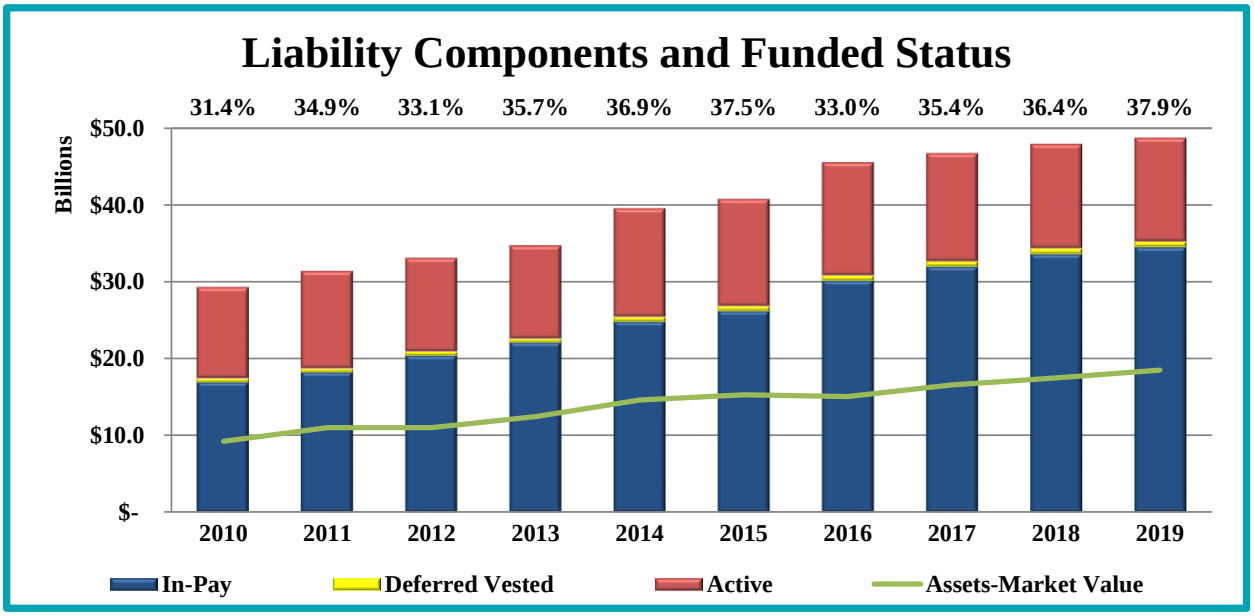
The actuarial valuation report prepared by GRS includes both traditional actuarial measurements, as well as additional risk measurements that are shown on pages 17 to 19 of the draft June 30, 2019 valuation report. Given the unique and substantial funding challenges faced by the Illinois pension systems, this additional information is quite important and supplements the information we present here on funding adequacy to better inform the legislature and other stakeholders about the adequacy of the System's funding.

### System Funded Status

The first funding adequacy measure we present is a historical funded status trend for the past ten years. Funded status for this measure is defined as the ratio of the Market Value of Assets to the Actuarial Liability. The chart below shows SERS' funded status since 2010 has gone from 31.4% funded to 37.9% funded in 2019, an increase in funded status of 6.5%. In addition to showing the funded status, this chart also shows the breakdown of the plan's liabilities by membership status:

- Active liability – the liability (attributable to service already performed) for future payments to members who are currently working in the System,
- Deferred Vested liability – the liability for future payments to members who are no longer working in the system, and
- In-Pay liability – the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown shows that today plan assets only cover about 54% of the liabilities for just those members currently in-pay status.

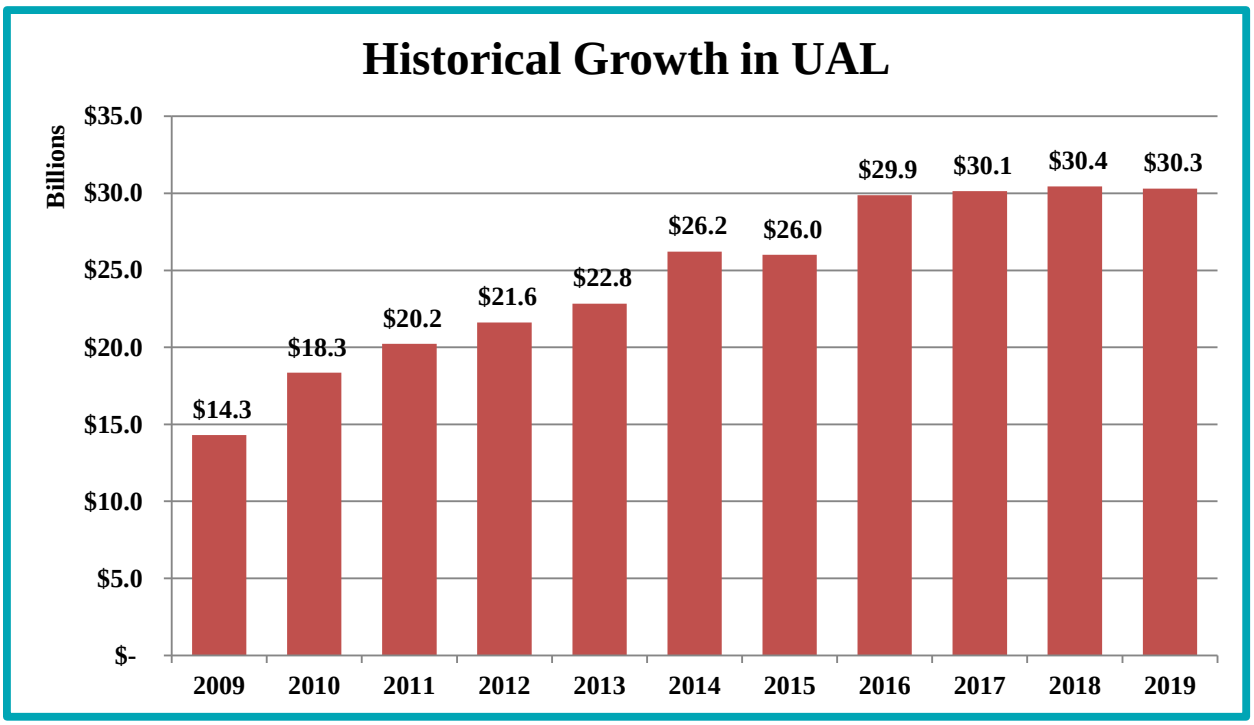



Source: Cheiron analysis of funding adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

### Sources of Changes in the UAL

As shown in the chart below, SERS' Unfunded Actuarial Liability (UAL) has grown from about $14.3 billion in 2009 to $30.3 billion in 2019, an increase of $16.0 billion. In order to understand how to reverse this trend, it is important to understand the sources contributing to it.




Source: Cheiron analysis of funding adequacy.

The changes to the UAL from June 30, 2009 to June 30, 2019 can be separated into the following components:

- **Contribution Deficiencies** – Contributions that are less than the tread water contribution cause the UAL to increase. The tread water contribution consists of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the Unfunded Actuarial Liability. This sum is referred to as the tread water contribution because it is the contribution necessary so that the UAL will remain constant, or "tread water" (absent experience gains or losses). The difference between actual contributions and the tread water contributions have increased the UAL by $6.7 billion over this period.

- **Assumption Changes** are changes to actuarial assumptions as the System updated expectations on future investment returns and life expectancy. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations. Over this period assumption changes have increased the UAL by $9.4 billion.

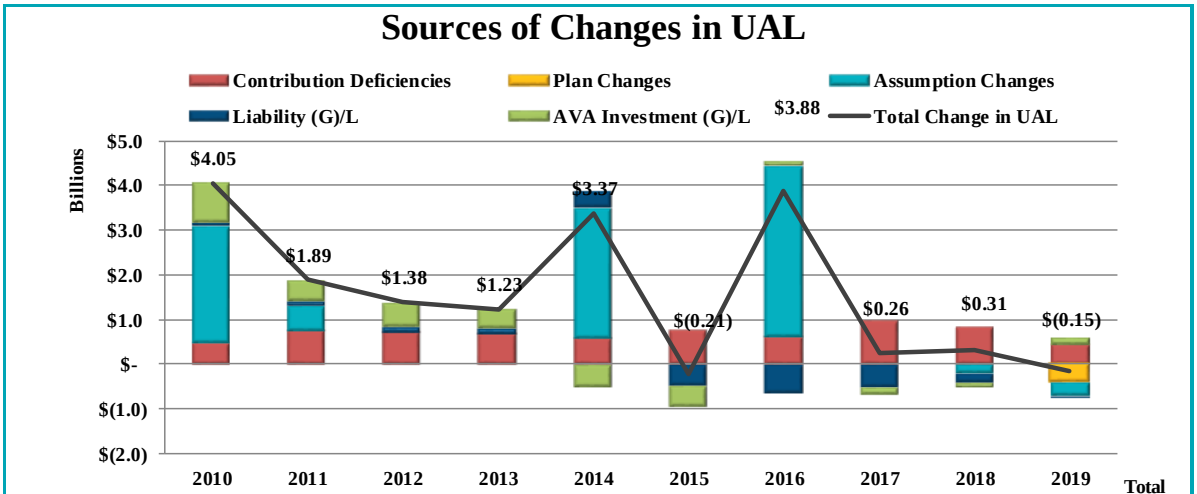
- **Plan Changes** are any modifications of the design of the Plan, which have affected benefits already accrued. Since most of the changes to the System's plan affect only future benefits

the impact has been negligible during this period, but were about $0.4 billion in the current year.

- **Liability (G)/L** are the changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.). These were generally small and had a net effect of decreasing the UAL by $1.0 billion during this period.

- **AVA (Actuarial Value of Assets) Investment (G)/L** is the net investment gain or loss due to assets earning more or less than assumed. These have increased the UAL over this period by $1.3 billion.

The chart below shows the changes in UAL each year broken into these five components. The sum of all the components total change in UAL is shown as the black line and values in the chart.




| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Contributions | 0.47 | 0.75 | 0.72 | 0.66 | 0.58 | 0.74 | 0.61 | 0.93 | 0.81 | 0.44 | $ 6.71 |
| Assumptions | 2.61 | 0.55 | - | - | 2.92 | - | 3.82 | - | (0.21) | (0.29) | $ 9.39 |
| Investments | 0.89 | 0.48 | 0.53 | 0.43 | (0.51) | (0.46) | 0.08 | (0.16) | (0.10) | 0.16 | $ 1.35 |
| Plan Changes | - | - | - | - | - | - | - | - | - | (0.40) | $ (0.40) |
| Liabilities | 0.08 | 0.10 | 0.13 | 0.14 | 0.38 | (0.49) | (0.64) | (0.51) | (0.19) | (0.05) | $ (1.04) |
| **Total** | **$ 4.05** | **$ 1.89** | **$ 1.38** | **$ 1.23** | **$ 3.37** | **$ (0.21)** | **$ 3.88** | **$ 0.26** | **$ 0.31** | **$ (0.15)** | **$ 16.00** |

Source: Cheiron analysis of funding adequacy.

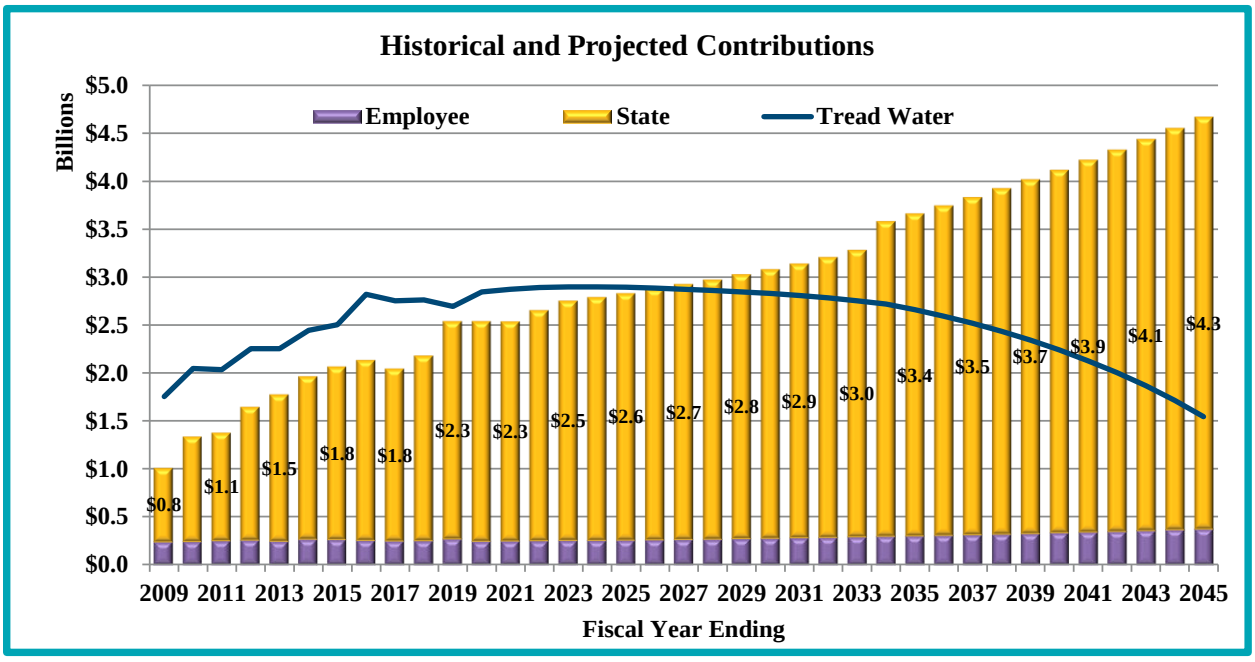
We expect that this chart will help stakeholders understand the sources of growth in the UAL over the past decade and inform discussions about the current funding requirements and adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

### Actual Contributions Compared to Tread Water Contribution

One of the persistent sources of the increase in UAL is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the UAL from increasing if all assumptions are met). These contribution deficiencies have added between $500 to $900 million to the UAL each year.

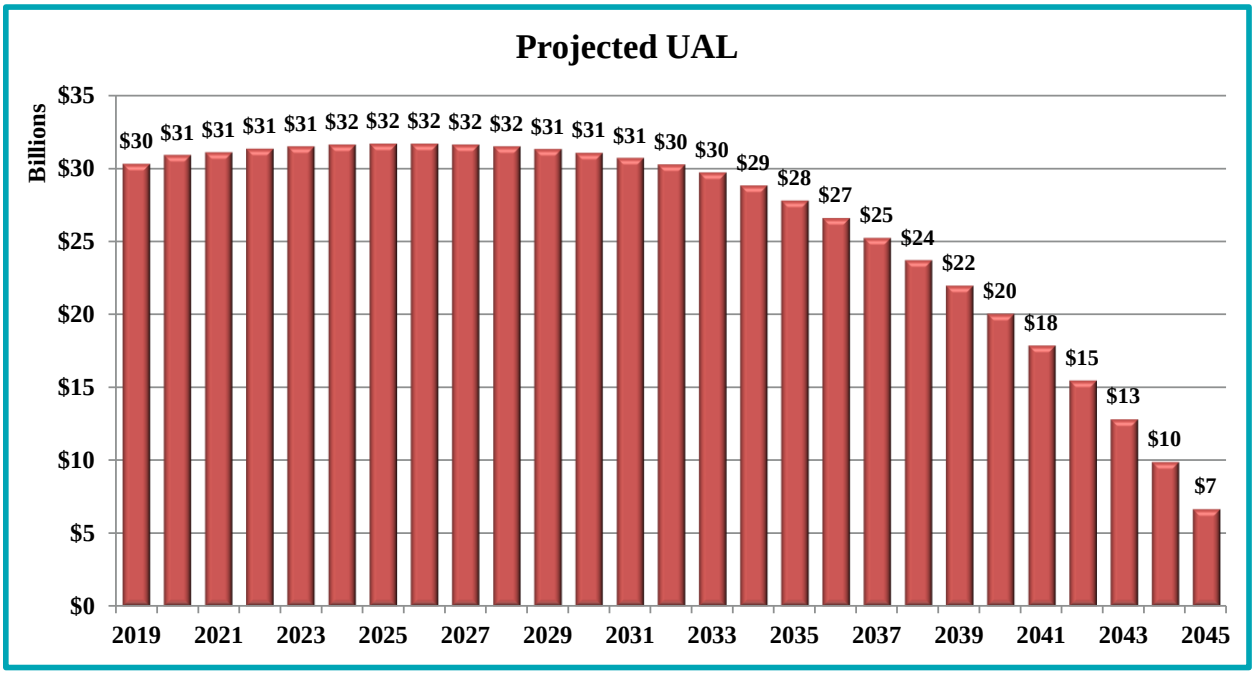
As the chart below shows, actual contributions have been significantly less than the tread water cost, and this trend is projected to continue for several years into the future. Each year that total contributions remain below the tread water cost (blue line), the UAL is expected to grow. As shown in the graph below the contributions from the State will need to increase significantly before the total contribution reaches the tread water contribution and begins to pay down the UAL.




Source: Cheiron analysis of funding adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

The next chart shows that if the Minimum Required Contributions continue to be made each year and all other assumptions are met, the UAL is projected to grow from $30 billion in 2019 to $32 billion in 2026 before contributions are sufficient to start paying the UAL down. Note that the UAL is not projected to get below its current level until 2032.



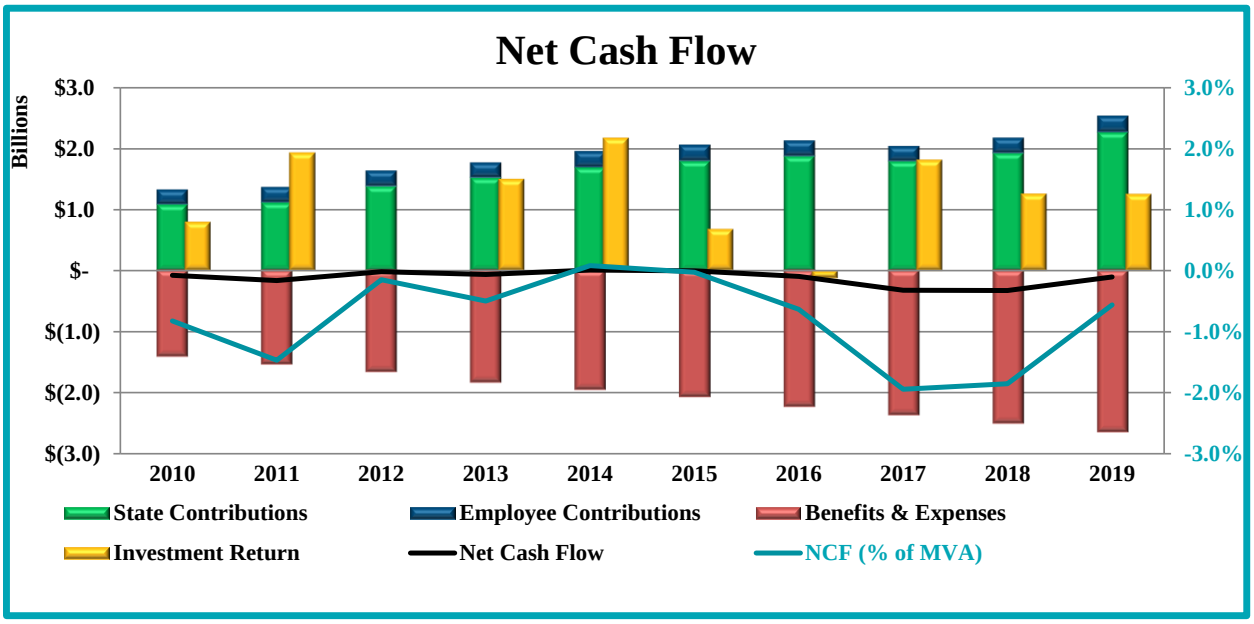

Source: Cheiron analysis of funding adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

# Net Cash Flow Analysis

The plan's net cash flow is defined as State and Member contributions less benefit payments and administrative expenses. The more negative net cash flow is as a percentage of the plan's assets, the more vulnerable the plan is to market downturns. When a pension plan has more payouts than contributions and suffers an investment loss, it is left with fewer assets to invest and recapture during a recovery.

Looking at the chart below, SERS has mildly negative net cash flow (black line). If contributions increase as quickly as benefit payments, the net cash flow will remain stable. But if contributions do not continue to grow either because the plan has become better funded or because the expected contributions are not made, negative net cash flow may become a more significant issue, therefore it should continue to be monitored. The teal line shows net cash flow as a percent of Market Value of Assets on the right side axis. The greater the negative cash flows are relative to plan assets the more vulnerable a plan is to market downturns. This is because once there is a market downturn, the plan assets lose both on the return and the negative cash flow, leaving it with a lower asset base from which to recover from the loss.




Source: Cheiron analysis of funding adequacy

## STATUS OF RECOMMENDATIONS FROM THE 2018 STATE ACTUARY'S REPORT

## Response to Recommendations in 2018

In the State Actuary's Preliminary Report on the State Employees' Retirement System of Illinois presented December 19, 2018, 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, 2019 Actuarial Valuation.

| Recommendations to Retirement System from 2018 State Actuary Report | Status | Comments |
|---|---|---|
| 1. We recommend that the SERS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary. | **Not Implemented** | While the December 11, 2018 State Actuary Response states the SERS Board of Trustees and management will discuss the need for a full scope actuarial audit prior to the 2019 valuation, we were provided no evidence that a discussion took place.<br><br>**Recommendation repeated.** |
| 2. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SERS. Continuing the practice of underfunding future accruals such that the unfunded liability is expected to continue to grow and targeting a funded percentage less than 100% 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.<br><br>GRS continues to include strong language throughout their report recommending the use of an actuarially sound method and stating clearly that the statutory method is not actuarially sound. We find these statements to be appropriate and support their continuation.<br><br>**Recommendation repeated.** |
| 3. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In | **Implemented** | SERS added stress testing in appendices to the final Actuarial Valuation Report in a letter dated December 19, 2018.<br><br>**Recommendation continued.** |

## STATUS OF RECOMMENDATIONS FROM THE 2018 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2018 State Actuary Report | Status | Comments |
|---|---|---|
| particular, the tests should demonstrate whether or not there is a potential for unsustainable costs during the statutory funding period. GRS did include stress testing in last year's final report, but did not include such stress testing in this year's draft report, or in any supplemental report. We recommend that stress testing be added into this year's report. Because the public may only look to the valuation report for this type of information, we believe it should be contained here instead of any supplemental document to the Board that may potentially be overlooked. | | |
| 4. We recommend the SERS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation. | **Implemented** | This review has been performed, evidenced through the *2018 Actuarial Experience Study* dated June 17, 2019.<br><br>We will continue to include this recommendation each year.<br><br>**Recommendation continued.** |

**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 3, 2019. The preliminary report was based on Cheiron's review of actuarial assumptions included in JRS' 2019 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the Judges' Retirement System. JRS' written response, provided on December 13, 2019, can be found in Appendix C.

**OVERVIEW**
**JUDGES' RETIREMENT SYSTEM**
as of June 30, 2019

| | |
|---|---|
| Actuarial accrued liability | $2,793,016,352 |
| Actuarial value of assets | $1,068,739,561 |
| Unfunded liability | $1,724,276,791 |
| Funded ratio | 38.3% |
| | |
| Employer normal cost | $35,869,092 |
| State contribution (FY21) | $148,618,000 |
| | |
| Active members | 956 |
| Inactive members | 26 |
| Current benefit recipients | 1,262 |
| Total membership | 2,244 |
| | |
| Interest rate assumption | 6.50% |
| Inflation assumption | 2.25% |
| Actuarial cost method | Projected Unit Credit |
| Asset valuation method | 5-year Smoothing |
| | |
| Executive Director | Tim Blair |
| Actuarial Firm | Gabriel, Roeder, Smith & Company |

Source: June 30, 2019 JRS actuarial valuation report.

December 17, 2019

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

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

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution to the Judges' Retirement System of Illinois (JRS or System) for Fiscal Year 2021.

**In summary, we believe that the assumptions and methods used in the draft June 30, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, 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 2021. Section III also includes comments on other issues impacting the funding of the Judges' Retirement System, including the implications of Article 18 of the Illinois Pension Code, which establishes the statutory minimum funding requirements for the System. **In our opinion, the statutory mandated minimum funding requirements are inadequate.** Section IV reviews the projections contained in the draft June 30, 2019 Actuarial Valuation. Finally, Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by JRS and GRS. This information includes actuarial assumptions and methods adopted by the JRS Board, System provisions, the draft June 30, 2019 Actuarial Valuation, the draft 2019 GASB 67/68 Report, the 2019 Valuation Results presentation, the 2018 Actuarial Experience Review, and minutes of the plan year 2019 JRS Board of Trustee meetings. A detailed description of all information provided for this review is contained in Appendix B.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. 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

Coralie A. Taylor, FSA, FCA, MAAA, EA
Consulting Actuary

SIGNED ORIGINAL ON FILE

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

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE 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) 2021. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the JRS Board to consider before finalizing its certification of the required State contributions for FY 2021.

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, 2019 Actuarial Valuation, the draft 2019 GASB 67/68 Report, the 2019 Actuarial Results presentation, the 2018 Actuarial Experience Review, and minutes of the plan year 2019 Board of Trustees meetings. The materials we reviewed are listed in Appendix B.

In addition to reviewing the Actuarial Certification of the required State contribution to JRS, the Act requires the State Actuary to conduct a review of the "actuarial practices" of the Board. While the term "actuarial practices" was not defined in the Act, we continue to interpret this language to mean that we review: (1) the use of a qualified actuary (as defined by the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2019 Actuarial Valuation.

# SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2019 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 2021 required State contribution calculated under the current statutory funding plan is $148,618,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based. As such, we have accepted GRS's annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

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

## State Mandated Funding Method

2. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of JRS. Continuing the practice of underfunding future accruals such that the unfunded liability is expected to continue to grow and targeting a funded percentage less than 100% increases the risk of the System becoming unsustainable. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

## Conformance to Statutory Funding Changes of Public Act 100-0023

*Recognition of Changes in Actuarial Assumptions*

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

## SECTION II – SUMMARY OF RECOMMENDATIONS

The Act requires that the impact of assumption changes "be implemented in equal annual amounts over a five-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution." This amount is then implemented "at the resulting annual rate in each of the remaining fiscal years in that five-year period." GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of payroll and reflecting one-fifth of that percentage change each year over five years. The method used by GRS will result in the cost impact due to assumption changes being recognized as varying dollar amounts. This is because the recognition as an equal percentage of pay gets applied to a changing payroll over a five-year period.

### Assessment of Actuarial Assumptions Used in the 2019 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, 2019 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

### Recommended Additional Disclosures for the 2019 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 illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made. GRS did include stress testing in last year's final report, but did not include such stress testing in this year's draft report or in any supplemental report.

### 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.

A new Actuarial Standard of Practice became effective for this valuation on the Assessment and Disclosure of Risk (ASOP 51). GRS made a good faith effort to comply with the new requirements, but the risk section in the valuation report (see pages 14, 15, and 16) could be improved to better comply with the new requirements.

5. For future risk disclosure we recommend:
   - An assessment should be provided for each risk that is identified by GRS.
   - An explanation should be provided as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified by GRS.

## SECTION II – SUMMARY OF RECOMMENDATIONS

- Historical values that are significant to understanding the risks identified by GRS should be disclosed along with an explanation of how they help the reader understand the risks identified by GRS.

### GASB 67 and 68

The 2019 JRS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2019 JRS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

# 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 the required State contribution, reviewed the assumptions on which it is based, and accepted GRS's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

Given the size of JRS, the System's low funded ratio, the recent changes in legal requirements, and guidance issued by the Government Finance Officers Association, we are recommending again that the Board periodically undertake a full scope actuarial audit, utilizing the services of a reviewing actuary. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary. Results are compared in a detailed fashion to measure the liabilities for each benefit form and feature. A replication audit will uncover any potential problems in the processing and certification of valuation results. This recommendation was first made to JRS in our 2014 report. JRS has responded in the past that it would complete a full scope actuarial audit if budgetary resources allow. The response to last year's report stated that the JRS Board of Trustees and management would discuss the need for a full scope actuarial audit prior to the next valuation. We were provided no evidence that a discussion took place.

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

## State Mandated Funding Method

The Illinois Pension Code (40 ILCS 5/18-131) establishes a method that does not adequately fund the System. This law requires the actuary to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the actuarial accrued liability in the year 2045 if all assumptions are met. This contribution level does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the actuarial accrued liability, not 90%. In addition, the State mandated method produces a contribution that results in an increase in the unfunded actuarial liabilities over the next decade if all assumptions are met.

**We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of JRS** (Recommendation #2). The funding method should target 100% of the actuarial accrued liability, and contributions should ramp up as quickly as possible to a level that is expected to prevent the unfunded actuarial accrued

liability from growing. Continuing the practice of underfunding the System increases the risk of needing even larger contributions in the future that may make the System unsustainable.

We have reviewed the funding policy adopted by the Board of Trustees. We agree that the policy is a reasonable method that conforms to the Actuarial Standards of Practice, and we agree with its use in the GASB report as an Actuarially Determined Contribution (ADC). The funding policy calls for a funding amount equal to the normal cost plus a closed 25-year amortization as a level percentage of capped payroll of the Unfunded Actuarial Liability. This policy defines a method that would ultimately fully fund the plan and falls within generally accepted actuarial funding methods currently in use for public plans. As of June 30, 2019, the remaining amortization period is 21 years. According to this methodology, the State's contribution amount would be $173,205,430 for FY 2021. It is important though to recognize that this change does not affect the actual funding of the System. The board adopted funding policy conforms to a goal of full funding within a reasonable time period and with generally accepted actuarial principles and practices.

Based on the draft June 30, 2019 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 38.26%. The unfunded actuarial accrued liability is currently about $1.7 billion and is expected to increase slightly before contributions start to reduce it. The required State contribution rate is currently 91.85% of payroll and is scheduled to increase to 95.87% of payroll. However, if there is a significant market downturn, the unfunded actuarial liability could increase substantially and the required State contribution rate could increase significantly, putting the sustainability of the system further into question. Stress testing should be performed to better understand these risks and the potential advantages of additional contributions in the near term to maintain the sustainability of the system.

**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 illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made** (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 System look to for assessing the System's financial conditions. Supplemental reports, such as the stress testing report GRS provided separately for the prior valuation, may not be publicly identified, and therefore not readily accessible.

As mentioned in Section II, a new Actuarial Standard of Practice (ASOP) has been introduced, ASOP 51, and is effective for JRS actuarial valuation starting June 30, 2019. ASOP 51 provides guidance to actuaries on the assessment and disclosure of risks to help readers of the actuarial

## SECTION III – SUPPORTING ANALYSIS

valuation report "*understand the effects of future experience differing from the assumptions used*" and "*the potential volatility of future measurements resulting from such differences*".

ASOP 51's first requirement is to "*identify risks that, in the actuary's professional judgment, may reasonably be anticipated to significantly affect the plan's future financial condition.*" GRS identified six sources of risk to JRS: investment risk, asset/liability mismatch risk, contribution risk, salary and payroll risk, longevity risk and other demographic risks. With the exception of the contribution risk due to the statutorily-required amount of contributions, the risks JRS identified are relatively generic and would apply to most pension plans. We believe JRS should stress the net cash flow situation as that is expected to become a problem in the future.

ASOP 51 requires the actuary to assess each of the risks identified. While the assessment does not have to be quantitative, it does have to take into account the specifics of the individual plan. ASOP 51 also describes several quantitative methods that may be used to assess risk.

- Investment Risk. GRS describes the impact of a variation in the investment return in the next year from the assumed rate, but do not provide any additional assessment.

- Asset/Liability Mismatch Risk. GRS does not appear to provide an assessment of asset/liability mismatch risk other than to indicate that asset value changes that do not match liability changes will either increase or decrease costs.

- Contribution Risk. GRS discusses several issues with the statutorily-required contribution amounts in the risk section as well as in other parts of the valuation report. It would be useful to reference the other analyses of contribution risk that are in the report in the risk section.

- Salary and Payroll Risk. GRS does not appear to provide an assessment of salary and payroll risk other than to indicate that experience that differs from the assumptions will either increase or decrease costs.

- Longevity Risk. GRS does not appear to provide an assessment of longevity risk other than to indicate that experience that differs from the assumptions will either increase or decrease costs.

- Other Demographic Risk. GRS provides an explanation of demographic risks, but does not appear to provide any assessment of these risks.

ASOP 51 requires the actuary to recommend a more detailed assessment of risks if it *"would be significantly beneficial."* GRS adequately identified the primary drivers of these risks, provided background information and assessments about these identified risks, but did not in our opinion adequately communicate the significance of these risks to this plan. That could have been achieved if GRS included additional stress testing in the report. GRS indicated that an additional

risk assessment was performed. However, there is no communication about the findings from the additional risk assessment or any indication of where to find the additional risk assessment.

ASOP 51 requires the actuary to *"calculate and disclose plan maturity measures that … are significant to understanding the risks associated with the plan."* GRS calculates the current and prior year actives to annuitant ratio and the net cash flow, but there is no explanation of how these measures help to understand any of the risks identified. There are also other maturity measures, such as the assets to payroll ratio and the actuarial liability to payroll ratio that provide significant information about the potential effects of investment risk and demographic risk. GRS discusses the importance of monitoring the continued maturation of the plan, but does not provide any projections of any of these maturity measures even though they are all readily available given the projections required to determine the statutory contribution amounts.

ASOP 51 Section 3.8 says the actuary *"should identify and disclose relevant historical values of the plan's actuarial measurements"* if they are reasonably available and are significant to the risks identified. JRS historical values are readily available for funding status and plan maturity measures. We believe adding historical values and commentary about the trends shown would enhance the understanding of risks within the plan. For example, showing how the historical Ratio of Actuarial Accrued Liability to Covered Payroll has changed over the past 10 years would give insight into how the maturity of JRS is changing and therefore how the sensitivity to risks may be changing.

**Thus, we recommend that an assessment be provided for each risk that is identified by GRS, that an explanation be provided as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified, and that historical values that are significant to understanding the risks identified be disclosed along with an explanation of how they help the reader understand the risks identified by GRS.** (Recommendation #5).

## Conformance to Statutory Funding Changes of Public Act 100-0023

*Recognition of Changes in Actuarial Assumptions*

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a five-year period. This phase-in provides time to adjust to a higher level of contributions. However, for a System in which the unfunded liability is already expected to continue to grow for several more years such delays allow the unfunded liability to increase even more, adding additional risks to the System.

Public Act 100-0023 states:

*A change in an actuarial or investment assumption that increases or decreases the required State contribution and first applies in State fiscal year 2018 or thereafter shall be implemented in*

## SECTION III – SUPPORTING ANALYSIS

*equal annual amounts over a 5-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution.*

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

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

GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of expected 2019 payroll, and reflecting one-fifth of that percentage change over five years. In the draft 2019 Actuarial Valuation report there is a demonstration of the dollar amounts to be smoothed as a result of the assumption changes as disclosed in the 2013, 2016, and 2018 actuarial valuation reports and the calculation of the annual rate change based on the appropriate payroll. This rate adjustment is then recognized over a five-year period as an adjustment to the contribution rate that would otherwise be required from the State. The method used by GRS will result in the cost impact due to assumption changes being recognized as increasing dollar amounts. This is because the recognition as an equal percentage of pay gets applied to an increasing payroll over a five-year period.

# SECTION III – SUPPORTING ANALYSIS

## Assessment of Actuarial Assumptions Used in the 2019 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 reduced from 6.75% to 6.50% for the draft June 30, 2019 Actuarial Valuation.

**After reviewing all the materials (see Appendix B of this report) that were made available, Cheiron concludes that reducing the interest rate to 6.50% 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)**.**

*The items we considered and our rationale for this recommendation are 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 July 16, 2019 report on the 2018 Actuarial Experience Study, they presented the opinions of three independent investment consultants on the future expected earnings of the System and concluded that, adjusting for GRS's assumed rate of inflation, the 20-year expected geometric mean of the JRS portfolio is 6.71% (See Page C-9 of the 2018 Actuarial Experience Study). They also presented the distribution of the 20-year average geometric net nominal return for these three consultants. This showed that JRS has a 53.03% chance of meeting or exceeding the reduced 6.50% assumption (See the sixth column, bottom row). This supports the Board reducing this assumption for the current valuation.

## SECTION III – SUPPORTING ANALYSIS

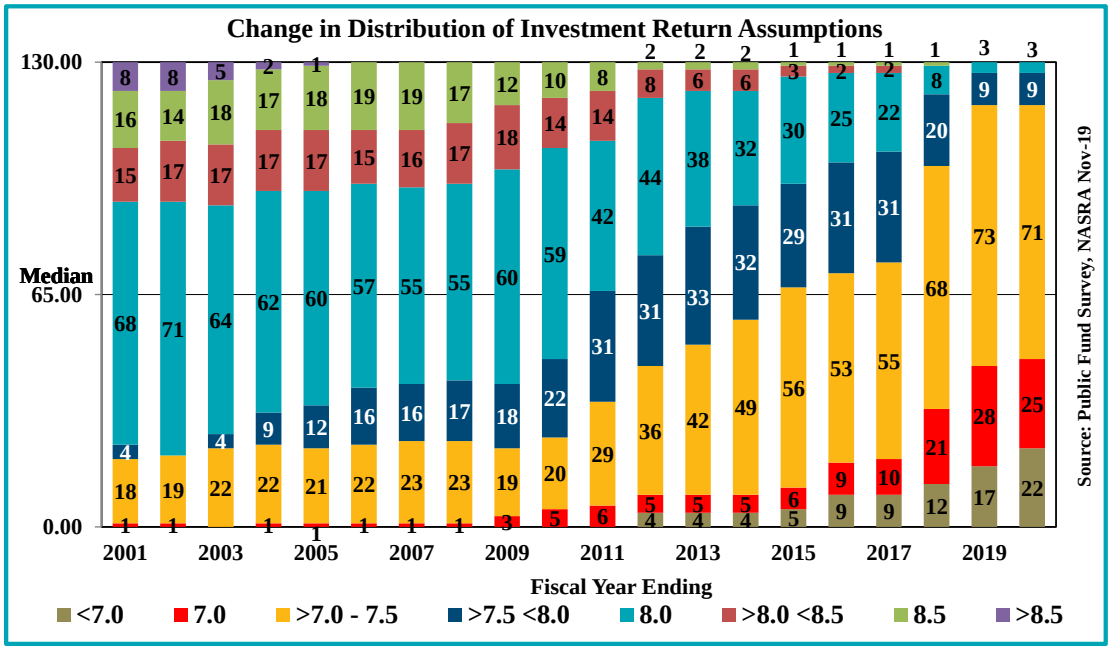
Distribution of 20-year Average Geometric Net Nominal Return

| Investment Consultant | Distribution of 20-Year Average Geometric Net Nominal Return 40th | 50th | 60th | Probability of exceeding 6.75% | Probability of exceeding 6.50% | Probability of exceeding 6.25% |
|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1 | 5.84% | 6.49% | 7.14% | 45.90% | 49.78% | 53.68% |
| 2 | 6.21% | 6.89% | 7.58% | 52.09% | 55.76% | 59.40% |
| 3 | 6.04% | 6.75% | 7.47% | 50.02% | 53.54% | 57.04% |
| **Average** | **6.03%** | **6.71%** | **7.40%** | **49.34%** | **53.03%** | **56.71%** |

- GRS's July 16, 2019 2018 Actuarial Experience report also presented the expectation of the Illinois State Board of Investment's investment consultant Meketa Investment Group. After adjusting for GRS's assumed rate of inflation, Meketa's expected 20-year geometric average return of the JRS portfolio is 7.06% (See page C-9 of the GRS 2018 Actuarial Experience Study). Based on the capital market assumptions provided by Meketa, JRS has a 57.68% chance of meeting or exceeding the reduced assumption of 6.50%. This supports the reasonableness of assuming a 6.50% interest rate for the current year.

- While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 130 large retirement plans. The following chart shows the distribution of discount rates for the Plans in the Public Plans Database since 2001. Historically, JRS has had higher discount rates in the past, but now the 6.50% assumption is below the median assumption. The latest data includes results collected through November 2019.

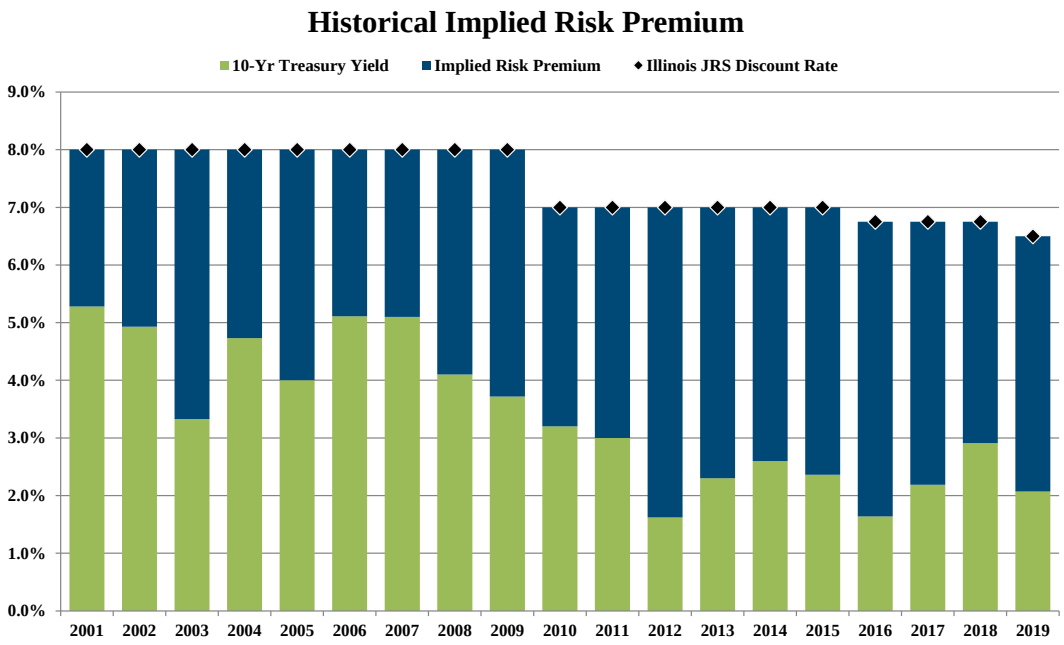
## SECTION III – SUPPORTING ANALYSIS




Over the period shown, there continues to be a pattern of reducing discount rates. Of the 130 plans shown for both 2019 and 2013, 114 have reduced their discount rate assumption since 2013. For these 114 plans, the average reduction is 0.57%. The data is consistent with the experience of other Cheiron clients, which have generally shown a significant trend of reducing their discount rate assumptions over the last several years.

- Declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, as shown in the chart on the following page, in 2001 the yield on 10-year Treasury bonds (a proxy for a risk free investment) was 5.3%. To achieve JRS' assumed return of 8.0%, the System's investments had to outperform the yield on the 10-year Treasury by 2.7%. As of June 2019, the yield on the 10-year Treasury is now 2.1%, and to achieve JRS' assumed return of 6.5%, the System's investments need to exceed the 10-year Treasury yield by 4.4%. So, even though JRS reduced its assumption by 150 basis points, it still has to take more investment risk in 2019 to meet its assumption than it did in 2001. 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.

## SECTION III – SUPPORTING ANALYSIS




- JRS has experienced a slightly negative cash flow for FY 2019 (contribution income less benefits and expense payouts). The negative cash flow of JRS is currently -0.38% of assets. Negative cash flow is expected to grow in the coming years as shown in the graph on page 11 and table 4d of the draft 2019 Actuarial Valuation. When short-term returns are expected to be lower than the long-term expectations, which is the current case with JRS, a plan with negative cash flows will have actuarial returns (i.e., dollar-weighted returns) that are less than their "time-weighted" returns.

2. *Inflation Assumption*

**We find that lowering the inflation assumption from 2.50% to 2.25%, which primarily impacts the salary increase assumption, for the draft June 30, 2019 Actuarial Valuation is reasonable.**

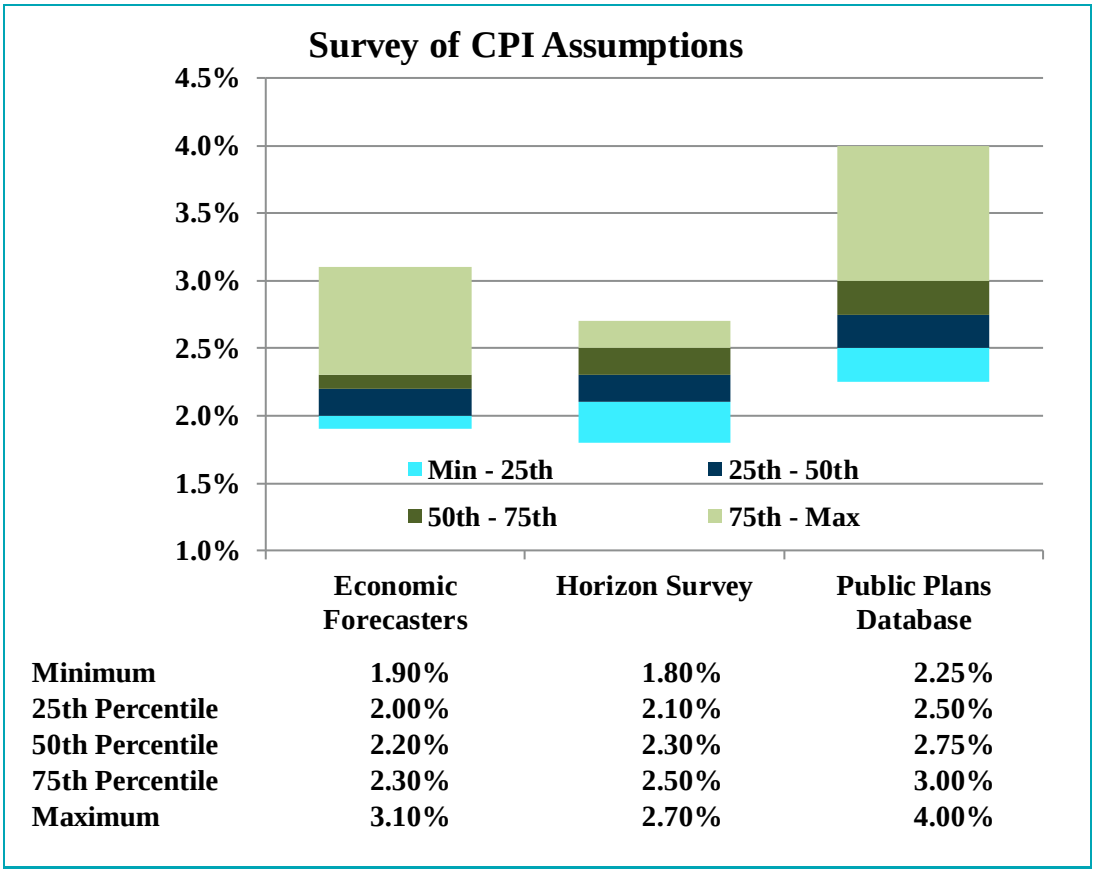
*Our rationale for concurring with the 2.25% assumption:*

- GRS's July 16, 2019 report on the 2018 Actuarial Experience Review included a survey of the inflation assumptions of eleven independent investment consultants with a shorter time horizon and three with a longer time horizon. GRS found they ranged from 1.95% to 2.75%, with an average of 2.20% for short term and 2.42% in the long term.

- The April 2019 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), inflation will average between

2.0% and 3.2% (https://www.ssa.gov/OACT/TR/2019/tr2019.pdf). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.6%.

- The chart below shows the distribution of inflation expectations for the Third Quarter 2019 survey of professional economic forecasters published by the Philadelphia Federal Reserve, the 2019 Horizon survey of investment consultant capital market assumptions (20-year), and the 2018 inflation assumptions used by plans in the Public Plans Database. The assumption of 2.25% is near the middle of the range projected by professional economic forecasters and investment consultants, and is on the low end of the range used by other public plans.




| | Economic Forecasters | Horizon Survey | Public Plans Database |
|---|---|---|---|
| Minimum | 1.90% | 1.80% | 2.25% |
| 25th Percentile | 2.00% | 2.10% | 2.50% |
| 50th Percentile | 2.20% | 2.30% | 2.75% |
| 75th Percentile | 2.30% | 2.50% | 3.00% |
| Maximum | 3.10% | 2.70% | 4.00% |

## SECTION III – SUPPORTING ANALYSIS

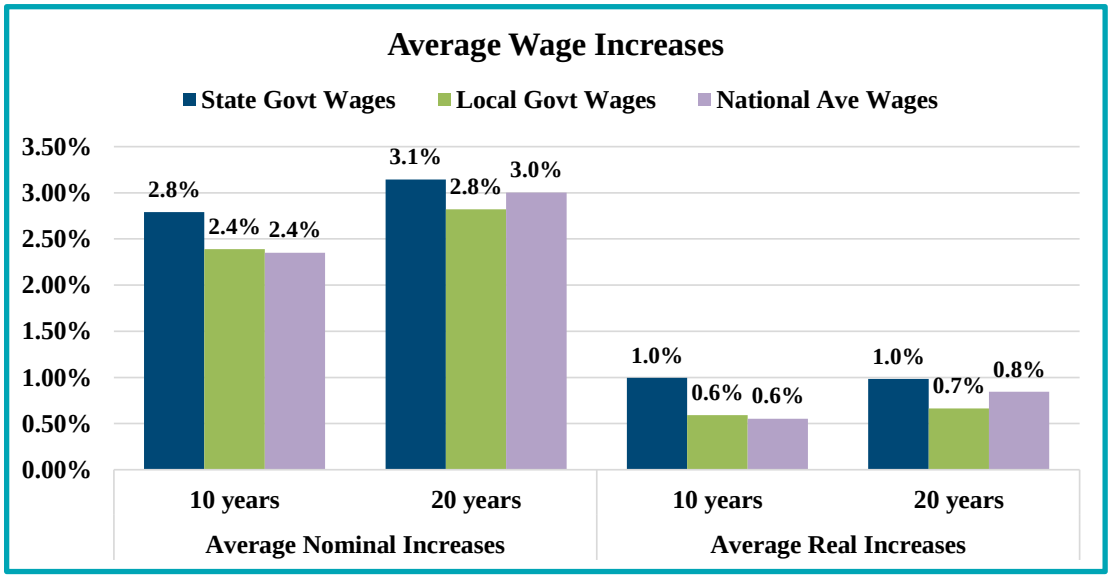
*3. Salary (Annual Compensation) Increase Assumption*

The salary increase assumption for uncapped payroll is 2.50% per year, compounded annually for all active members, regardless of age or service. It includes components of 2.25% per annum for inflation and 0.25% per annum for productivity.

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

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

- The chart below shows the average nominal and real increases in wages over the last 10 and 20 years for State governments, local governments, and National Average Wages. State and local government data is from the Quarterly Census of Employment and Wages as published by the Bureau of Labor Statistics. National Average Wages is published by the Social Security Administration.




- The April 2019 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (between 2028 and 2093) real wage differential will average somewhere between 0.60% and 1.84%.

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

## SECTION III – SUPPORTING ANALYSIS

4. *Cost of Living Adjustment Assumption*

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

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

5. *Capped Pay Assumption*

The Tier 2 capped payroll growth is 2.25% per year, compounded annually, which is the inflation assumption.

**We find the assumption reasonable.**

6. *Expenses*

Expenses are expected to increase with the projected capped payroll at 2.25% and are included in the service cost.

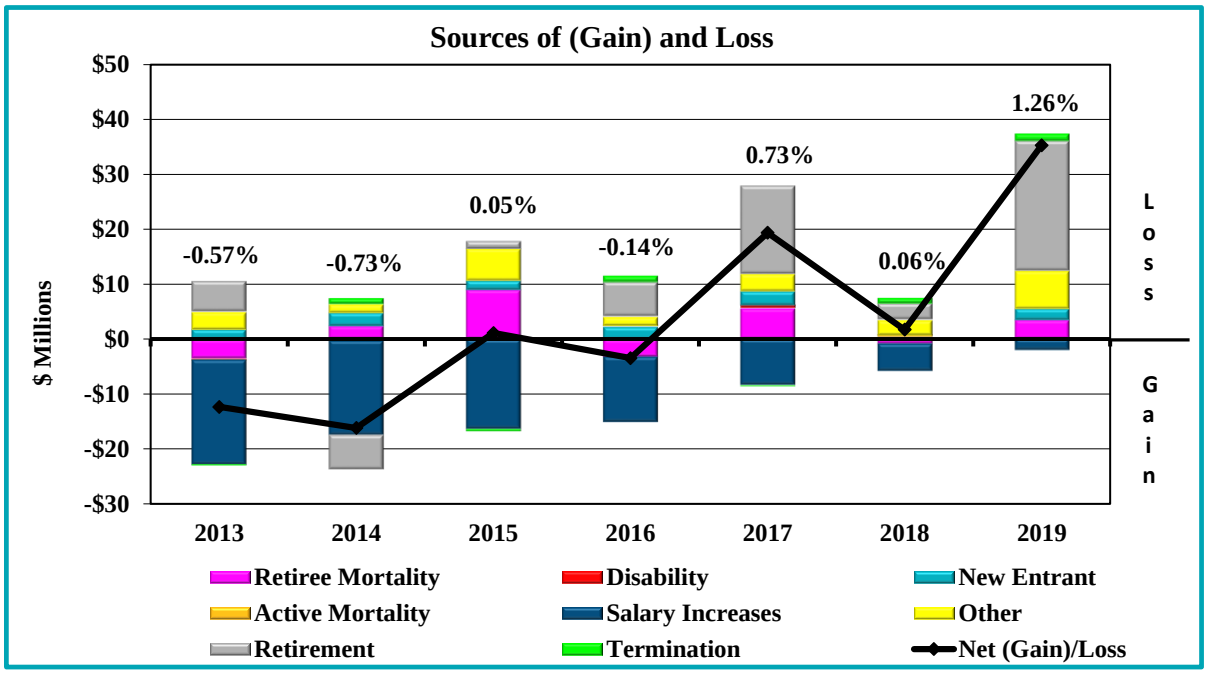
**We find the assumption reasonable.**

## SECTION III – SUPPORTING ANALYSIS

### B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2019 Actuarial Valuation, these are shown on page 20. In the chart below, we have collected similar data from past valuation reports dating back to 2013 and use these to present a historical review of past demographic and salary increase experience gains and losses.

The following chart 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, it represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, it represents an experience gain for that year with liabilities less than expected. The net liability (gains)/losses are shown by the black line. This net (gain)/loss as a percent of liability is shown above the bars.




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

Key observations from this chart are as follows:

1. There has been a gain due to salary for each of the last seven years. However, as we discussed in the salary assumption section, this is likely to be a reflection of the general economic environment rather than a problem with the long-term assumption.

2. Retiree mortality and termination have both been volatile over recent years.

## SECTION III – SUPPORTING ANALYSIS

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

### 1. Mortality

*Post-Retirement Mortality*

The mortality basis was updated with the June 30, 2019 Actuarial Valuation and is based on the Pub-2010 Above-Median Income General Healthy Retiree Mortality tables, sex distinct, with scaling factors of 102 percent for males and 98 percent for females, with generational mortality improvement using the MP-2018 two-dimensional mortality improvement scales.

*Pre-Retirement Mortality*

The mortality basis was updated with the June 30, 2019 Actuarial Valuation and is based on the Pub-2010 Above-Median Income General Employee Mortality tables, sex distinct, with scaling factors of 99 percent for males and females, and with generational mortality improvement using the MP-2018 two-dimensional mortality improvement scales.

### 2. Termination

Overall termination rates were decreased based on the 2018 Actuarial Experience Study for valuations beginning with the June 30, 2019 Actuarial Valuation.

Illustrative rates of withdrawal from the plan are as follows:

| | Termination Rates | |
|---|---|---|
| | **Males** | **Females** |
| 30 | 0.0129 | 0.0162 |
| 35 | 0.0124 | 0.0162 |
| 40 | 0.0108 | 0.0162 |
| 45 | 0.0095 | 0.0162 |
| 50 | 0.0083 | 0.0158 |
| 55 | 0.0071 | 0.0092 |
| 60 | 0.0059 | 0.0074 |
| 65 | 0.0047 | 0.0057 |

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.

## SECTION III – SUPPORTING ANALYSIS

### 3. Retirement

Overall retirement rates were decreased based on the 2018 Actuarial Experience Study for valuations beginning with the June 30, 2019 Actuarial Valuation.

Assumed retirement rates are as follows:

| Retirement Rates – Tier 1 | | |
|---|---|---|
| | **Males** | **Females** |
| 55-59 | 5.50% | 8.50% |
| 60 | 9.00% | 9.00% |
| 61-65 | 11.00% | 11.00% |
| 66-70 | 12.00% | 12.00% |
| 70-74 | 13.00% | 13.00% |
| 75-79 | 14.00% | 14.00% |
| 80+ | 100.00% | 100.00% |

| Retirement Rates – Tier 2 | |
|---|---|
| **Age** | **Male & Female** |
| 62 | 11.00% |
| 63 | 12.00% |
| 64 | 13.00% |
| 65 | 14.00% |
| 66 | 14.00% |
| 67 | 30.00% |
| 68-69 | 12.00% |
| 70 | 13.00% |
| 71 | 10.00% |
| 72 | 11.00% |
| 73 | 12.00% |
| 74 | 13.00% |
| 75-79 | 14.00% |
| 80 | 100.00% |

### 4. Disability

No assumption for disability was assumed.

### 5. Spouse's Age

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

## SECTION III – SUPPORTING ANALYSIS

### 6. New Entrants

The new entrant profile includes uncapped and capped salary information. New entrants are assumed to enter with an average age of 47.44, average uncapped pay of $199,596, average capped pay of $122,547, and with 67.29% male. The size of the active group is assumed to remain level at the number of actives as of the valuation date. The average increase in uncapped payroll for the projection period is 2.50% per annum. The average increase in capped payroll for the projection period is 2.25% percent per year.

### 7. Decrement Timing

All decrements are assumed to occur beginning of year.

### 8. Decrement Relativity

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

### 9. Decrement Operation

Turnover decrements do not operate after member reaches retirement eligibility.

### 10. Eligibility Testing

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

### 11. Marriage Assumption

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

### 12. Employee Contribution Election

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

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

No explicit assumption is made with respect to these items.

# SECTION III – SUPPORTING ANALYSIS

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

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

## SECTION III – SUPPORTING ANALYSIS

### C. Funding Methods

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and (3) the amortization method.

*1. Actuarial Cost Method*

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

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

*2. Asset Valuation Method*

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

The 2018 Public Retirement Systems Study by the National Conference on Public Employee Retirement Systems (NCPERS) survey of 167 public retirement funds found that the majority of plans responding to the survey have a five-year smoothing period.

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

## SECTION III – SUPPORTING ANALYSIS

*3. Amortization Method*

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2045. While not a traditional amortization method, this methodology effectively amortizes a portion of the unfunded actuarial liability over the remaining period until 2045, which is currently 26 years.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be "a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period." Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

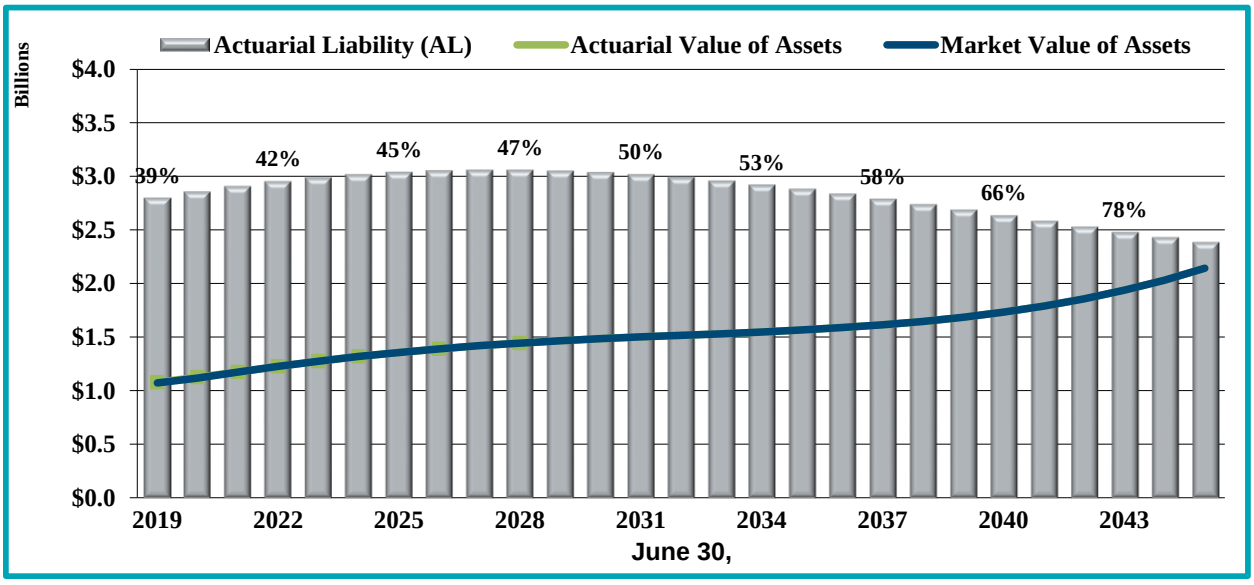
Typical public plan amortization methods are designed to increase each year by expected payroll growth. Under the State mandated method, however, the effective amortization payment increases each year by more than the expected growth in payroll. As a result, the State mandated method defers payments on the unfunded actuarial liability further into the future than under typical public plan amortization methods.

## SECTION IV – PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2019 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 projections performed by the State Actuary to verify that the System's funding projections are reasonable. They do not reflect all the precision of the projections applied by the System's actuary, but instead they are intended to verify the reasonableness of the modeling done by the System's actuary.

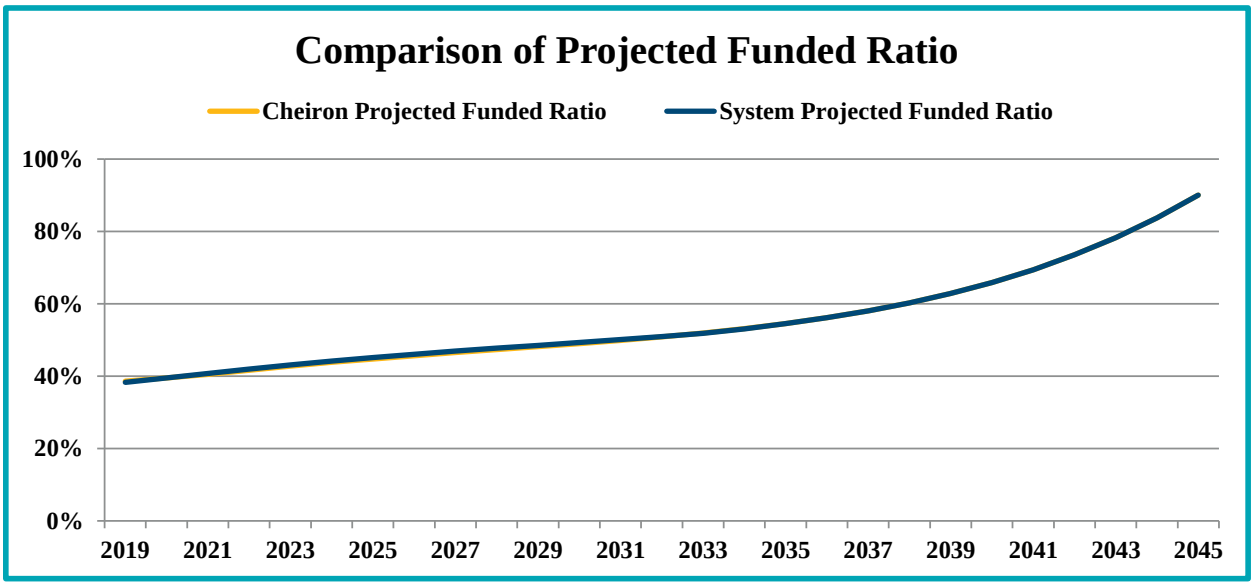
The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As pointed out on page 10 of the draft June 30, 2019 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projections. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio for each year is shown at the top of the graph. For example, in 2031, the funded ratio is projected to be approximately 50% with assets being approximately $1.5 billion and liabilities being approximately $3.0 billion.




Source: Cheiron projection analysis.

## SECTION IV – PROJECTION ANALYSIS

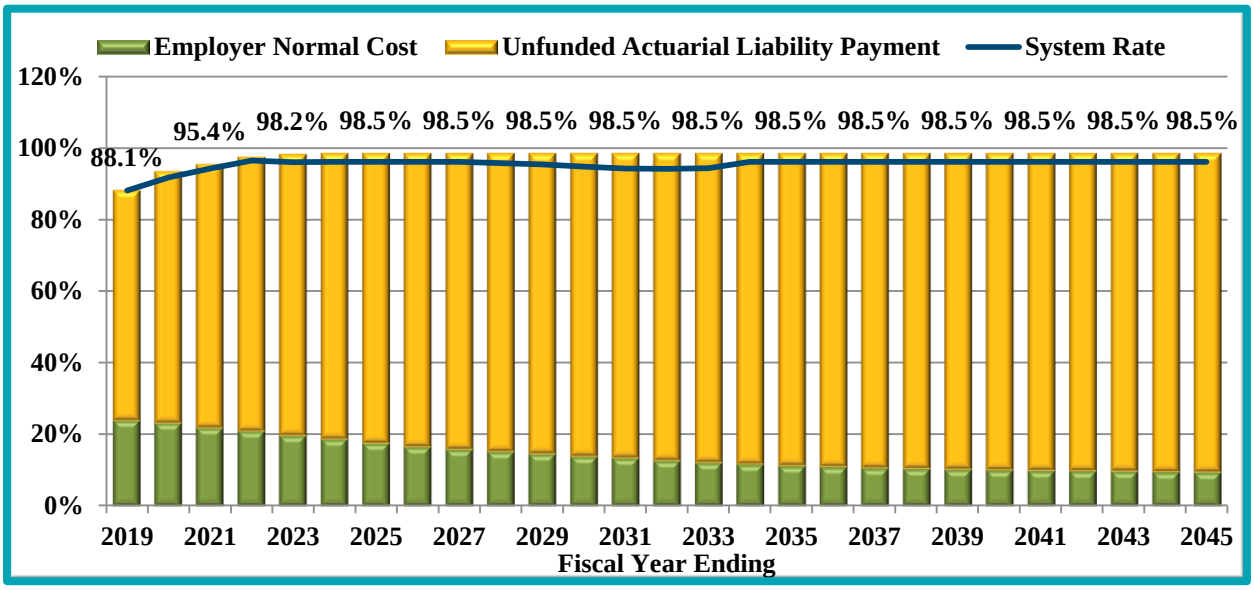
When we compare our projected funded ratio against the results shown in the draft June 30, 2019 Actuarial Valuation, **we find a close match in expected funded ratio**. This close match of the funded ratio indicates that the projections done by the System's actuary are reasonable.




Source: Cheiron projection analysis.

## SECTION IV – PROJECTION ANALYSIS

The following graph shows the expected contribution calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for the fiscal year ending 2020 was set based on the June 30, 2018 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2020 (Fiscal Year Ending June 30, 2021). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by participants not covered by employee contributions based on the statutory funding method; and 2) an amortization of the unfunded liability. The normal cost amounts are shown by the green bars and the amortization of the Unfunded Actuarial Liability (UAL) amounts by the yellow bars. The percentages shown are the total contribution rates calculated by Cheiron, which are equal to the sum of the bars. The graph shows that a larger percentage of the total contribution is being made toward the UAL payment later in the period. The blue line shows the projected contribution rates as percentages of payroll from the draft June 30, 2019 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.**

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

In this section, we examine the adequacy of the funding for the System, including funded status, the sources of changes in the Unfunded Actuarial Liability (UAL), and projections of the UAL and statutory funding requirements compared to contributions needed to pay down the UAL.

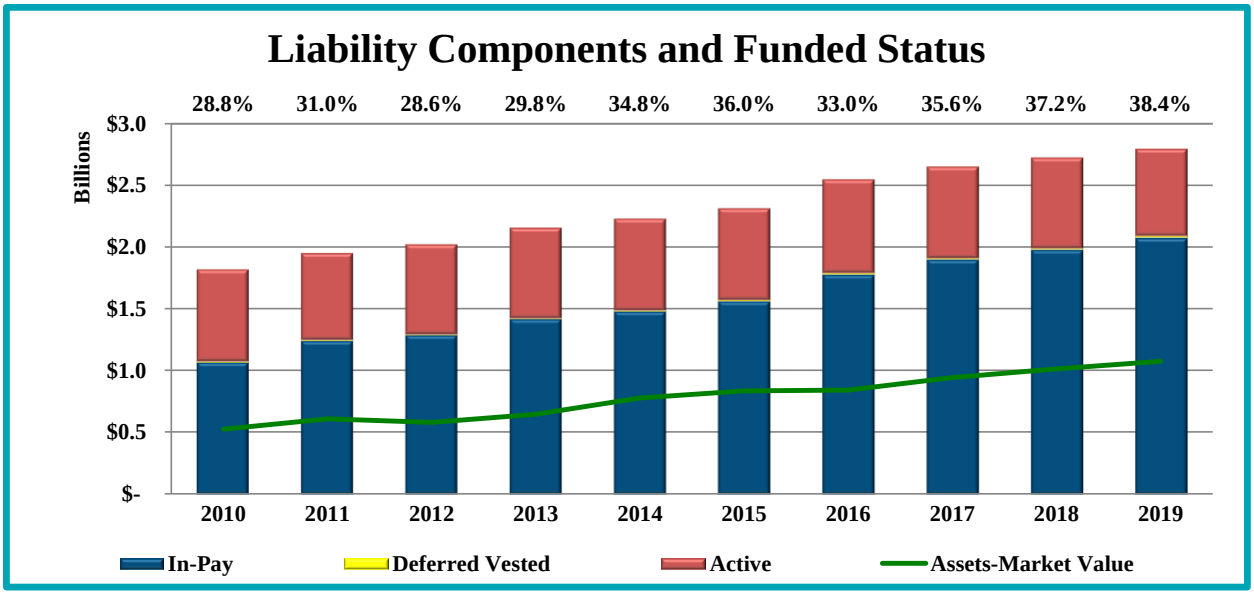
The actuarial valuation report prepared by GRS includes both traditional actuarial measurements, as well as additional risk measurements that are shown on pages 14 to 16 of the draft June 30, 2019 valuation report. Given the unique and substantial funding challenges faced by the Illinois pension systems, this additional information is quite important and supplements the information we present here on funding adequacy to better inform the legislature and other stakeholders about the adequacy of the System's funding.

### System Funded Status

The first funding adequacy measure is the historical trend of the System's funded status for the past ten years. Funded status for this purpose is defined as the ratio of the Market Value of Assets to the Actuarial Liability. The chart below shows JRS' funded status since 2010 has gone from 28.8% funded to 38.4% funded in 2019, an increase in funded status of 9.6%. In addition to showing the funded status, this chart also shows the breakdown of the Plan's liabilities by membership status:

- Active liability – the liability (attributable to service already performed) for future payments to members who are currently working in the System,
- Deferred Vested liability – the liability for future payments to members who are no longer working in the System, and
- In-Pay liability – the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown shows that today plan assets only cover about 50% of the liabilities for just those members currently in-pay status.

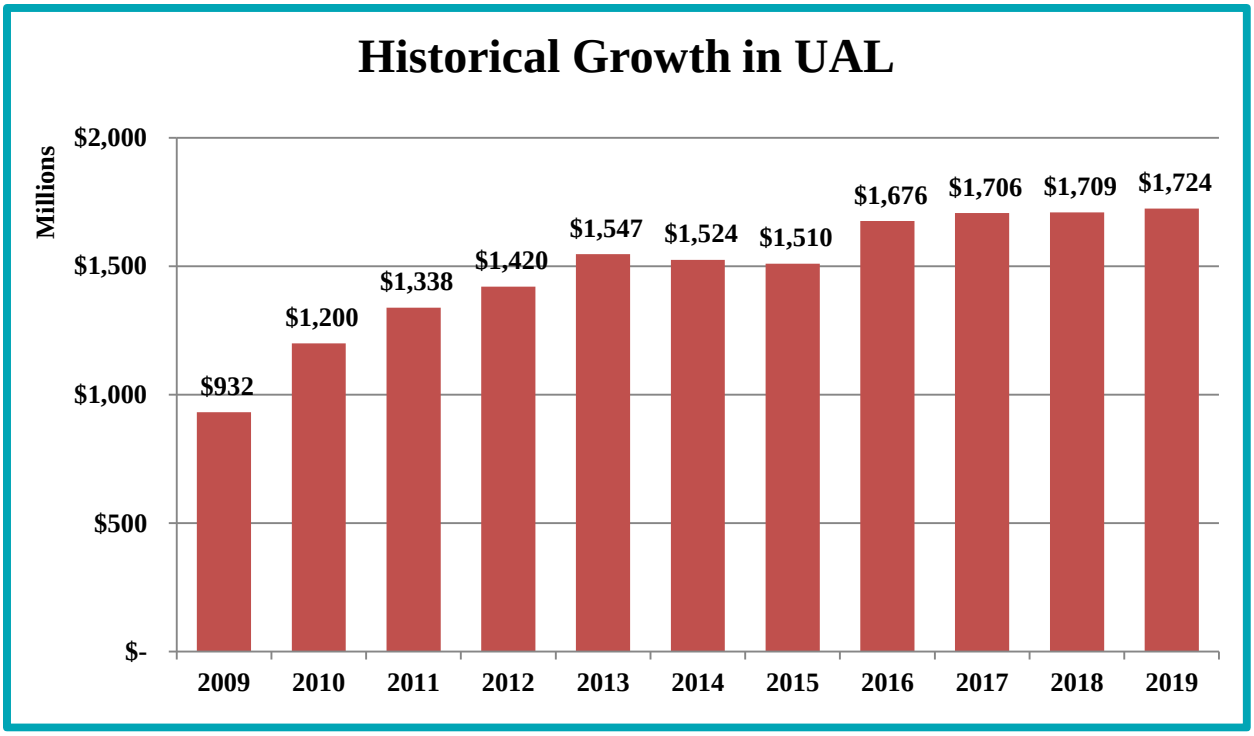



Source: Cheiron analysis of funding adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

### Sources of Changes in the UAL

As shown in the chart below, JRS' Unfunded Actuarial Liability (UAL) has grown from about $932 million in 2009 to $1.72 billion in 2019, an increase of about $792 million. In order to understand how to reverse this trend, it is important to understand the sources contributing to it.




Source: Cheiron analysis of funding adequacy.

The changes to the UAL from June 30, 2009 to June 30, 2019 can be separated into the following components:

- **Contribution Deficiencies** – Contributions that are less than the tread water contribution cause the UAL to increase. The tread water contribution consists of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the Unfunded Actuarial Liability. This sum is referred to as the tread water contribution because it is the contribution necessary so that the UAL will remain constant, or "tread water" (absent experience gains or losses). The difference between actual contributions and the tread water contributions increased the UAL by $324 million over this period.

- **Assumption Changes** – Changes to actuarial assumptions over this period increased the UAL by $374 million. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations.

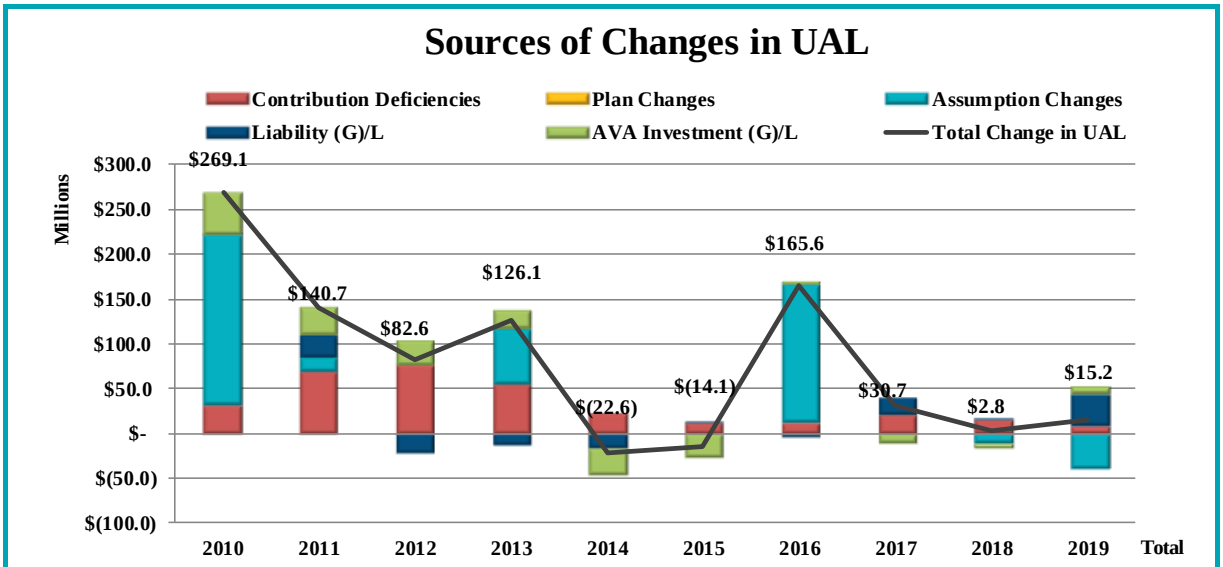
## SECTION V – ANALYSIS OF FUNDING ADEQUACY

- **Plan Changes** – Modifications to the design of the plan had a negligible impact over this period as most of the changes only affected future benefits.

- **Liability (Gain) or Loss** – The changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.) were generally small and only increased the UAL by
  $29 million over this period.

- **AVA (Actuarial Value of Assets) Investment (Gain) or Loss** – The net investment gain or loss due to assets earning more or less than assumed increased the UAL over this period increased the UAL by $69 million.

The chart below shows the changes in UAL each year broken into these five components. The sum of the total change in UAL from all the components for each year is shown as the black line with the labeled values in the chart.




| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Contributions | 31.8 | 68.9 | 75.2 | 54.4 | 22.5 | 11.8 | 13.0 | 20.8 | 16.1 | 9.5 | $ 324.1 |
| Assumptions | 188.9 | 15.6 | 1.2 | 62.9 | - | - | 153.2 | - | (9.6) | (37.7) | $ 374.5 |
| Investments | 48.2 | 31.5 | 27.5 | 21.2 | (28.9) | (26.9) | 2.9 | (9.5) | (5.4) | 8.1 | $ 68.7 |
| Plan Changes | - | - | - | - | - | - | - | - | - | - | $ - |
| Liabilities | 0.1 | 24.7 | (21.4) | (12.4) | (16.2) | 1.1 | (3.5) | 19.4 | 1.7 | 35.3 | $ 28.9 |
| **Total** | **$ 269.1** | **$ 140.7** | **$ 82.6** | **$ 126.1** | **$ (22.6)** | **$ (14.1)** | **$ 165.6** | **$ 30.7** | **$ 2.8** | **$ 15.2** | **$ 796.1** |

Source: Cheiron analysis of funding adequacy.

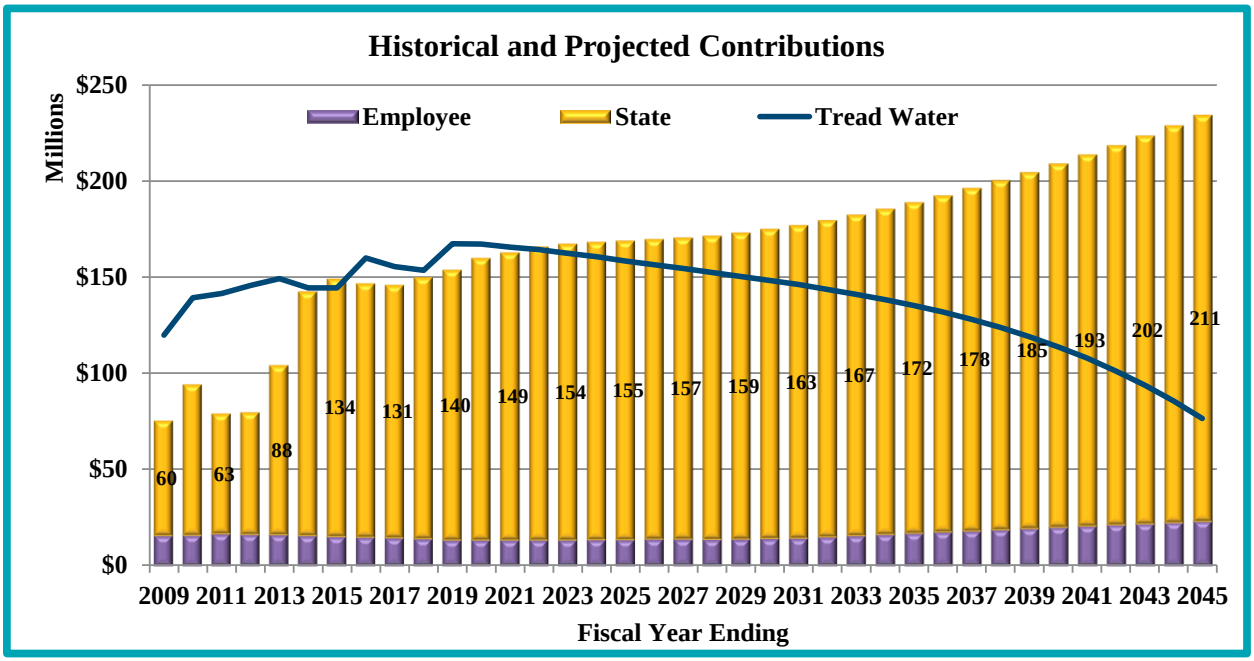
We expect that this chart will help stakeholders understand the sources of growth in the UAL over recent years and inform discussions about the current funding requirements and adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

### Actual Contributions Compared to Tread Water Contribution

One of the persistent sources of the increase in UAL is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the UAL from increasing if all assumptions are met). These contribution deficiencies have added between $11 and $75 million to the UAL each year.

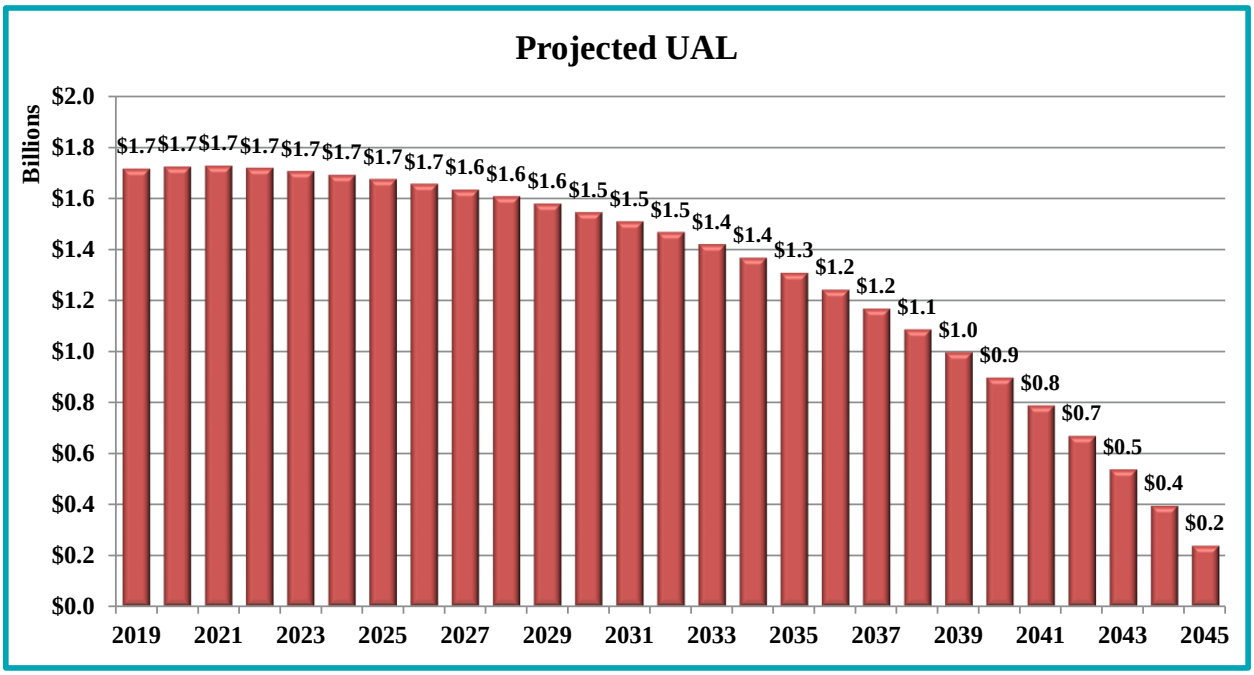
As the chart below shows, actual contributions had been significantly less than the tread water cost prior to 2014. Each year that total contributions remain below the tread water cost (blue line), the UAL is expected to grow. As shown in the graph below the contributions from the State have increased significantly and the total contribution reaches the tread water contribution by 2022 and begins to pay down the UAL.




Source: Cheiron analysis of funding adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

The next chart shows that if the Minimum Required Contributions continue to be made each year and all other assumptions are met, the UAL is projected to grow from $1.72 billion in 2019 to $1.74 billion in 2022 before contributions are sufficient to start paying the UAL down. Note that the UAL is not projected to get below its current level until 2026.



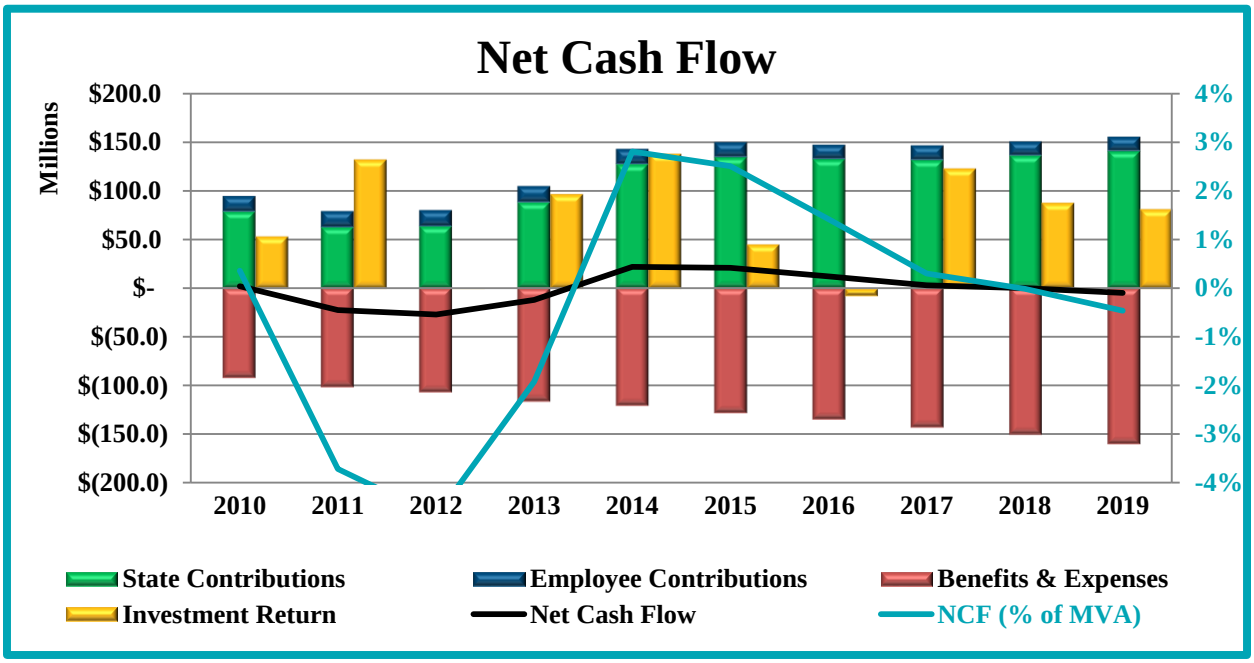

Source: Cheiron analysis of funding adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

### Net Cash Flow Analysis

The plan's net cash flow is defined as State and Member contributions less benefit payments and administrative expenses. The more negative net cash flow is as a percentage of the plan's assets, the more vulnerable the plan is to market downturns. When a pension plan has more payouts than contributions and suffers an investment loss, it is left with fewer assets to invest and recapture during a recovery.

Looking at the chart below, JRS is neither mature nor immature on a net cash flow basis (black line), as the net cash flow has been close to zero relative to the size of the System's assets. This measure should continue to be monitored as negative cash flow increases the System's vulnerability to market downturns. The teal line shows net cash flow as a percent of Market Value of Assets on the right side axis. The greater the negative cash flows are relative to plan assets the more vulnerable a plan is to market downturns. This is because once there is a market downturn, the plan assets lose both on the return and the negative cash flow, leaving it with a lower asset base from which to recover from the loss.




Source: Cheiron analysis of funding adequacy.

GRS's graph of cash flows on page 11 of the June 30, 2019 Actuarial Valuation shows that benefit payments and expenses in the years 2030 to 2034 are expected to come close to exceeding investment income at 6.50%. This should be monitored closely as assets can deteriorate quickly if investments earn less than what is assumed.

## STATUS OF RECOMMENDATIONS FROM THE 2018 STATE ACTUARY'S REPORT

**Response to Recommendations in 2018**

In the State Actuary's Preliminary Report on the Judges' Retirement System of Illinois presented December 19, 2018, 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, 2019 Actuarial Valuation.

| Recommendations to Retirement System from 2018 State Actuary Report | Status | Comments |
|---|---|---|
| 1. We continue to recommend that the JRS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary | **Not Implemented** | While, the System noted in its December 11, 2018 response that the Board and management will discuss the need for a full scope actuarial audit prior to the next valuation, we were provided no evidence that a discussion took place.<br><br>**Recommendation repeated.** |
| 2. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of JRS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable. We understand that changing the funding method is under the jurisdiction of State law and not the Retirement System | **Partially Implemented** | JRS has adopted a funding policy that would provide for annual State contributions, the "Actuarially Determined Contribution", and is used for informational purposes only.<br><br>GRS continues to include strong language throughout their report recommending the use of an actuarially sound method and stating clearly that the statutory method is not actuarially sound. We find these statements to be appropriate and support their continuation.<br><br>**Recommendation repeated.** |
| 3. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether or not there is | **Implemented** | JRS added stress testing in appendices to the final Actuarial Valuation Report in a letter dated December 20, 2018.<br><br>**Recommendation continued.** |

## STATUS OF RECOMMENDATIONS FROM THE 2018 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2018 State Actuary Report | Status | Comments |
|---|---|---|
| a potential for unsustainable costs during the statutory funding period. GRS did include stress testing in last year's final report, but did not include such stress testing in this year's draft report or in any supplemental report. We recommend that stress testing be added into this year's report. Because the public may only look to the valuation report for this type of information, we believe it should be contained here instead of any supplemental document to the Board that may potentially be overlooked. | | |
| 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. | **Implemented** | GRS has continued to do this, most recently providing a review in the *2018 Actuarial Experience Study* dated July 16, 2019.<br><br>We will continue to include this recommendation each year.<br><br>**Recommendation continued.** |

**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 3, 2019. The preliminary report was based on Cheiron's review of actuarial assumptions included in GARS' 2019 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the General Assembly Retirement System. GARS' written response, provided on December 13, 2019, can be found in Appendix C.

**OVERVIEW**
**GENERAL ASSEMBLY RETIREMENT SYSTEM**
as of June 30, 2019

| | |
|---|---|
| Actuarial accrued liability | $374,597,259 |
| Actuarial value of assets | $60,057,098 |
| Unfunded liability | $314,540,161 |
| Funded ratio | 16.0% |
| | |
| Employer normal cost | $2,001,416 |
| State contribution (FY21) | $27,299,000 |
| | |
| Active members | 126 |
| Inactive members | 69 |
| Current benefit recipients | 441 |
| Total membership | 636 |
| | |
| Interest rate assumption | 6.50% |
| Inflation assumption | 2.25% |
| Actuarial cost method | Projected Unit Credit |
| Asset valuation method | 5-year Smoothing |
| | |
| Executive Director | Tim Blair |
| Actuarial Firm | Gabriel, Roeder, Smith & Company |

Source: June 30, 2019 GARS actuarial valuation report.

December 17, 2019

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

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

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution to the General Assembly Retirement System of Illinois (GARS or System) for Fiscal Year 2021.

**In summary, we believe that the assumptions and methods used in the draft June 30, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, 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 2021. Section III also includes comments on other issues impacting the funding of the General Assembly Retirement System, including the implications of Article 2 of the Illinois Pension Code, which establishes the statutory minimum funding requirements for the System. **In our opinion, the statutory mandated minimum funding requirements are inadequate.** Section IV reviews the projections contained in the draft June 30, 2019 Actuarial Valuation. Finally, Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by GARS and GRS. This information includes actuarial assumptions and methods adopted by the GARS Board, System provisions, the draft June 30, 2019 Actuarial Valuation, the draft 2019 GASB 67/68 Report, the 2019 Valuation Results presentation, the 2018 Actuarial Experience Review, and minutes of the plan year 2019 GARS Board of Trustee meetings. A detailed description of all information provided for this review is contained in Appendix B.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. 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

Christian Benjaminson, FSA, FCA, MAAA, EA
Principal Consulting Actuary

SIGNED ORIGINAL ON FILE

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

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE GENERAL ASSEMBLY 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 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) 2021. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the GARS Board to consider before finalizing its certification of the required State contributions for FY 2021.

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, 2019 Actuarial Valuation, the draft 2019 GASB 67/68 Report, the 2019 Actuarial Results presentation, the 2018 Actuarial Experience Review, and minutes of the plan year 2019 Board of Trustees meetings. The materials we reviewed are listed in Appendix B.

In addition to reviewing the Actuarial Certification of the required State contribution to GARS, the Act requires the State Actuary to conduct a review of the "actuarial practices" of the Board. While the term "actuarial practices" was not defined in the Act, we continue to interpret this language to mean that we review: (1) the use of a qualified actuary (as defined by the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2019 Actuarial Valuation.

## SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2019 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 2021 required State contribution calculated under the current statutory funding plan is $27,299,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based. As such, we have accepted GRS's annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

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

## State Mandated Funding Method

2. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of GARS. Continuing the practice of underfunding future accruals such that the unfunded liability is expected to continue to grow and targeting a funded percentage less than 100% increases the risk of the System becoming unsustainable. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

## Conformance to Statutory Funding Changes of Public Act 100-0023

*Recognition of Changes in Actuarial Assumptions*

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

## SECTION II – SUMMARY OF RECOMMENDATIONS

The Act requires that the impact of assumption changes "be implemented in equal annual amounts over a five-year period beginning in the State fiscal year in which the actuarial change first applies to the required State contribution." This amount is then implemented "at the resulting annual rate in each of the remaining fiscal years in that five-year period." GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of payroll, and reflecting one-fifth of that percentage change each year over five years. The method used by GRS will result in the cost impact due to assumption changes being recognized as varying dollar amounts. This is because the recognition as an equal percentage of pay gets applied to a changing payroll over a five-year period.

## Assessment of Actuarial Assumptions Used in the 2019 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, 2019 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

## Recommended Additional Disclosures for the 2019 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 illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made. GRS did include stress testing in last year's final report, but did not include such stress testing in this year's draft report or in any supplemental report.

## 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.

A new Actuarial Standard of Practice became effective for this valuation on the Assessment and Disclosure of Risk (ASOP 51). GRS made a good faith effort to comply with the new requirements, but the risk section in the valuation report (see pages 14, 15, and 16) could be improved to better comply with the new requirements.

5. For future risk disclosure we recommend:
   - An assessment should be provided for each risk that is identified by GRS.
   - An explanation should be provided as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified by GRS.

## SECTION II – SUMMARY OF RECOMMENDATIONS

- Historical values that are significant to understanding the risks identified by GRS should be disclosed along with an explanation of how they help the reader understand the risks identified by GRS.

## GASB 67 and 68

The 2019 GARS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2019 GARS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

## 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 the required State contribution, reviewed the assumptions on which it is based, and accepted GRS's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

Given the size of GARS, the System's low funded ratio, the recent changes in legal requirements, and guidance issued by the Government Finance Officers Association, we are recommending again that the Board periodically undertake a full scope actuarial audit, utilizing the services of a reviewing actuary. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary. Results are compared in a detailed fashion to measure the liabilities for each benefit form and feature. A replication audit will uncover any potential problems in the processing and certification of valuation results. This recommendation was first made to GARS in our 2014 report. GARS has responded in the past that it would complete a full scope actuarial audit if budgetary resources allow. The response to last year's report stated that the GARS Board of Trustees and management would discuss the need for a full scope actuarial audit prior to the next valuation. We were provided no evidence that a discussion took place.

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

## State Mandated Funding Method

The Illinois Pension Code (40 ILCS 5/2-124) establishes a method that does not adequately fund the System. This law requires the actuary to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the actuarial accrued liability in the year 2045 if all assumptions are met. This contribution level does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the actuarial accrued liability, not 90%. In addition, the State mandated method produces a contribution that results in an increase in the unfunded actuarial liabilities over the next decade if all assumptions are met.

**We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of GARS** (Recommendation #2). The funding method should target 100% of the actuarial accrued liability, and contributions should ramp up

## SECTION III – SUPPORTING ANALYSIS

as quickly as possible to a level that is expected to prevent the unfunded actuarial accrued liability from growing. Continuing the practice of underfunding the System increases the risk of needing even larger contributions in the future that may make the System unsustainable.

We have reviewed the funding policy adopted by the Board of Trustees. We agree that the policy is a reasonable method that conforms to the Actuarial Standards of Practice, and we agree with its use in the GASB report as an Actuarially Determined Contribution (ADC). The funding policy calls for a funding amount equal to the normal cost plus a closed 20-year amortization as a level percentage of capped payroll of the unfunded actuarial liability. This policy defines a method that would ultimately fully fund the plan and falls within generally accepted actuarial funding methods currently in use for public plans. As of June 30, 2019, the remaining amortization period is 16 years. According to this methodology, the State's contribution amount would be $34,432,777 for FY 2021. It is important though to recognize that this change does not affect the actual funding of the System. The board adopted funding policy conforms to a goal of full funding within a reasonable time period and with generally accepted actuarial principles and practices.

Based on the draft June 30, 2019 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the actuarial liability, is currently at 16.03% The unfunded actuarial accrued liability is currently about $315 million and is expected to decrease over time. The required State contribution rate is currently 257.78% of payroll and is scheduled to increase to 283.9% of payroll. However, if there is a significant market downturn, the unfunded actuarial liability could increase substantially and the required State contribution rate could increase significantly, putting the sustainability of the system further into question. Stress testing should be performed to better understand these risks and the potential advantages of additional contributions in the near term to maintain the sustainability of the system.

**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 illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made** (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 System look to for assessing the System's financial conditions. Supplemental reports, such as the stress testing report GRS provided separately for the prior valuation, may not be publicly identified, and therefore not readily accessible.

As mentioned in Section II, a new Actuarial Standard of Practice (ASOP) has been introduced, ASOP 51, and is effective for GARS actuarial valuation starting June 30, 2019. ASOP 51 provides guidance to actuaries on the assessment and disclosure of risks to help readers of the

## SECTION III – SUPPORTING ANALYSIS

actuarial valuation report "*understand the effects of future experience differing from the assumptions used*" and "*the potential volatility of future measurements resulting from such differences*".

ASOP 51's first requirement is to "*identify risks that, in the actuary's professional judgment, may reasonably be anticipated to significantly affect the plan's future financial condition.*" GRS identified six sources of risk to GARS: investment risk, asset/liability mismatch risk, contribution risk, salary and payroll risk, longevity risk and other demographic risks. With the exception of the contribution risk due to the statutorily-required amount of contributions, the risks GARS identified are relatively generic and would apply to most pension plans. We believe GARS should stress the net cash flow situation as that is expected to become a problem in the future.

ASOP 51 requires the actuary to assess each of the risks identified. While the assessment does not have to be quantitative, it does have to take into account the specifics of the individual plan. ASOP 51 also describes several quantitative methods that may be used to assess risk.

- Investment Risk. GRS describes the impact of a variation in the investment return in the next year from the assumed rate, but do not provide any additional assessment.

- Asset/Liability Mismatch Risk. GRS does not appear to provide an assessment of asset/liability mismatch risk other than to indicate that asset value changes that do not match liability changes will either increase or decrease costs.

- Contribution Risk. GRS discusses several issues with the statutorily-required contribution amounts in the risk section as well as in other parts of the valuation report. It would be useful to reference the other analyses of contribution risk that are in the report in the risk section.

- Salary and Payroll Risk. GRS does not appear to provide an assessment of salary and payroll risk other than to indicate that experience that differs from the assumptions will either increase or decrease costs.

- Longevity Risk. GRS does not appear to provide an assessment of longevity risk other than to indicate that experience that differs from the assumptions will either increase or decrease costs.

- Other Demographic Risk. GRS provides an explanation of demographic risks, but does not appear to provide any assessment of these risks.

ASOP 51 requires the actuary to recommend a more detailed assessment of risks if it "*would be significantly beneficial.*" GRS adequately identified the primary drivers of these risks, provided background information and assessments about these identified risks, but did not in our opinion

adequately communicate the significance of these risks to this plan. That could have been achieved if GRS included additional stress testing in the report. GRS indicated that an additional risk assessment was performed. However, there is no communication about the findings from the additional risk assessment or any indication of where to find the additional risk assessment.

ASOP 51 requires the actuary to "*calculate and disclose plan maturity measures that … are significant to understanding the risks associated with the plan.*" GRS calculates the current and prior year actives to annuitant ratio and the net cash flow, but there is no explanation of how these measures help to understand any of the risks identified. There are also other maturity measures, such as the assets to payroll ratio and the actuarial liability to payroll ratio that provide significant information about the potential effects of investment risk and demographic risk. GRS discusses the importance of monitoring the continued maturation of the plan, but doesn't provide any projections of any of these maturity measures even though they are all readily available given the projections required to determine the statutory contribution amounts.

ASOP 51 Section 3.8 says the actuary *"should identify and disclose relevant historical values of the plan's actuarial measurements"* if they are reasonably available and are significant to the risks identified. GARS historical values are readily available for funding status and plan maturity measures. We believe adding historical values and commentary about the trends shown would enhance the understanding of risks within the plan. For example, showing how the historical Ratio of Actuarial Accrued Liability to Covered Payroll has changed over the past 10 years would give insight into how the maturity of GARS is changing and therefore how the sensitivity to risks may be changing.

**Thus, we recommend that an assessment be provided for each risk that is identified by GRS, that an explanation be provided as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified, and that historical values that are significant to understanding the risks identified be disclosed along with an explanation of how they help the reader understand the risks identified by GRS** (Recommendation #5).

## Conformance to Statutory Funding Changes of Public Act 100-0023

*Recognition of Changes in Actuarial Assumptions*

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a five-year period. This phase-in provides time to adjust to a higher level of contributions. However, for a System in which the unfunded liability is already expected to continue to grow for several more years such delays allow the unfunded liability to increase even more if the assumption change is an increase in cost, adding additional risks to the System.

## SECTION III – SUPPORTING ANALYSIS

Public Act 100-0023 states:

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

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

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

GRS has interpreted this to mean determining the cost impact of the change, converting it to a percentage of expected 2019 payroll, and reflecting one-fifth of that percentage change over five years. In the draft 2019 Actuarial Valuation report there is a demonstration of the dollar amounts to be smoothed as a result of the assumption changes as disclosed in the 2013, 2015, 2016, 2018, and 2019 actuarial valuation reports and the calculation of the annual rate change based on the appropriate payroll. This rate adjustment is then recognized over a five-year period as an adjustment to the contribution rate that would otherwise be required from the State. The method used by GRS will result in the cost impact due to assumption changes being recognized as increasing dollar amounts. This is because the recognition as an equal percentage of pay gets applied to an increasing payroll over a five-year period.

## SECTION III – SUPPORTING ANALYSIS

# Assessment of Actuarial Assumptions Used in the 2019 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 reduced from 6.75% to 6.50% for the draft June 30, 2019 Actuarial Valuation.

**After reviewing all the materials (see Appendix B of this report) that were made available, Cheiron concludes that decreasing the interest rate to 6.50% 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)**.**

*The items we considered and our rationale for this recommendation are 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 23, 2019 report on the 2018 Actuarial Experience Study, they presented the opinions of three independent investment consultants on the future expected earnings of the System and concluded that, adjusting for GRS's assumed rate of inflation, the 20-year expected geometric mean of the GARS portfolio is 6.71% (See Page C-9 of the 2018 Actuarial Experience Study). They also presented the distribution of the 20-year average geometric net nominal return for these three consultants. This showed that GARS has a 53.03% chance of meeting or exceeding the reduced 6.50% assumption (See the sixth column, bottom row). This supports the Board reducing this assumption for the current valuation.

## SECTION III – SUPPORTING ANALYSIS

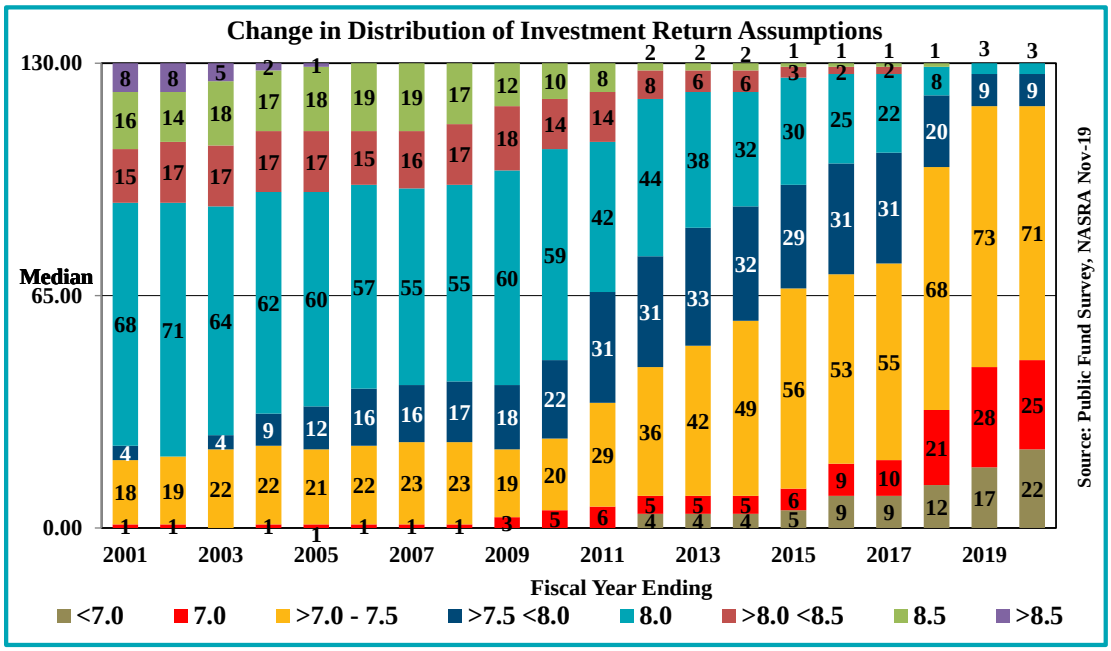
Distribution of 20-year Average Geometric Net Nominal Return

| Investment Consultant | Distribution of 20-Year Average Geometric Net Nominal Return | | | Probability of exceeding 6.75% | Probability of exceeding 6.50% | Probability of exceeding 6.25% |
|---|---|---|---|---|---|---|
| | 40th | 50th | 60th | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1 | 5.84% | 6.49% | 7.14% | 45.90% | 49.78% | 53.68% |
| 2 | 6,21% | 6.89% | 7.58% | 52.09% | 55.76% | 59.40% |
| 3 | 6.04% | 6.75% | 7.47% | 50.02% | 53.54% | 57.04% |
| **Average** | **6.03%** | **6.71%** | **7.40%** | **49.34%** | **53.03%** | **56.71%** |

- GRS's April 23, 2019 2018 Actuarial Experience Study report also presented the expectation of the Illinois State Board of Investment's investment consultant Meketa Investment Group. After adjusting for GRS's assumed rate of inflation, Meketa's expected 20-year geometric average return of the GARS portfolio is 7.06% (See page C-9 of the GRS 2018 Actuarial Experience Study report). Based on the capital market assumptions provided by Meketa, GARS has a 57.68% chance of meeting or exceeding the reduced assumption of 6.50%. This supports the reasonableness of assuming a 6.50% interest rate for the current year.

- While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 130 large retirement plans. The following chart shows the distribution of discount rates for the plans in the Public Plans Database since 2001. Historically, GARS has had higher discount rates in the past, but now the 6.50% assumption is below the median assumption. The latest data includes results collected through November 2019.

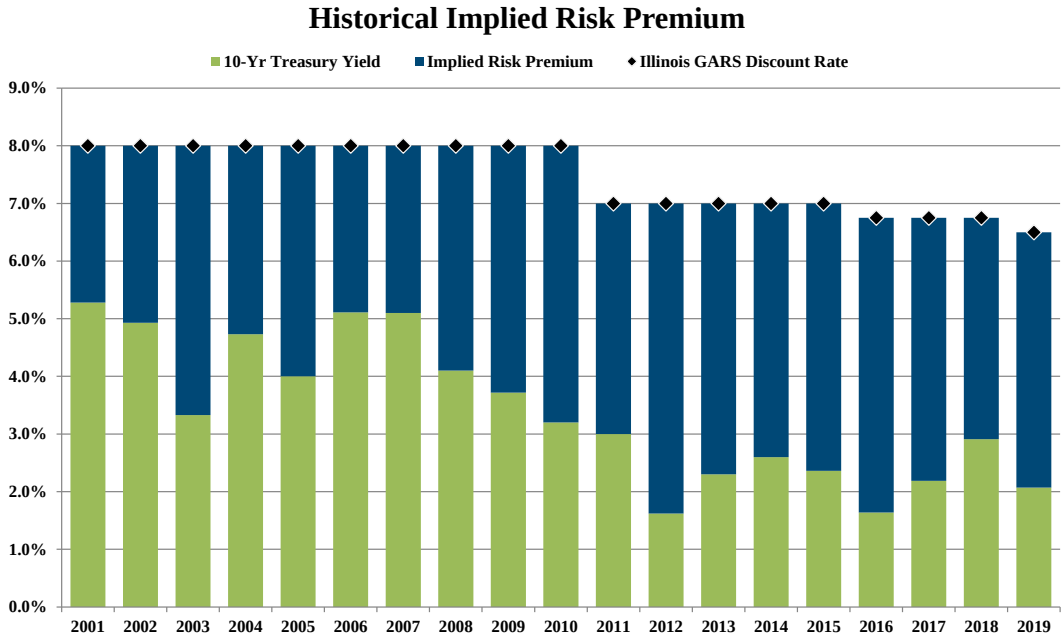
## SECTION III – SUPPORTING ANALYSIS




Over the period shown, there continues to be a pattern of reducing discount rates. Of the 130 plans shown for both 2019 and 2013, 114 have reduced their discount rate assumption since 2013. For these 114 plans, the average reduction is 0.57%. The data is consistent with the experience of other Cheiron clients, which have generally shown a significant trend of reducing their discount rate assumptions over the last several years.

- Declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, as shown in the chart on the following page, in 2001 the yield on 10-year Treasury bonds (a proxy for a risk free investment) was 5.3%. To achieve GARS' assumed return of 8.0%, the System's investments had to outperform the yield on the 10-year Treasury by 2.7%. As of June 2019, the yield on the 10-year Treasury is now 2.1%, and to achieve GARS' assumed return of 6.5%, the System's investments need to exceed the 10-year Treasury yield by 4.4%. So, even though GARS reduced its assumption by 150 basis points, it still has to take more investment risk in 2019 to meet its assumption than it did in 2001. 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.

## SECTION III – SUPPORTING ANALYSIS




- GARS has experienced negative cash flow for FY 2019 (contribution income less benefits and expense payouts). The negative cash flow of GARS is currently 0.92% of assets. However, negative cash flow is expected to continue in the coming years as shown in the graph on page 11 of the draft 2019 Actuarial Valuation. When short-term returns are expected to be lower than the long-term expectations, which is the current case with GARS, a plan with negative cash flows will have actuarial returns (i.e., dollar-weighted returns) that are less than their "time-weighted" returns.

*2. Inflation Assumption*

**We find that lowering the inflation assumption from 2.50% to 2.25%, which primarily impacts the salary increase assumption, for the draft June 30, 2019 Actuarial Valuation is reasonable.**

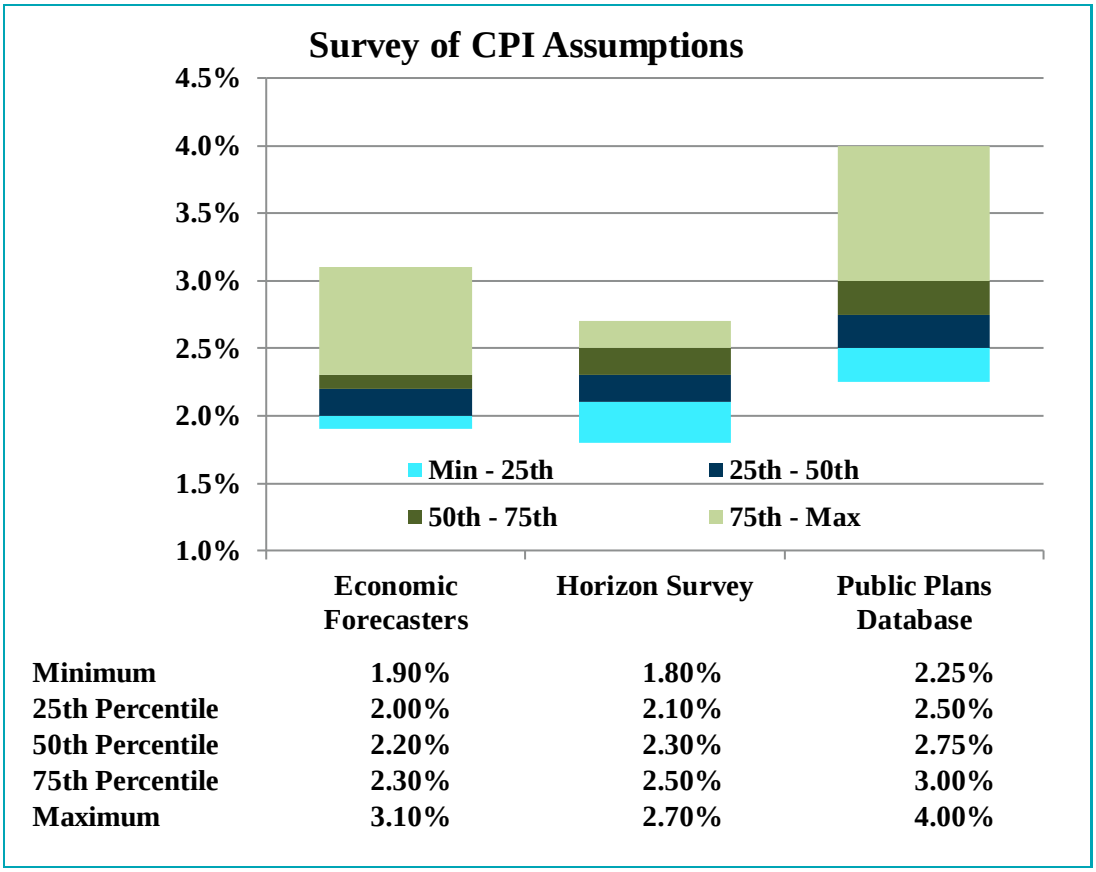
*Our rationale for concurring with the 2.25% assumption:*

- GRS's April 23, 2019 report on the 2018 Actuarial Experience Study included a survey of the inflation assumptions of eleven independent investment consultants with a shorter time horizon and three with a longer time horizon. GRS found they ranged from 1.95% to 2.75%, with an average of 2.20% for short term and 2.42% in the long term.

- The April 2019 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (next 75 years), inflation will average between

2.0% and 3.2% (https://www.ssa.gov/OACT/TR/2019/tr2019.pdf). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.6%.

- The chart below shows the distribution of inflation expectations for the Third Quarter 2019 survey of professional economic forecasters published by the Philadelphia Federal Reserve, the 2018 Horizon survey of investment consultant capital market assumptions (20-year), and the 2017 inflation assumptions used by plans in the Public Plans Database. The assumption of 2.25% is near the middle of the range projected by professional economic forecasters and investment consultants, and is on the low end of the range used by other public plans.




| | Economic Forecasters | Horizon Survey | Public Plans Database |
|---|---|---|---|
| **Minimum** | **1.90%** | **1.80%** | **2.25%** |
| **25th Percentile** | **2.00%** | **2.10%** | **2.50%** |
| **50th Percentile** | **2.20%** | **2.30%** | **2.75%** |
| **75th Percentile** | **2.30%** | **2.50%** | **3.00%** |
| **Maximum** | **3.10%** | **2.70%** | **4.00%** |

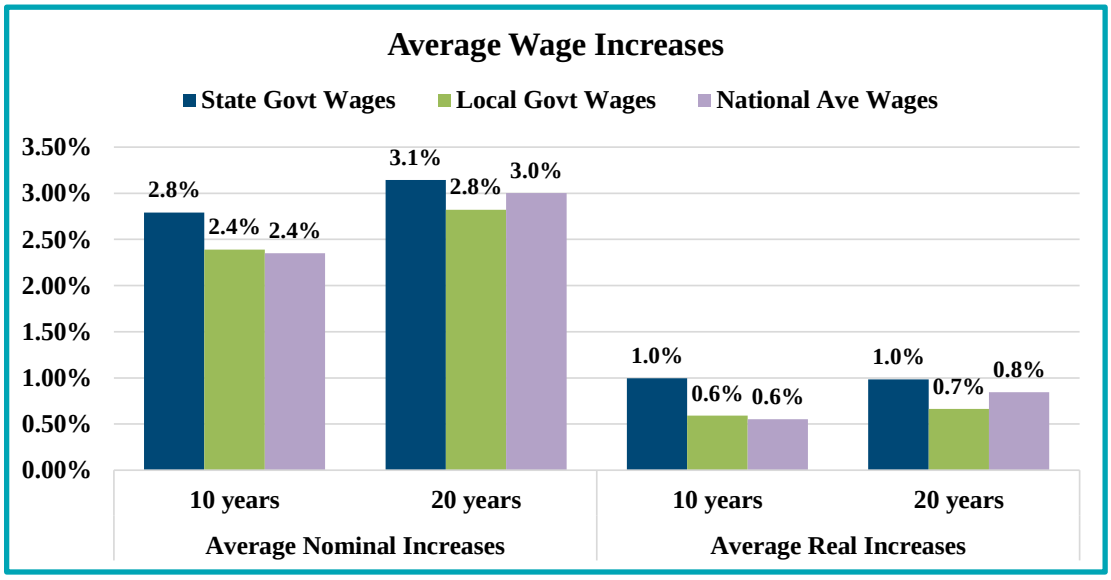
*3. Salary (Annual Compensation) Increase Assumption*

The salary increase assumption for uncapped payroll is 2.50% per year, compounded annually for all active members, regardless of age or service. It includes components of 2.25% per annum for inflation and 0.25% per annum for productivity.

## SECTION III – SUPPORTING ANALYSIS

**We find the assumption and the basis for setting the assumption reasonable and consistent with the inflation assumption.**
*Our rationale for concurring with GRS's recommended salary increase assumption:*

- The chart below shows the average nominal and real increases in wages over the last 10 and 20 years for State governments, local governments, and National Average Wages. State and local government data is from the Quarterly Census of Employment and Wages as published by the Bureau of Labor Statistics. National Average Wages is published by the Social Security Administration.




- The April 2019 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long term (between 2028 and 2093) real wage differential will average somewhere between 0.60% and 1.84%.

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

4. *Cost of Living Adjustment Assumption*

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

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

## SECTION III – SUPPORTING ANALYSIS

5. *Capped Pay Assumption*

The Tier 2 capped payroll growth is 2.25% per year, compounded annually, which is the inflation assumption.

**We find the assumption reasonable.**

6. *Expenses*

Expenses are expected to increase with the projected capped payroll at 2.25% and are included in the service cost.

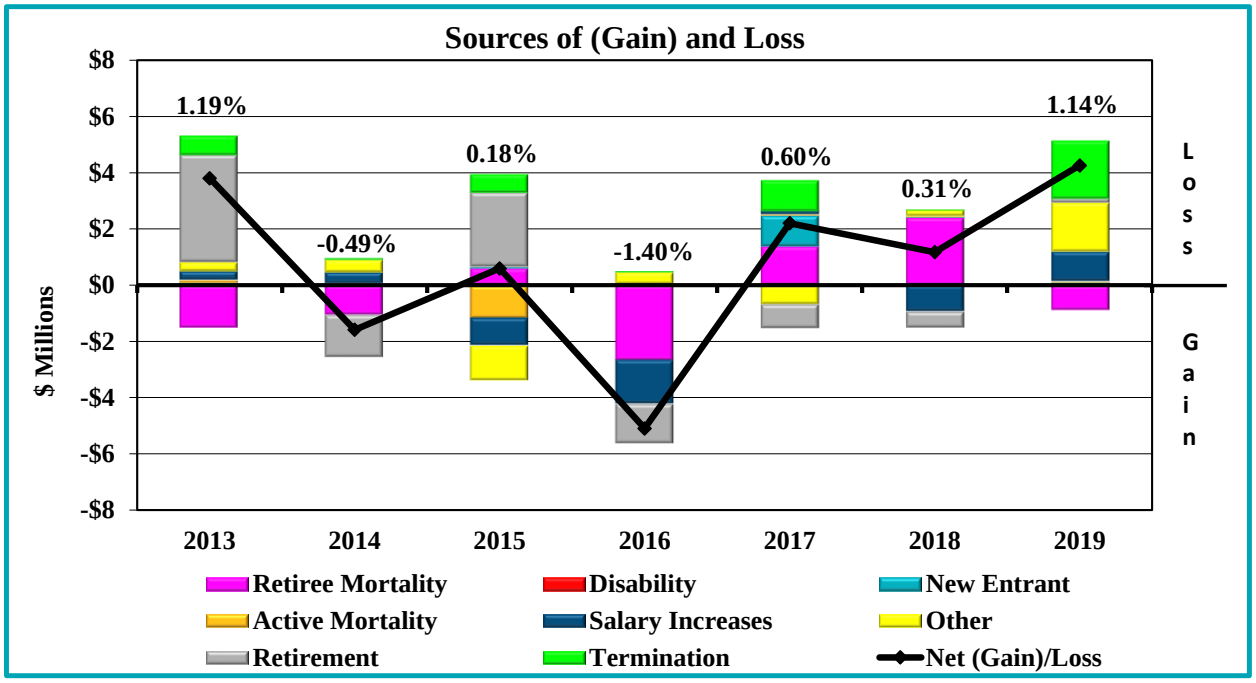
**We find the assumption reasonable.**

## SECTION III – SUPPORTING ANALYSIS

### B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2019 Actuarial Valuation, these are shown on page 20. In the chart below, we have collected similar data from past valuation reports dating back to 2013 and use these to present a historical review of past demographic and salary increase experience gains and losses.

The following chart 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, it represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, it represents an experience gain for that year with liabilities less than expected. The net liability (gains)/losses are shown by the black line. This net (gain)/loss as a percent of liability is shown above the bars.




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

Key observations from this chart are as follows:

1. Retirement experience has been volatile over the years shown. The most recent year showed a small loss after gains in each of the prior three years.

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 seven years, which means participants are not terminating. The loss in the most recent valuation is almost as much as the prior six years combined. This should continue to be monitored and the assumption may need to be revised if the population continues to decline as expected.

4. While there have been both salary gains and losses over the last six years, total payroll has decreased significantly over the period and the average pay has been relatively stable.

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

## 1. Mortality

*Post-Retirement Mortality*

The mortality basis was updated with the June 30, 2019 Actuarial Valuation and is based on the Pub-2010 Above-Median Income General Healthy Retiree Mortality tables, sex distinct, with scaling factors of 99 percent for males and females, with generational mortality improvement using the MP-2018 two-dimensional mortality improvement scales.

*Pre-Retirement Mortality*

The mortality basis was updated with the June 30, 2019 Actuarial Valuation and is based on the Pub-2010 Above-Median Income General Employee Mortality tables, sex distinct, with no scaling factors and with generational mortality improvement using the MP-2018 two-dimensional mortality improvement scales.

Future mortality improvements are found by projecting the base mortality tables forward from the base year of 2010 using the MP-2018 mortality improvement scale.

## 2. Termination

Rates of withdrawal are assumed to be equal to six percent for all ages 20 through 65 for both Tier 1 and Tier 2 members.

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.

## SECTION III – SUPPORTING ANALYSIS

### 3. Retirement

The overall retirement rates were reduced based on the Actuarial Experience Study for valuations beginning with the June 30, 2019 Actuarial Valuation.

Rates of retirement for Tier 1 members are as follows:

| Retirement Rates | |
|---|---|
| **Age** | **Male and Female** |
| 55 | 5.00% |
| 56-64 | 15.00% |
| 65-74 | 20.00% |
| 75 | 100.00% |

Rates of retirement for Tier 2 members are as follows:

| Retirement Rates | |
|---|---|
| **Age** | **Male and Female** |
| 62 | 20.00% |
| 63 | 10.00% |
| 64 | 12.00% |
| 65 | 14.00% |
| 66 | 16.00% |
| 67 | 35.00% |
| 68-70 | 25.00% |
| 71-74 | 20.00% |
| 75 | 100.00% |

### 4. Marriage Assumption

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

### 5. Disability

No assumption for disability was assumed.

## SECTION III – SUPPORTING ANALYSIS

### 6. New Entrants

The new entrant profile includes uncapped and capped salary information. New entrants are assumed to enter with an average age (41.85), average uncapped pay of $83,694, and average capped pay of $82,631. 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 126 members as of the valuation date, to 66 members in 2045 and ultimately reach 63 members in 2054. The average increase in uncapped payroll for the projection period is 2.50% per annum.

The 2018 Actuarial Experience Study Report noted the 2018 opt-out experience was 46% which is in line with the current assumption. More historical experience would be helpful to compare the historical trend to the ongoing assumption. **We suggest adding the annual opt-out percentage to the Active Membership table on page 12.**

### 7. Spouse's Age

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

### 8. Decrement Timing

All decrements are assumed to occur beginning of year.

### 9. Decrement Relativity

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

### 10. Decrement Operation

Turnover decrements do not operate after member reaches retirement eligibility.

### 11. Eligibility Testing

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

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

No explicit assumption is made with respect to these items.

# SECTION III – SUPPORTING ANALYSIS

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

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

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

## SECTION III – SUPPORTING ANALYSIS

### C. Funding Methods

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and, (3) the amortization method.

*1. Actuarial Cost Method*

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

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

*2. Asset Valuation Method*

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

The 2018 Public Retirement Systems Study by the National Conference on Public Employee Retirement Systems (NCPERS) survey of 167 public retirement funds found that the majority of plans responding to the survey have a five-year smoothing period.

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

## SECTION III – SUPPORTING ANALYSIS

*3. Amortization Method*

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2045. While not a traditional amortization method, this methodology effectively amortizes a portion of the unfunded actuarial liability over the remaining period until 2045, which is currently 26 years.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be "a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period." Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

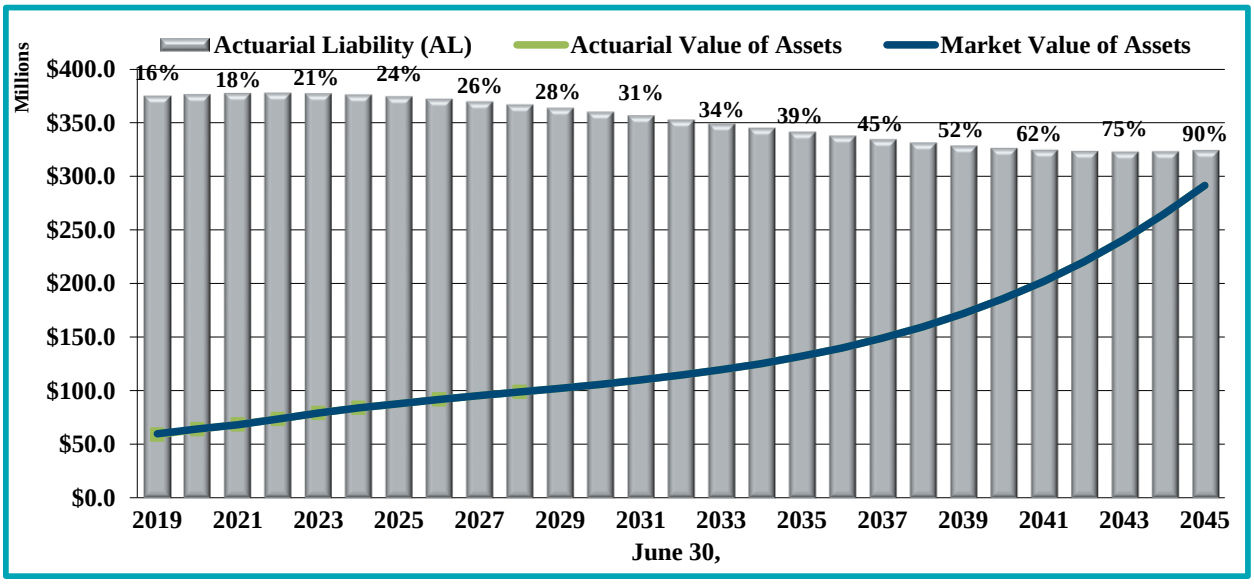
Typical public plan amortization methods are designed to increase each year by expected payroll growth. Under the State mandated method, however, the effective amortization payment increases each year by more than the expected growth in payroll. As a result, the State mandated method defers payments on the unfunded actuarial liability further into the future than under typical public plan amortization methods.

## SECTION IV– PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2019 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 projections performed by the State Actuary to verify that the System's funding projections are reasonable. They do not reflect all the precision of the projections applied by the System's actuary, but instead they are intended to verify the reasonableness of the modeling done by the System's actuary.

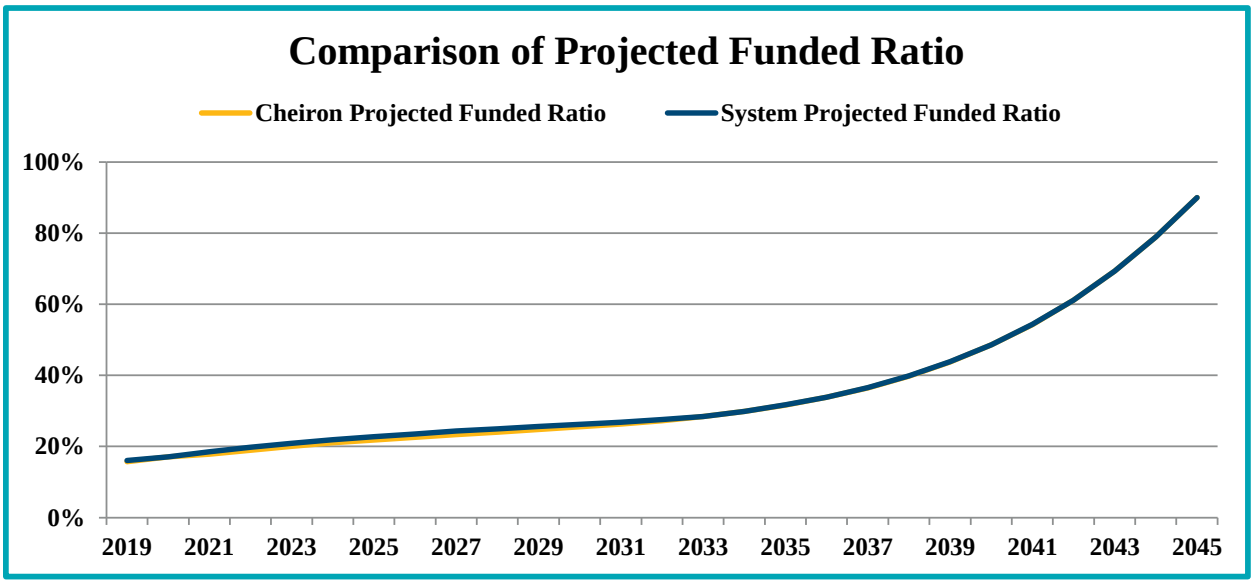
The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As pointed out on page 10 of the draft June 30, 2019 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projections. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio for each year is shown at the top of the graph. For example, in 2031, the funded ratio is projected to be approximately 31% with assets being approximately $110 million and liabilities being approximately $356 million.




Source: Cheiron projection analysis.

## SECTION IV– PROJECTION ANALYSIS

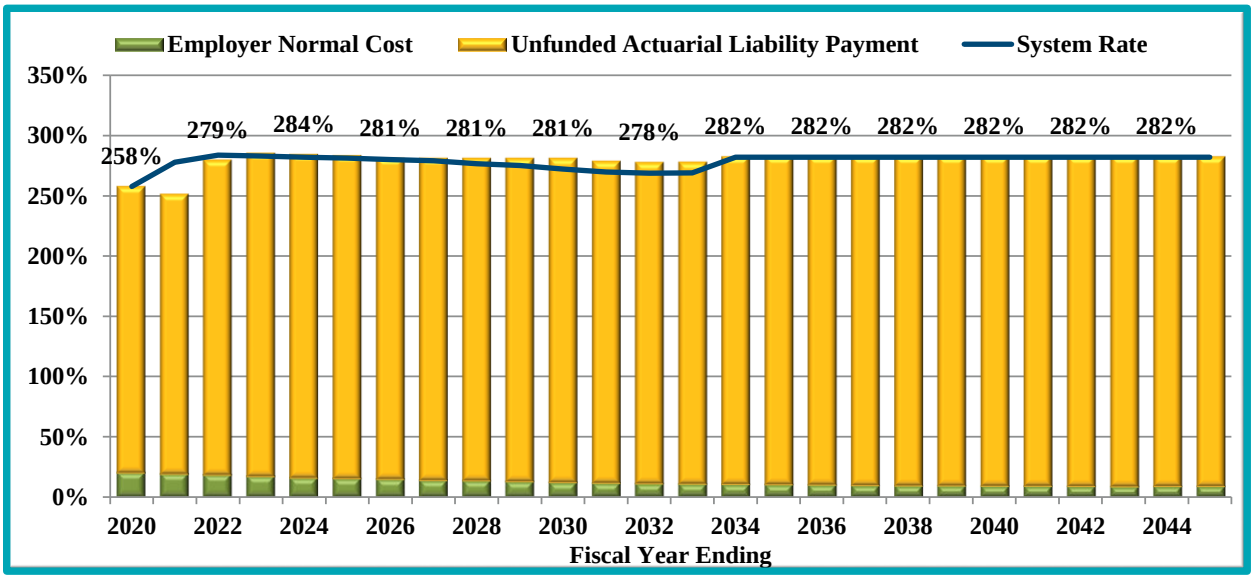
When we compare our projected funded ratio against the results shown in the draft June 30, 2019 Actuarial Valuation, **we find a close match in expected funded ratio**. This close match of the funded ratio indicates that the projections done by the System's actuary are reasonable.




Source: Cheiron projection analysis.

## SECTION IV– PROJECTION ANALYSIS

The following graph shows the expected contribution calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for the fiscal year ending 2020 was set based on the June 30, 2018 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2020 (Fiscal Year Ending June 30, 2021). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by participants not covered by employee contributions based on the statutory funding method; and 2) an amortization of the unfunded liability. The normal cost amounts are shown by the green bars and the amortization of the unfunded actuarial liability (UAL) amounts by the yellow bars. The percentages shown are the total contribution rates calculated by Cheiron, which are equal to the sum of the bars. The graph shows that a larger percentage of the total contribution is being made toward the UAL payment later in the period. The blue line shows the projected contribution rates as percentages of payroll from the draft June 30, 2019 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.**

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

In this section, we examine the adequacy of the funding for the System, including funded status, the sources of changes in the unfunded actuarial liability (UAL), and projections of the UAL and statutory funding requirements compared to contributions needed to pay down the UAL.

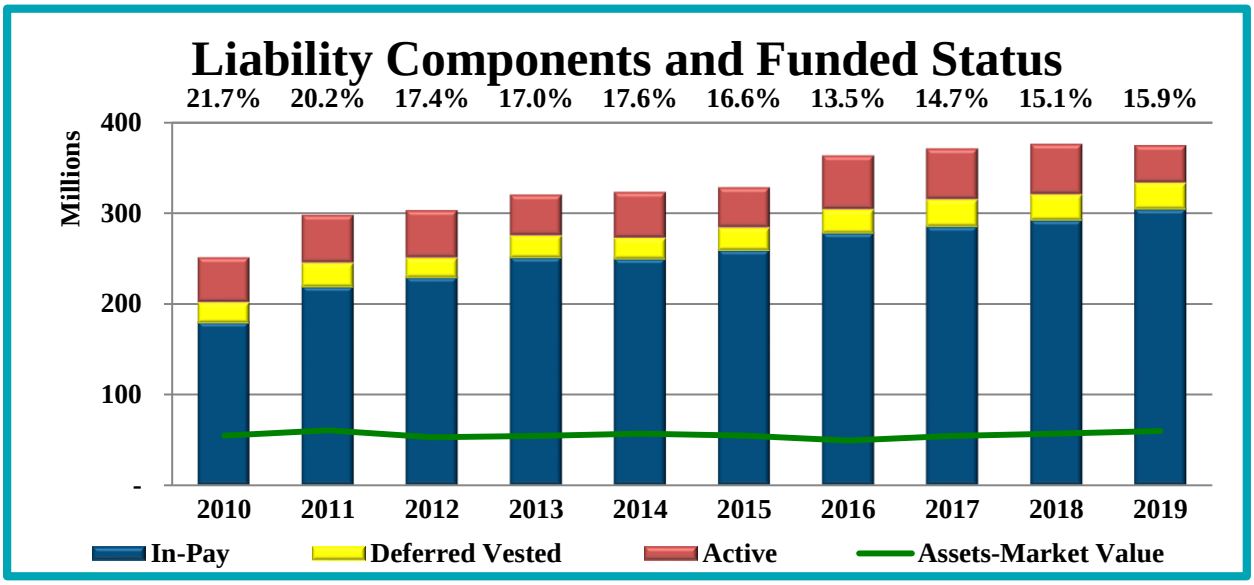
The actuarial valuation report prepared by GRS includes both traditional actuarial measurements, as well as additional risk measurements that are shown on pages 14 to 16 of the draft June 30, 2019 valuation report. Given the unique and substantial funding challenges faced by the Illinois pension systems, this additional information is quite important and supplements the information we present here on funding adequacy to better inform the legislature and other stakeholders about the adequacy of the System's funding.

### System Funded Status

The first funding adequacy measure is the historical trend of the System's funded status for the past ten years. Funded status for this purpose is defined as the ratio of the Market Value of Assets to the Actuarial Liability. The chart below shows that GARS' funded status has declined from 21.7% in 2010 to 15.9% in 2019, a decline in funded status of 5.8%. In addition to showing the funded status, this chart also shows the breakdown of the plan's liabilities by membership status:

- Active liability – the liability (attributable to service already performed) for future payments to members who are currently working in the System,
- Deferred Vested liability – the liability for future payments to members who are no longer working in the System, and
- In-Pay liability – the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown shows that today plan assets only cover about 20% of the liabilities for just those members currently in-pay status.

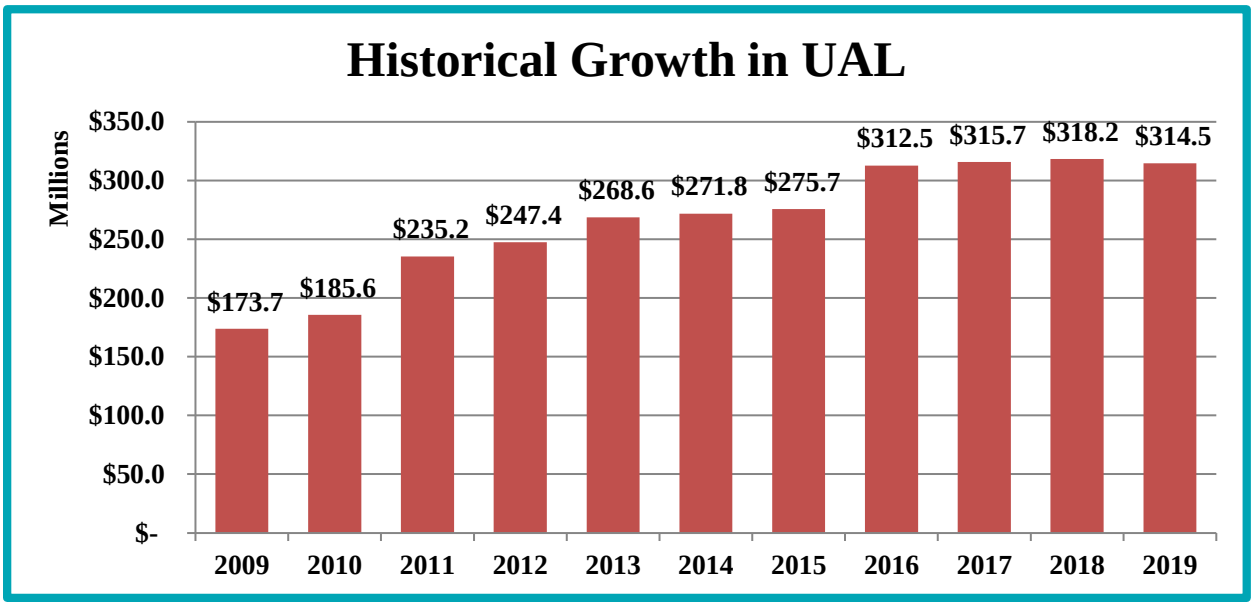



Source: Cheiron analysis of funding adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

### Sources of Changes in the UAL

As shown in the chart below, GARS' Unfunded Actuarial Liability (UAL) has grown from $173.7 million in 2009 to $314.5 million in 2019, an increase of $140.8 million. In order to understand how to reverse this trend, it is important to understand the sources contributing to it.




Source: Cheiron analysis of funding adequacy.

The changes to the UAL from June 30, 2009 to June 30, 2019 can be separated into the following components:

- **Contribution Deficiencies** – Contributions that are less than the tread water contribution cause the UAL to increase. The tread water contribution consists of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability. This sum is referred to as the tread water contribution because it is the contribution necessary so that the UAL will remain constant, or "tread water" (absent experience gains or losses). The difference between actual contributions and the tread water contributions increased the UAL by $47.3 million over this period.

- **Assumption Changes** – changes to actuarial assumptions over this period increased the UAL by $70.0 million. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations.

- **Plan Changes** – modifications to the design of the plan had a negligible impact over this period as most of the changes only affected future benefits.

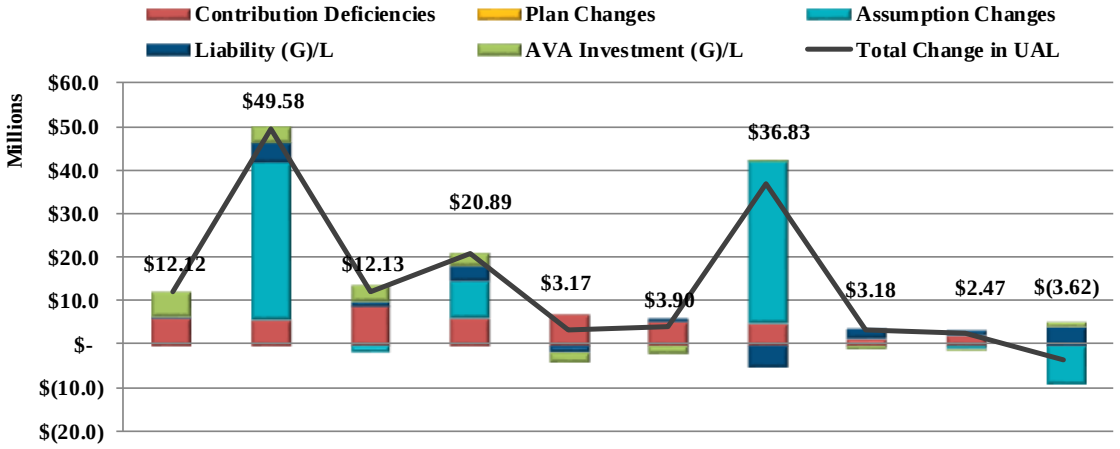
## SECTION V – ANALYSIS OF FUNDING ADEQUACY

- **Liability (Gain) or Loss** – the changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.) were generally small and only increased the UAL by $11.2 million over this period.

- **AVA (Actuarial Value of Assets) Investment (Gain) or Loss** – the net investment gain or loss due to assets earning more or less than assumed increased the UAL over this period increased the UAL by $12.1 million.

The chart below shows the changes in UAL each year broken into these five components. The sum of all the components (total change in UAL) is shown as the black line.

Except for gains due to investment returns in 2014, 2015, 2017 and 2018, liability experience gains in 2014 and 2016, and assumption changes in 2012, 2018, and 2019, all other factors have increased the UAL. Finally the UAL has increased every year except last year.




| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Contributions** | 5.89 | 5.51 | 8.91 | 5.89 | 7.00 | 5.32 | 4.94 | 1.62 | 2.17 | 0.07 | **$ 47.32** |
| **Assumptions** | - | 35.81 | (1.44) | 8.42 | - | - | 36.73 | - | (0.73) | (8.78) | **$ 70.01** |
| **Investments** | 5.71 | 3.58 | 3.66 | 3.11 | (2.24) | (2.01) | 0.27 | (0.65) | (0.15) | 0.83 | **$ 12.11** |
| **Plan Changes** | - | - | - | - | - | - | - | - | - | - | **$ -** |
| **Liabilities** | 0.52 | 4.69 | 1.00 | 3.46 | (1.59) | 0.60 | (5.10) | 2.21 | 1.17 | 4.26 | **$ 11.22** |
| **Total** | **$ 12.12** | **$ 49.58** | **$ 12.13** | **$ 20.89** | **$ 3.17** | **$ 3.90** | **$ 36.83** | **$ 3.18** | **$ 2.47** | **$ (3.62)** | **$ 140.65** |

Source: Cheiron analysis of funding adequacy.

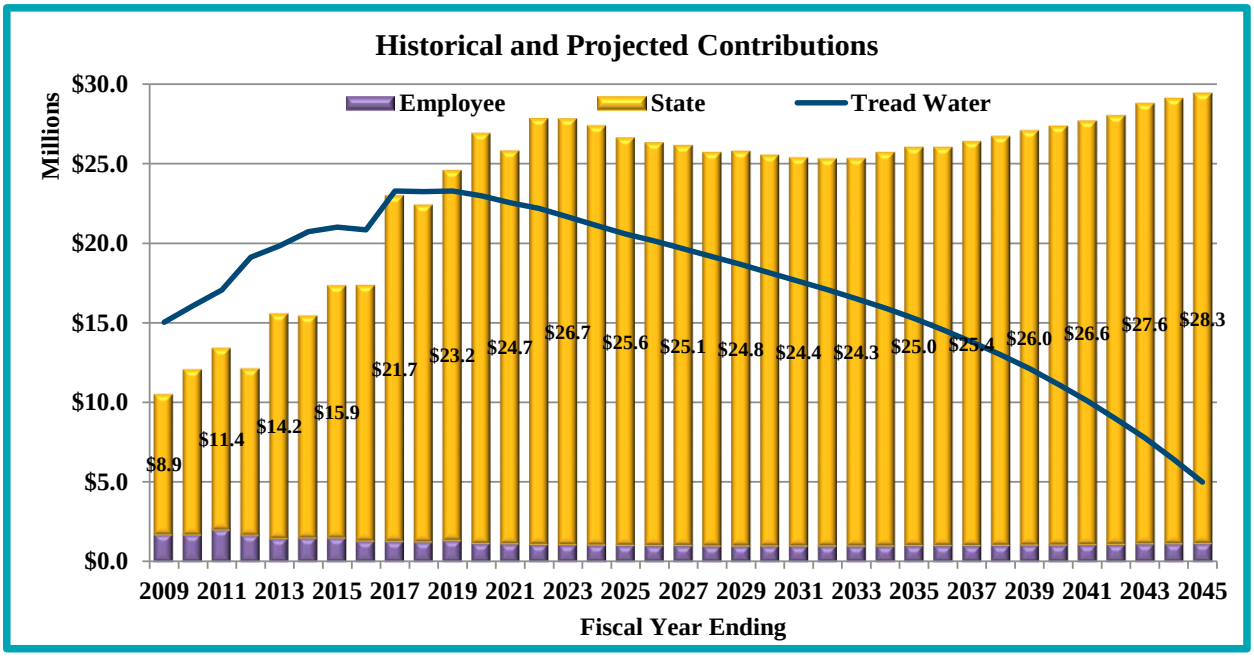
We expect that this chart will help stakeholders understand the sources of growth in the UAL over recent years and inform discussions about the current funding requirements and adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

## Actual Contributions Compared to Tread Water Contribution

One of the persistent sources of the increase in UAL is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the UAL from increasing if all assumptions are met). These contribution deficiencies have added between $0.1 to $8.9 million to the UAL each year.

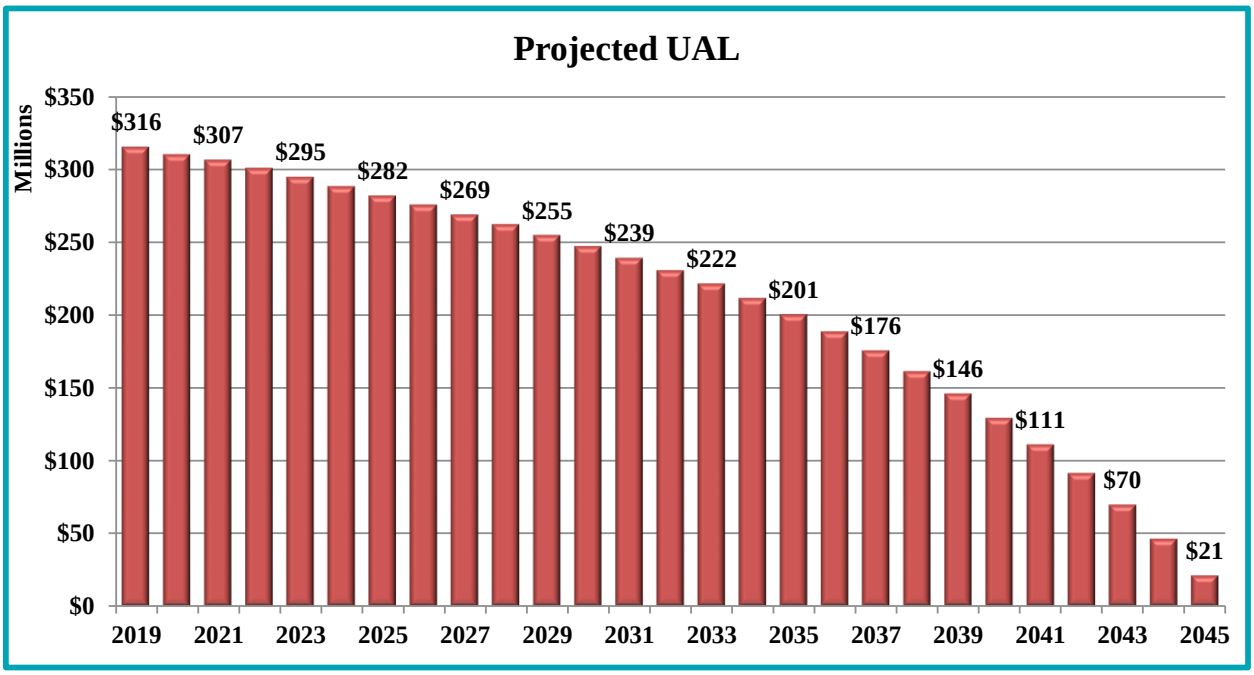
As the chart below shows, actual contributions have been significantly less than the tread water cost through 2016. This trend was reversed beginning in 2017 and into the future. Each year that total contributions remain above the tread water cost (blue line), the UAL is expected to decline.




Source: Cheiron analysis of funding adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

The next chart shows that if the Minimum Required Contributions continue to be made each year and all other assumptions are met, the UAL is projected to decline each year.



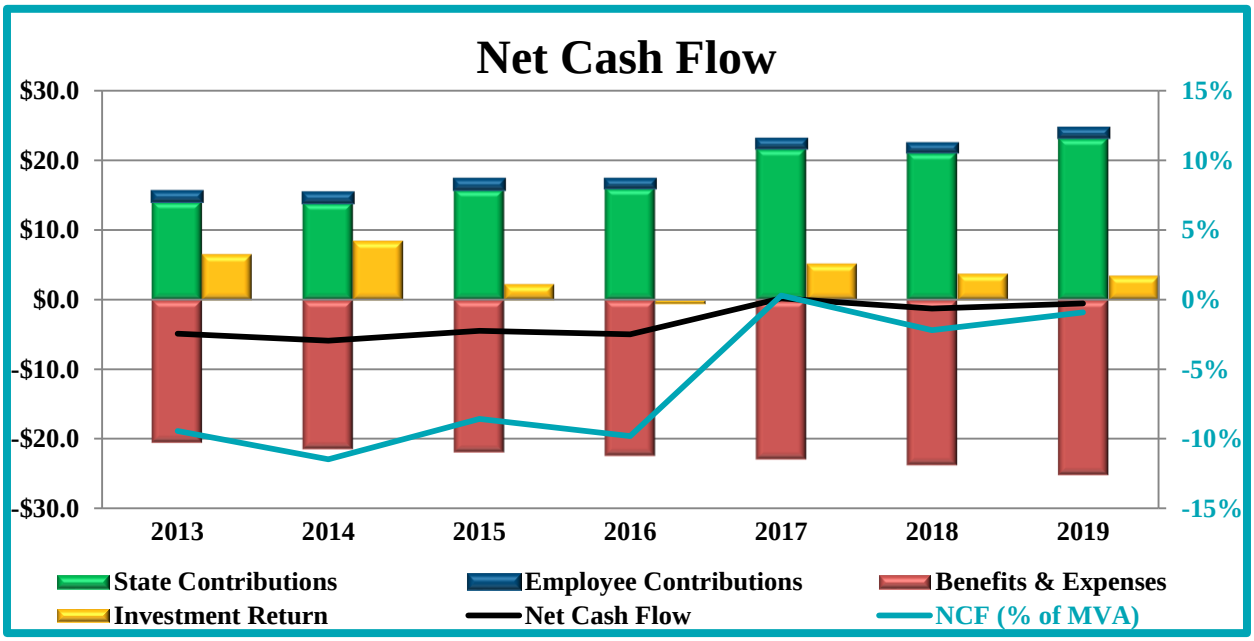

Source: Cheiron analysis of funding adequacy.

## SECTION V – ANALYSIS OF FUNDING ADEQUACY

### Net Cash Flow Analysis

The plan's net cash flow is defined as State and Member contributions less benefit payments and administrative expenses. The more negative net cash flow is as a percentage of the plan's assets, the more vulnerable the plan is to market downturns. When a pension plan has more payouts than contributions and suffers an investment loss, it is left with fewer assets to invest and recapture during a recovery.

Looking at the following chart, GARS is neither mature nor immature on a net cash flow basis (black line), as the net cash flow has been close to zero relative to the size of the System's assets. This measure should continue to be monitored as negative cash flow increases the System's vulnerability to market downturns. The teal line shows net cash flow as a percent of Market Value of Assets on the right side axis. The greater the negative cash flows are relative to plan assets the more vulnerable a plan is to market downturns. This is because once there is a market downturn, the plan assets lose both on the return and the negative cash flow, leaving it with a lower asset base from which to recover from the loss.




Source: Cheiron analysis of funding adequacy.

## STATUS OF RECOMMENDATIONS FROM THE 2018 STATE ACTUARY'S REPORT

## Response to Recommendations in 2018

In the State Actuary's Preliminary Report on the General Assembly Retirement System of Illinois presented December 19, 2018, 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, 2019 Actuarial Valuation.

| Recommendations to Retirement System from 2018 State Actuary Report | Status | Comments |
|---|---|---|
| 1. We continue to recommend that the GARS Board periodically retain the services of an independent actuary to conduct a full scope actuarial audit. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the System's actuary. | **Not Implemented** | While the System noted in its December 11, 2018 response that the Board and management will discuss the need for a full scope actuarial audit prior to the next valuation, we were provided no evidence that a discussion took place.<br><br>**Recommendation repeated.** |
| 2. We continue to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of GARS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable. We understand that changing the funding method is under the jurisdiction of State law and not the Retirement System. | **Partially Implemented** | GARS has adopted a funding policy that would provide for annual State contributions, the "Actuarially Determined Contribution", and is used for informational purposes only.<br><br>GRS continues to include strong language throughout their report recommending the use of an actuarially sound method and stating clearly that the statutory method is not actuarially sound. We find these statements to be appropriate and support their continuation.<br><br>**Recommendation repeated.** |
| 3. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g. membership declines, lower salary growth) can have on future State costs. In particular, the tests should demonstrate whether or not there is | **Implemented** | GARS added stress testing in appendices to the final Actuarial Valuation Report in a letter dated December 20, 2018.<br><br>**Recommendation continued.** |

## STATUS OF RECOMMENDATIONS FROM THE 2018 STATE ACTUARY'S REPORT

| Recommendations to Retirement System from 2018 State Actuary Report | Status | Comments |
|---|---|---|
| a potential for unsustainable costs during the statutory funding period. GRS did include stress testing in last year's final report, but did not include such stress testing in this year's draft report or in any supplemental report. We recommend that stress testing be added into this year's report. Because the public may only look to the valuation report for this type of information, we believe it should be contained here instead of any supplemental document to the Board that may potentially be overlooked. | | |
| 4. We recommend the GARS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work, and adjust assumptions accordingly. | **Implemented** | GRS has continued to do this, most recently providing a review in the *2018 Actuarial Experience Study* report dated April 23, 2019.<br><br>We will continue to include this recommendation each year.<br><br>**Recommendation continued.** |

**Chapter Seven**

# PRELIMINARY REPORT ON THE CHICAGO TEACHERS' PENSION FUND

In accordance with 40 ILCS 5/17-127(e), Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the Chicago Teachers' Pension Fund (CTPF) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to CTPF on December 3, 2019. The preliminary report was based on Cheiron's review of actuarial assumptions included in CTPF's 2019 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the Chicago Teachers' Pension Fund. CTPF's written response, provided on December 10, 2019, can be found in Appendix C.

**OVERVIEW**
**CHICAGO TEACHERS' PENSION FUND**
as of June 30, 2019

| | |
|---|---|
| Actuarial accrued liability | $23,252,163,307 |
| Actuarial value of assets | $11,021,811,634 |
| Unfunded liability | $12,230,351,673 |
| Funded ratio | 47.4% |
| | |
| State contribution (FY21) | $254,560,000 |
| | |
| Active members | 29,295 |
| Inactive members | 9,926 |
| Current benefit recipients | 28,317 |
| Non-vested eligible for refunds | 20,621 |
| Total membership | 88,159 |
| | |
| Interest rate assumption | 7.00% |
| Inflation assumption | 2.50% |
| Actuarial cost method | Projected Unit Credit |
| Asset valuation method | 4-year Smoothing |
| | |
| Executive Director | Charles Burbridge |
| Actuarial Firm | Gabriel, Roeder, Smith & Company |

Source: June 30, 2019 CTPF actuarial valuation report.

December 18, 2019

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

Board of Trustees
Public School Teachers' Pension and Retirement Fund of Chicago
203 N. LaSalle Street
Suite 2600
Chicago, Illinois 60601

Dear Trustees and Auditor General:

In accordance with Illinois Public Act 100-0465, Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution to the Public School Teachers' Pension and Retirement Fund of Chicago (CTPF or System) for Fiscal Year 2021.

**In summary we believe that the assumptions and methods used in the draft June 30, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable. We also find that the certified portion of the contribution which the State is responsible for was properly calculated.**

We have reviewed the experience analysis covering the 2019 Actuarial Assumption Study performed in recognition of both GRS's and Cheiron's recommendation for additional monitoring and agree with the recommendation of GRS for no additional changes in support of the expectations presented by the Chicago Public Schools (CPS) exceptions to the recommendations made in the 2012 through 2017 experience study performed last year.

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 2021. Section III also includes additional comments relating to our findings and recommendations. Finally, Section IV provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by CTPF and GRS. This information includes actuarial assumptions and methods adopted by the CTPF Board, the results of the 2012 through 2017 experience analysis, the 2019 Actuarial Assumptions Study, supplemental experience information provided by the CPS, plan provisions, the draft June 30, 2019 Actuarial Valuation, and minutes of the 2019 CTPF Board of Trustee

meetings during the results presentation. A detailed description of all information provided for this review is contained in Appendix B.

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

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

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

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

SIGNED ORIGINAL ON FILE

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

## SECTION I – REPORT SCOPE

Illinois Public Act 100-0465 (the Act) amended the Illinois Pension Code (40 ILCS 5/17-127) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the Public School Teachers' Pension and Retirement Fund of Chicago (CTPF or System) and to issue to the CTPF Board this preliminary report on the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution for Fiscal Year (FY) 2020. Under the Act, the required State contribution consists of 0.544% of Teacher total capped payroll, plus the employer normal cost, plus an amount pursuant to paragraph (3) of Section 17-142.1 to defray health insurance costs. The purpose of this review is to identify any recommended changes to the actuarial assumptions and methods for the CTPF Board to consider before finalizing its certification of the required State contribution for FY 2021.

While the Act states that just the actuarial assumptions and valuation are to be reviewed, we have also reviewed the actuarial funding method employed in preparing the Actuarial Certification, as the funding method can have a material effect on the amount of the State contribution being certified.

In addition to reviewing the Actuarial Certification of the required State contribution to CTPF, we have reviewed the "actuarial practices" of the Board. We have reviewed: (1) the use of a qualified actuary (as defined in the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2019 Actuarial Valuation.

Finally, this report is more limited in scope than the State Actuary reviews for the other Illinois Retirement Systems. This is because the State's responsibility is limited to the 0.544% of Teacher total capped payroll, the employer Normal Cost, and the amount to defray health insurance costs. The State is not responsible for the funding of the underfunded status of CTPF or the implications of sustainability to meet the current and future contributions necessary to achieve the legislative requirement that the City fund the plan to 90% by 2059. The State is responsible for the funding of the other Illinois Systems, which requires the State Actuary to review and analyze the long-term projections and the State mandated funding method.

## SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2019 Actuarial Valuation of CTPF as well as the "actuarial practices" of the CTPF Board. Section III of this report provides detailed analysis and rationale for these recommendations.

## Proposed Certification of the Required State Contribution

GRS has determined that the FY 2021 required State contribution calculated under the current statutory funding plan is $254,560,000 pursuant to P.A. 100-0465. This amount represents the three cost components of the States funding obligation which includes the net employer contribution amount of $189,560,000 plus the $65,000,000 health insurance subsidy.

In addition, the State contributes an amount equal to 0.544 percent of pay which is equal to $12,333,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based.

## Assessment of Actuarial Assumptions Used in the 2019 Valuation

40 ILCS 5/17-127(e) requires the State Actuary to identify recommended changes in actuarial assumptions that the CTPF Board must consider before finalizing its certification of the required State contribution. In response to the experience study performed last year the Chicago Public Schools took exception to two of the changes involving an expectation of continued decline in the number of active participants and the trend toward retiring early. CPS's argument is that the experience during this period was in part due to the financial crisis and that the membership behavior was in response to that crisis. They identified that the crisis has passed and that the number of actives and retirement behavior should revert back to what has been the trend. The Board accepted GRS's assumptions with the CPS's requested modification.

As recommended, GRS' performed additional analysis of the two assumption changes which were deferred to determine if the CPS's objective were supported by additional experience analysis. In GRS's 2019 Actuarial Assumptions Study they presented additional experience that supported CPS's expectations resulting in a recommendation to not make the assumption changes identified in last years' experience study and we agree with their rational.

## Recommended Changes for Future Valuations

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

2. We recommend 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 illustrate the potential stresses on the System and its contributing sponsors that may add to the potential for additional funding subsidies from the State.

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 except with regard to the adjustment of the total normal cost before expenses. The State required contribution is clearly identified in the Executive Summary when coupled with the details demonstrated in the Employer Contribution Requirement for Fiscal Year 2021.

## Assessment of Actuarial Assumptions Used in the 2019 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 contribution requirement of the system. The assumption is used to value liabilities for funding purposes. As part of last year's report, CTPF decreased the assumption from 7.25% to 7.00% and has retained this assumption for the draft June 30, 2019 Actuarial Valuation.

**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.**

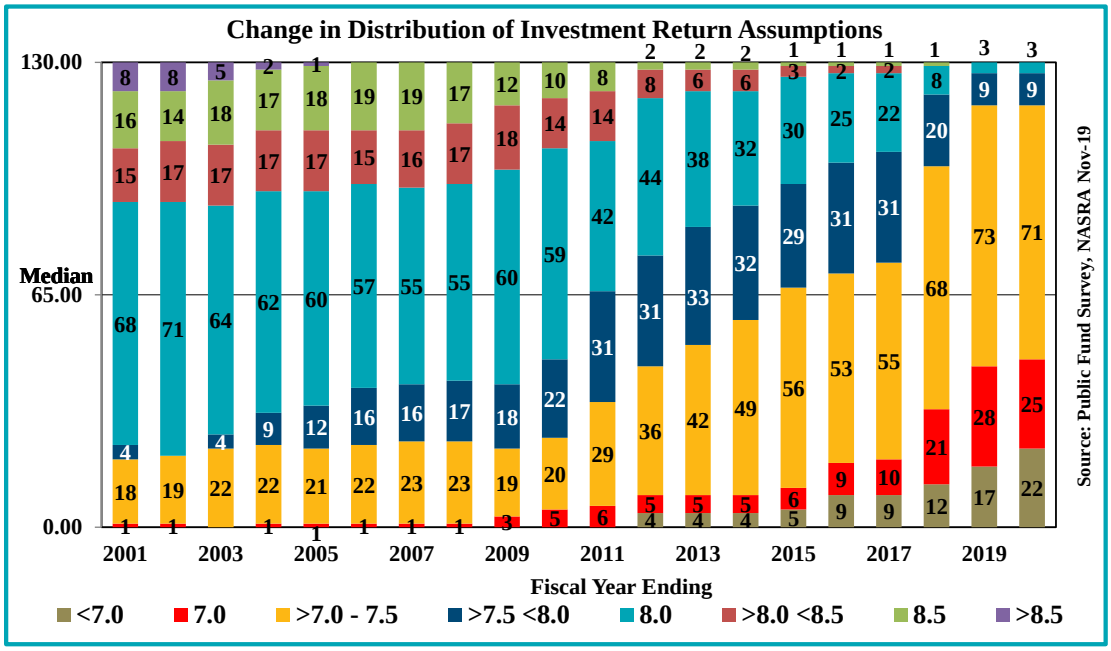
**We recommend that the CTPF Board continue to annually review the economic assumptions (interest rate and inflation), as was done for this valuation, prior to commencing the valuation work and adjust assumptions accordingly** (Recommendation #1).

*Our rationale for these recommendations:*

- In their September 10, 2019 Actuarial Assumptions Study, GRS presented long-term return expectations of fourteen selected investment consultants and concluded that the average10-year expected geometric return was 6.83%. This is based on a foundation assumption of 2.50% as the long- term inflation assumption.

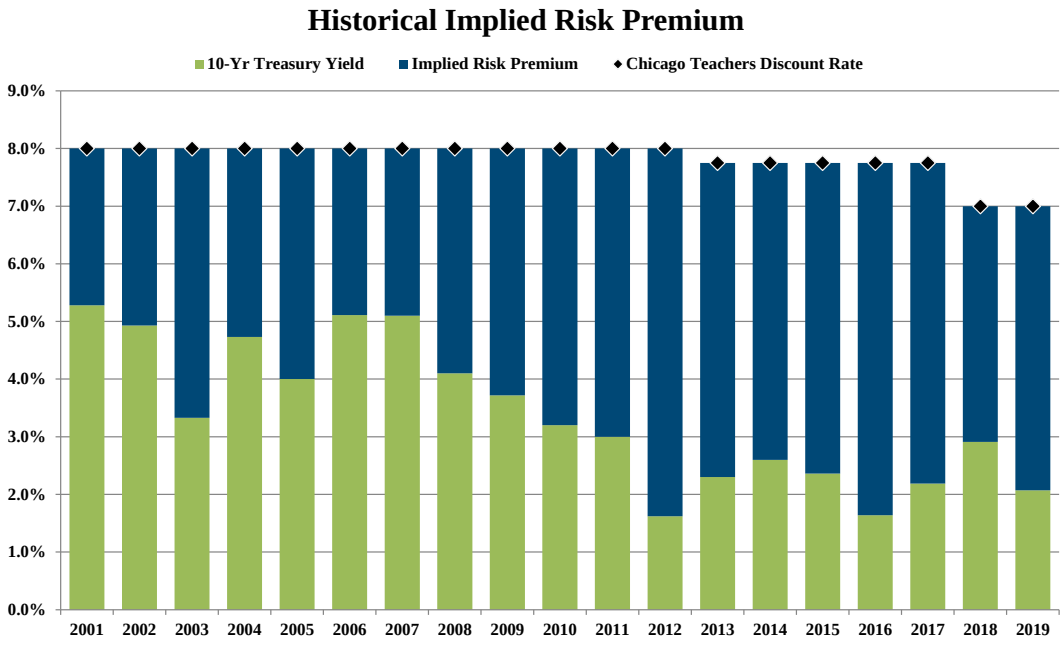
- While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 130 large retirement plans. The following chart shows the distribution of investment return assumptions for the plans

in the Public Plans Database since 2001. The latest data includes results collected through November 2019.




Over the period shown, there continues to be a pattern of reducing discount rates. Of the 130 plans shown for both 2019 and 2013, 114 have reduced their discount rate assumption since 2013. For these 114 plans, the average reduction is 0.57%. The data is consistent with the experience of other Cheiron clients, which have generally shown a significant trend of reducing their discount rate assumptions over the last several years.

- Declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, as shown in the following chart, in 2001 the yield on 10-year Treasury bonds (a proxy for a risk free investment) was 5.3%. To achieve CTPF's then assumed return of 8.0%, the System's investments had to outperform the yield on the 10-year Treasury by 2.7%. As of June 2019 the yield on the 10-year Treasury is now 2.1%, and to achieve CTPF's assumed return of 7.0%, the System's investments need to exceed the 10-year Treasury yield by 4.9%. So CTPF still has to take on more investment risk in 2019 to meet its assumption than it did in 2001. By reducing the investment return assumption, as CTPF has maintained, plans are more likely to meet their funding goals without requiring investment performance so much in excess of the risk free rate.




- As is the case with most maturing pension plans, CTPF is experiencing negative cash flows measured as contributions less benefits and expenses. CTPF's negative cash flow is 5.25% of assets and growing. When short-term returns are expected to be lower than the long-term expectations, which is the case with CTPF, a plan with negative cash flows will have actuarial returns (i.e., dollar weighted returns) that are less than "time weighted" returns.

2. *Inflation Assumption*

CTPF retained the 2.50% assumption for the June 30, 2019 valuation.

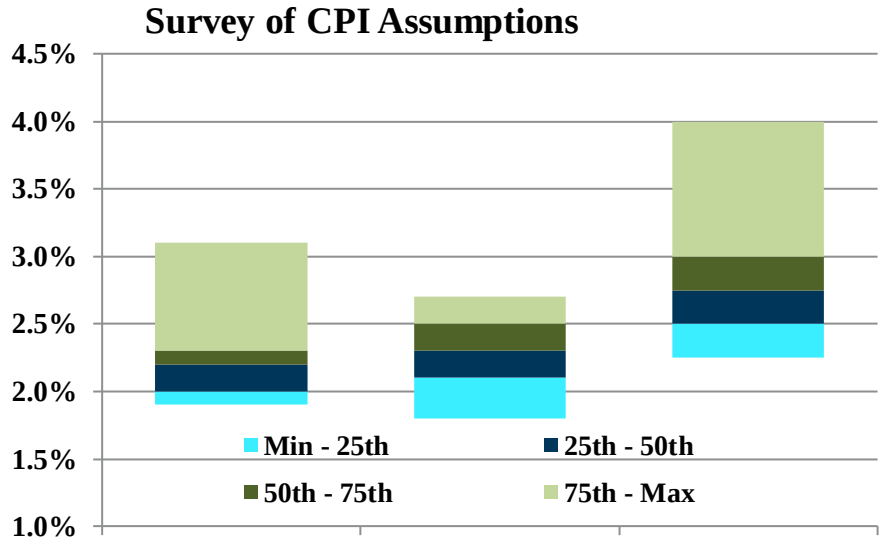
**We find the inflation assumption of 2.50% is reasonable.**

*Our rationale for conditionally concurring with the 2.50% assumption:*

- The April 2019 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years) inflation will average between 2.0% and 3.2% (http://www.ssa.gov/oact/tr/2019/tr2019.pdf). Under the intermediate cost projection the Social Security Administration uses an assumption of 2.6%.

- As supported in Pages B-2 to B-6 of the 2019 Actuarial Assumptions Study, GRS provides significant justification to retain the 2.50% inflation assumption.

- The chart below shows the distribution of inflation expectations for the Third Quarter 2019 survey of professional economic forecasters published by the Philadelphia Federal Reserve, the 2019 Horizon survey of investment consultant capital market assumptions (20-year), and the 2018 inflation assumptions used by plans in the Public Plans Database. While the assumption of 2.50% is higher than the middle of the range projected by professional economic forecasters and investment consultants, it is below the median rate used by other public plans.




| | Economic Forecasters | Horizon Survey | Public Plans Database |
|---|---|---|---|
| Minimum | 1.90% | 1.80% | 2.25% |
| 25th Percentile | 2.00% | 2.10% | 2.50% |
| 50th Percentile | 2.20% | 2.30% | 2.75% |
| 75th Percentile | 2.30% | 2.50% | 3.00% |
| Maximum | 3.10% | 2.70% | 4.00% |

*3. Salary (Annual Compensation) Increase Assumption*

For the 2018 Actuarial Valuation, the individual salary increase assumption was lowered by 0.25% from 3.25% to 3.00% based on the experience review of wage growth from 2012 through 2017. This assumption was retained for the draft June 30, 2019 valuation.

**We find the salary increase assumption consistent with information presented in the 2018 Actuarial Experience Study.** We reference Section E of that report with the supporting historic trends.

Below are illustrative rates of increase per individual employee per annum, compounded annually.

| Age | Annual Increase |
|---|---|
| 20 | 12.85% |
| 25 | 7.75% |
| 30 | 6.25% |
| 35 | 5.50% |
| 40 | 4.50% |
| 45 | 3.75% |
| 50 | 3.25% |
| 55 | 3.00% |
| 60 | 3.00% |
| 65 | 3.00% |
| 70 | 3.00% |

*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 2017, the assumption for COLAs was decreased from 1.375% to 1.25%. This is reasonable based on the inflation assumption change.

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

*5. Tier 2 Capped Pay Assumption*

Benefits for members hired after January 1, 2011, are calculated using pay that is capped under 40 ILCS 5/1-160. The pay cap increase assumption was lowered from 1.375% to 1.25% in 2017.

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

## B. Demographic Assumptions

Based on the 2018 Actuarial Experience Study, GRS made recommendations to the Board on September 20, 2018 for a number of assumption changes covering mortality rates, retirement, turnover, and disability rates. They also made recommendations to reflect the decline in active membership going forward in response to the trends demonstrated during the study period of 2012 through 2017.

The Chicago Public Schools (CPS) also made a presentation with respect to the recommendations putting forth a position that the active population trends and early retirement trends were a direct reflection during this period of study of the financial crisis and suggested that both these trends will revert back to past trends.

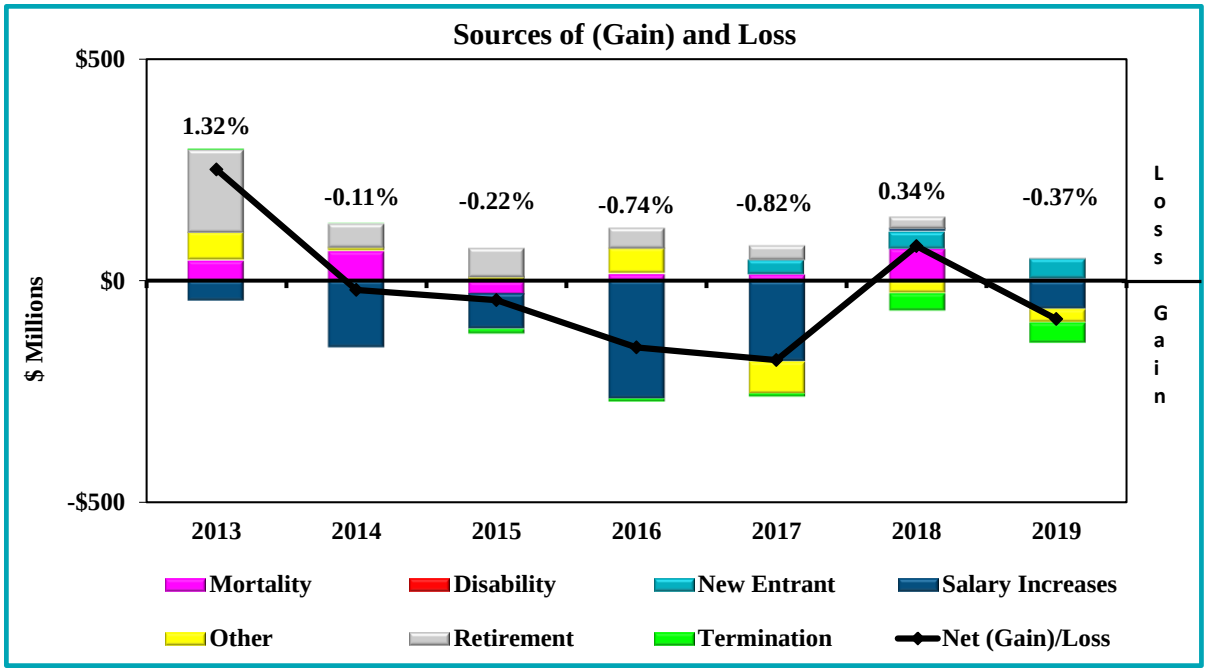
The Board adopted GRS's assumption change recommendations except for the active member reduction assumption and changes to the retirement trends to see if the position of the CPS holds up going forward. GRS committed to monitor these two assumptions and provide information to the Board on experience going forward.

GRS in their 2019 Actuarial Assumption Study provided additional evidence which supported CPS's concerns regarding these two assumptions resulting in GRS making no change to the assumptions

**We agree with CTPF's actuary, GRS that not changing the two assumptions is supported by the 2019 Actuarial Assumption Study and to maintain the assumptions in place prior to the study as suggested by the Chicago Public Schools.**

In its annual actuarial valuation reports, CTPF regularly reports sources of liability gains and losses. In the 2019 report, these are shown on pages 23 and 24. In the following chart, we have collected similar data from CTPF's past valuation reports dating back to 2013 and presented a historical review of past demographic and salary increase experience gains and losses.

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




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

Key observations from this chart are as follows:

1. A trend of salary gains has appeared in most years. This is likely to be a reflection of the current general economic environment and the cost impact of this System on budgets.

2. In every year since 2013 until this year, there have been experience losses attributable to retirement. As anticipated by CPS's expectations, it appears the trend shown here may have changed.

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

## 1. Mortality

*Pre-Retirement Mortality*

The RP-2014 White Collar Employee, sex distinct tables with 98% male adjustment and 113% female adjustment is used.

*Post-Retirement Disability Mortality*

The RP-2014 Disabled Annuitant, sex distinct tables with 103% male adjustment and 106% female adjustment is used.

*Post-Retirement Healthy Mortality*

The RP-2014 White Collar Healthy Annuitant, sex distinct tables with 108% male adjustment and 94% female adjustment is used.

Future mortality improvements are reflected by projecting the base mortality tables back from 2014 to 2006 using the Society of Actuaries MP-2014 tables and projecting from 2006 using the MP-2017 projection scale. This assumption provides generational mortality tables and includes a margin for future mortality improvements.

## 2. Termination

Service-based termination rates were used. Select rates are as follows:

| Termination | | | |
|---|---|---|---|
| **Service (Beginning of Year)** | **Rate (%)** | **Service (Beginning of Year)** | **Rate (%)** |
| 0 | 30.00% | 16 | 2.25% |
| 1 | 16.00% | 17 | 2.25% |
| 2 | 13.00% | 18 | 2.25% |
| 3 | 12.00% | 19 | 2.25% |
| 4 | 9.00% | 20 | 2.25% |
| 5 | 9.00% | 21 | 2.25% |
| 6 | 8.00% | 22 | 2.25% |
| 7 | 6.00% | 23 | 2.25% |
| 8 | 5.00% | 24 | 2.25% |
| 9 | 5.00% | 25 | 2.25% |
| 10 | 4.00% | 26 | 2.25% |
| 11 | 3.00% | 27 | 2.25% |
| 12 | 3.00% | 28 | 2.25% |
| 13 | 3.00% | 29 | 2.25% |
| 14 | 3.00% | 30 | 1.75% |
| 15 | 3.00% | 31 + | 1.75% |

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

## 3. Disability

Disability rates, based on recent experience of the Fund, were applied to members with at least 10 years of service. All disabilities are assumed to be non-duty disabilities. Sample rates are as follows:

| Age | Rate (%) |
|---|---|
| 20 | 0.04% |
| 25 | 0.04% |
| 30 | 0.04% |
| 35 | 0.05% |
| 40 | 0.06% |
| 45 | 0.08% |
| 50 | 0.19% |
| 55 | 0.24% |
| 60 | 0.29% |

## 4. Retirement

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

| Retirement Rates for Tier 1 Employees | | |
|---|---|---|
| Age | <34 Years of Service Rate (%) | 34+ Years of Service Rate (%) |
| 55 | 5.00% | 20.00% |
| 56 | 5.00% | 20.00% |
| 57 | 5.00% | 20.00% |
| 58 | 5.00% | 20.00% |
| 59 | 7.00% | 20.00% |
| 60 | 9.00% | 22.50% |
| 61 | 11.00% | 22.50% |
| 62 | 12.00% | 22.50% |
| 63 | 13.00% | 22.50% |
| 64 | 14.00% | 22.50% |
| 65 | 15.00% | 25.00% |
| 66 | 16.00% | 25.00% |
| 67 | 17.00% | 25.00% |
| 68 | 18.00% | 27.50% |
| 69 | 19.00% | 27.50% |
| 70 | 20.00% | 30.00% |
| 71 | 20.00% | 30.00% |
| 72 | 20.00% | 30.00% |
| 73 | 20.00% | 30.00% |
| 74 | 20.00% | 30.00% |
| 75 | 100.00% | 100.00% |

| Retirement Rates for Tier 2 Employees | |
|---|---|
| **Age** | **Rate (%)** |
| 62 | 40.00% |
| 63 | 25.00% |
| 64 | 25.00% |
| 65 | 30.00% |
| 66 | 25.00% |
| 67 | 30.00% |
| 68 | 20.00% |
| 69 | 20.00% |
| 70 | 20.00% |
| 71 | 20.00% |
| 72 | 20.00% |
| 73 | 20.00% |
| 74 | 20.00% |
| 75 | 100.00% |

## 5. Active Member Population as of the Valuation Date

The Tier 2 active population as of the actuarial valuation date of June 30, 2019, was increased by 142 members in order to estimate the total expected number of active members that will be working and making contributions in the upcoming fiscal year. Members who retire at the end of the school year have June retirement dates and are already reflected as retirees in the data received as of June 30, but new active members to replace these members are not hired until August or September and are not included in the census data until the following fiscal year. These members are assumed to have a similar demographic profile as new entrants who have been hired in the last three years.

## 6. Population Projection

For purposes of determining annual appropriation as a percent of total covered payroll, the size of the active group is assumed to remain level at the number of actives as of the actuarial valuation date including new hires, or 29,437. New entrants are assumed to enter with an average age and an average pay as disclosed below. New entrants are assumed to have a similar demographic profile of recent new entrants to the Fund. The average increase in payroll for the projection period is 3.00 percent per year.

| New Entrant Profile | | |
|---|---|---|
| **Age Group** | **No.** | **Salary** |
| Under 20 | | |
| 20-24 | 1,063 | $ 51,493,871 |
| 25-29 | 1,500 | 75,145,249 |
| 30-34 | 785 | 40,666,028 |
| 35-39 | 457 | 23,069,777 |
| 40-44 | 294 | 14,606,436 |
| 45-49 | 250 | 12,373,168 |
| 50-54 | 169 | 7,184,922 |
| 55-59 | 149 | 6,104,574 |
| 60-64 | 82 | 2,358,889 |
| 65-69 | 11 | 158,700 |
| 70 & Over | | |
| **Total** | **4,760** | **$ 233,161,614** |
| **Avg. Salary** | | **$ 48,984** |
| **Avg. Age** | | **32.22** |
| **Percent Female** | | **76%** |

## 7. Expenses

Administrative expenses included in the normal cost are based on the previous year's administrative expenses increased by 5.75 percent. Future administrative expenses are assumed to increase by 5.75 percent per year for 15 years and then increase at a rate consistent with the increase in projected capped payroll thereafter.

## 8. Marriage Assumption

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

### 9. Spouse's Age

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

### 10. Total Service at Retirement

A teacher's total service credit at retirement is assumed to be 103.3 percent of the teacher's regular period of service at retirement.

### 11. Valuation of Inactive Members Eligible for Deferred Vested Pension Benefits

Benefits for inactive deferred vested members were determined by projecting the accumulated contribution balance to retirement (age 62) with interest at the assumed investment rate of return, converted to an annuity, and then loaded by 35 percent.

### 12. Assumption for Missing Data

Members whose gender was not provided are assumed to be female.

### 13. Contribution Timing

Projected employer contributions are assumed to occur based on the following timing:

1. Additional Board of Education Contribution (0.58 percent of pay) - June 30th (End of Year)
2. Additional State Contribution (0.544 percent of pay) - Monthly (Middle of Year)
3. State Normal Cost Contribution - Monthly (Middle of Year)
4. Board of Education Early Payment of Special Tax Levy - March 1st, annually
    a. 55 percent of prior year's tax levy is assumed to occur each March 1st
        i. This amount is assumed to be $180,612,283 for fiscal year 2020 and increased each year by three percent
5. Remaining Board of Education Contribution - June 30th (End of Year)

### 14. Decrement Timing

All decrements are assumed to occur during the middle of the year.

### 15. Decrement Relativity

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

## 16. Decrement Operation

Turnover decrements do not operate after a member reaches retirement eligibility. Disability decrements do not operate after a member reaches normal retirement eligibility.

## 17. Eligibility Testing

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

## 18. Assumptions as a result of Public Act 96-0889

Members hired on or after January 1, 2011, are assumed to make contributions on salary up to the final average compensation cap in a given year.

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

Capped (pensionable) pay was $114,952 for fiscal year 2019 and increases at ½ the annual increase in the Consumer Price Index-U thereafter.

The annual increase in the Consumer Price Index-U is assumed to be 2.50 percent for all years.

## C. Funding Methods

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and, (3) the amortization method.

*1. Actuarial Cost Method*

The System uses the projected unit credit cost method (PUC) to assign costs to years of service, as required under the Pension Code (40 ILCS 5/17). **We have no objections with respect to using the PUC method, although we, as GRS does, would prefer the Entry Age Normal (EAN) cost method as it is more consistent with the requirement in 40 ILCS 5/17-129 for level percent of pay funding**.

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

*2. Asset Valuation Method*

The actuarial value of assets for the System is a smoothed market value. The primary purpose for smoothing out gains and losses over multiple years is so fluctuations in the contributions will be less volatile over time than if based on the Market Value of Assets. **The CTPF smooths the unexpected annual investment gains and losses over a period of four years to determine the Actuarial Value of Assets.** The investment gain or loss for a year is calculated as the total investment income on the Market Value of Assets, minus expected investment return on the prior actuarial value of assets. The final actuarial value is equal to the expected actuarial value plus (or minus) 25 percent of the calculated gain (or loss) in the prior four years. **This is a generally accepted approach in determining actuarial cost, and we concur with its use.**

*3. Amortization Method*

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2059. The problem with this

method and particularly by amortizing the unfunded over a level percent of pay means that the annual payments do not cover the interest cost on the unfunded until 2040 resulting in an increasing unfunded liability until then which is a concern for a plan that has such a low funded ratio.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be "a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period." Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

While there is concern over the mandated funding method conforming to generally acceptable actuarial principles and practices, the State's obligation for funding under this Fund is limited to payment of the future normal cost plus expenses and health care subsidy so these practices are not a concern relative to the State's obligation.

## SECTION IV – ANALYSIS OF FUNDING ADEQUACY

In this section, we examine the adequacy of the funding for the System, including funded status, the sources of changes in the Unfunded Actuarial Liability (UAL), and projections of the UAL.

CTPF has several indications that they are at risk of not adequately funding the system in order to avoid insolvency. Currently the System has a 47.5% funded ratio on a Market Value of Assets basis. This is the lowest point in the last 10 years reported in GRS's valuation report. When coupled with the negative cash flow (where benefit payments and expenses exceed the contributions to the fund) of 5.25% of the market asset value, the risk is increased. Even if the expected return on assets of 7.00% is met, only 1.75% of the return will be available to increase the asset value.

Insolvency risk increases if contribution levels increase to unsustainable levels. Currently, the cost of the Plan including the amounts from the State and Board of Education represents 52.07% of capped payroll when considering the actuarially determined contribution requirement. The State's current obligation is fixed at the net employer normal cost plus 0.544% of capped payroll and the health insurance subsidy. However, if the level of cost becomes unsustainable for the City, there could be additional risk of the State being called on to provide additional funding assistance through legislation. Therefore, it is important that the State understand the risks within the System. **On this basis, we 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 illustrate the potential stresses on the System and its contributing sponsors that may add to the potential for additional funding subsidies from the State** (Recommendation #2).

The actuarial valuation report prepared by GRS includes both traditional actuarial measurements, as well as some projections on pages 28 to 33 of the draft June 30, 2019 valuation report. Given the unique and substantial funding challenges faced by the CTPF and the implications of future reliance on the State for funding this additional information would be quite important and supplements the information we present here on funding adequacy to better inform the legislature and other stakeholders about the adequacy of the System's funding.

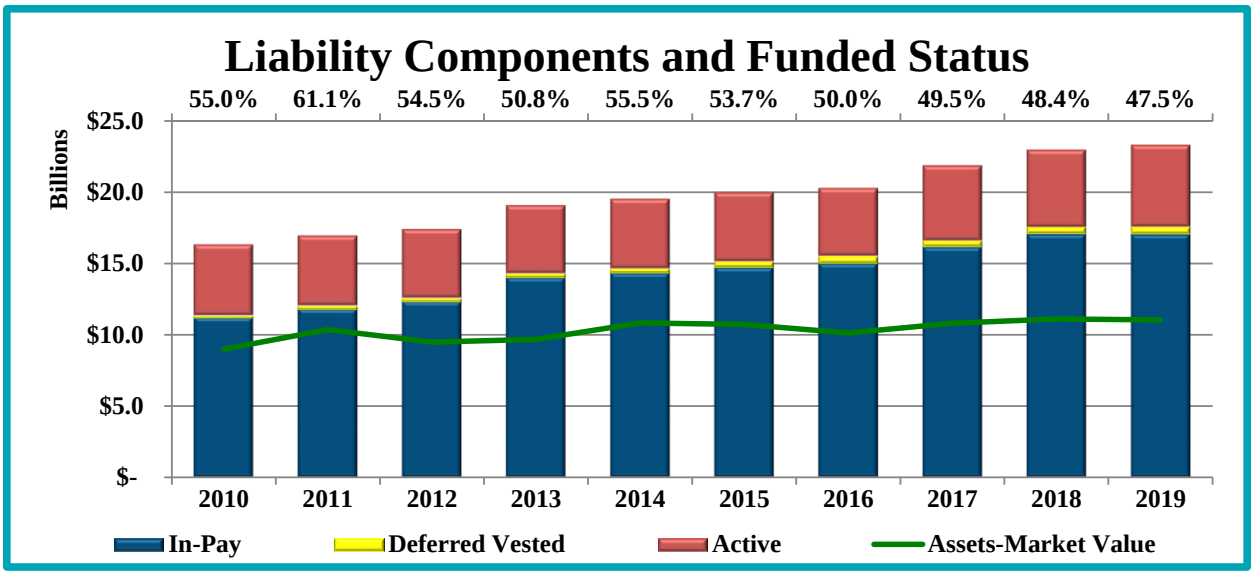
## SECTION IV – ANALYSIS OF FUNDING ADEQUACY

### System Funded Status

The first funding adequacy measure is the historical trend of the System's funded status for the past ten years which is also included in the GRS draft report. Funded status for this purpose is defined as the ratio of the market value of assets to the actuarial liability. The chart below shows that CTPF's funded status has declined from 55.0% in 2010 to 47.5% in 2019, a decline in funded status of 7.5%. In addition to showing the funded status, this chart also shows the breakdown of the plan's liabilities by membership status:

- Active liability – the liability (attributable to service already performed) for future payments to members who are currently working in the System,
- Deferred Vested liability – the liability for future payments to members who are no longer working in the system, and
- In-Pay liability – the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown shows that today plan assets only cover about 60% of the liabilities for just those members currently in-pay status.

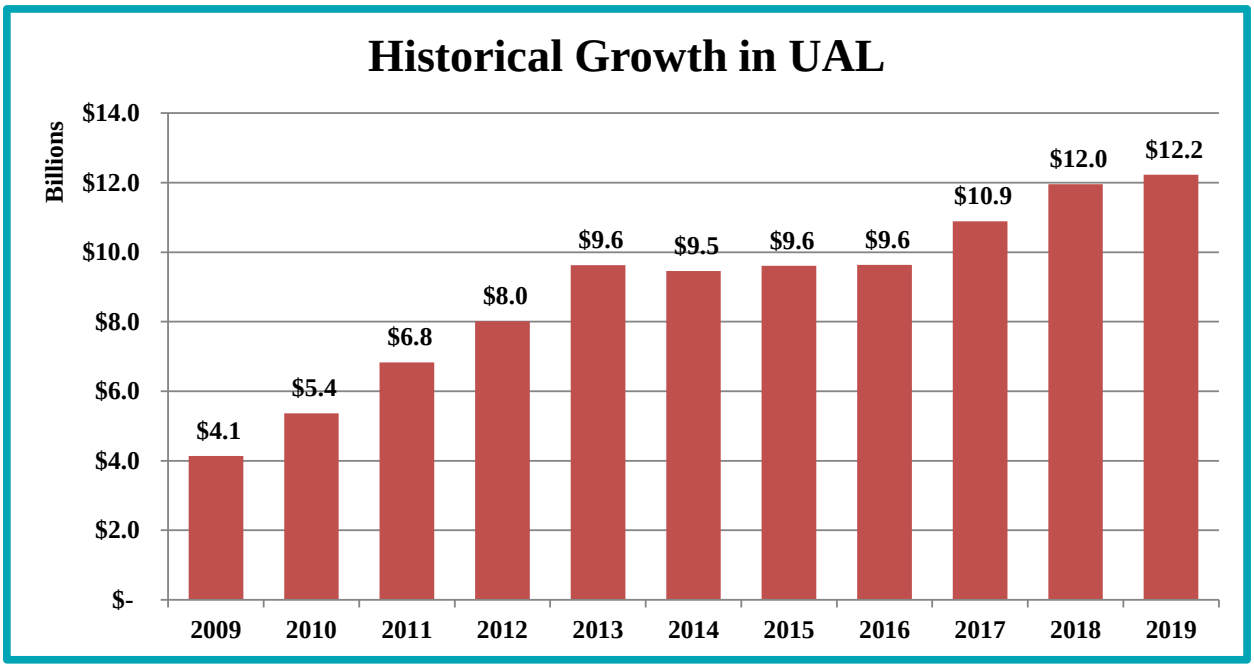



Source: Cheiron analysis of funding adequacy.

## SECTION IV – ANALYSIS OF FUNDING ADEQUACY

### Sources of Changes in the UAL

As shown in the chart below, CTPF's Unfunded Actuarial Liability (UAL) has grown from about $4.1 billion in 2009 to $12.2 billion in 2019, an increase of $8.1 billion. To understand how to reverse this trend, it is important to understand the sources contributing to it.




Source: Cheiron analysis of funding adequacy.

The changes to the UAL from June 30, 2009 to June 30, 2019 can be separated into the following components:

- **Contribution Deficiencies** – Contributions that are less than the tread water contribution cause the UAL to increase. The tread water contribution consists of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the Unfunded Actuarial Liability. This sum is referred to as the tread water contribution because it is the contribution necessary so that the UAL will remain constant, or "tread water" (absent experience gains or losses). The difference between actual contributions and the tread water contributions increased the UAL by $3.1 billion over this period.

- **Assumption Changes** – changes to actuarial assumptions over this period increased the UAL by $2.7 billion. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations. Without the changes a similar UAL increase would show up as experience losses over time.

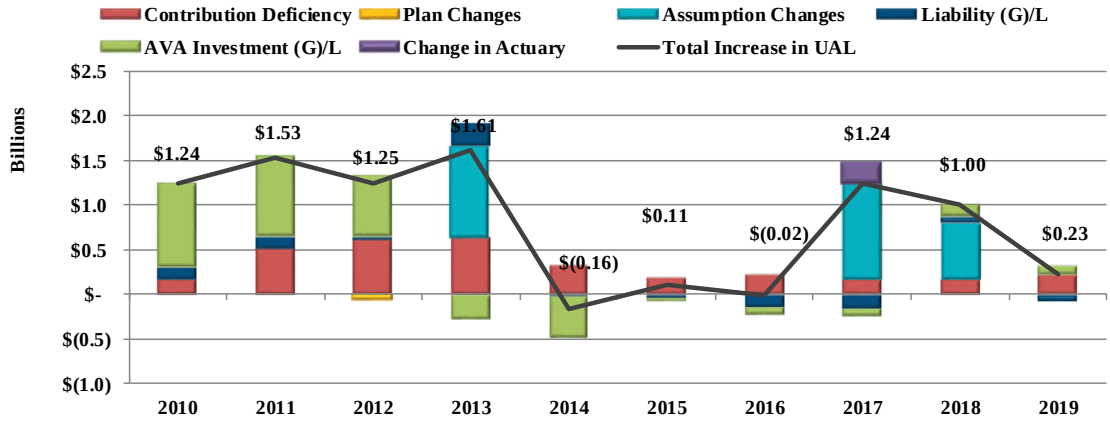
- **Plan Changes** – modifications to the design of the Plan had a negligible impact over this period as most of the changes only affected future benefits.

## SECTION IV – ANALYSIS OF FUNDING ADEQUACY

- **Liability (Gain) or Loss** – the changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.) were generally small and only increased the UAL by $0.2 billion over this period.

- **AVA (Actuarial Value of Assets) Investment (Gain) or Loss** – the net investment gain or loss due to assets earning more or less than assumed increased the UAL over this period increased the UAL by $1.8 billion.

The chart below shows the changes in UAL each year broken into these six components. The sum of all the components (total change in UAL) is shown as the black line.




| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Contributions** | 0.16 | 0.50 | 0.60 | 0.62 | 0.32 | 0.19 | 0.21 | 0.17 | 0.17 | 0.21 | **$ 3.14** |
| **Assumptions** | - | - | - | 1.02 | - | - | - | 1.07 | 0.62 | - | **$ 2.72** |
| **Investments** | 0.94 | 0.90 | 0.68 | (0.28) | (0.46) | (0.05) | (0.08) | (0.08) | 0.13 | 0.10 | **$ 1.80** |
| **Plan Changes** | - | - | (0.07) | - | - | - | - | - | - | - | **$ (0.07)** |
| **Liabilities** | 0.14 | 0.14 | 0.03 | 0.25 | (0.02) | (0.03) | (0.15) | (0.16) | 0.08 | (0.08) | **$ 0.20** |
| **Change in Actuary*** | - | - | - | - | - | - | - | 0.24 | - | - | **$ 0.24** |
| **Total** | **$ 1.24** | **$ 1.53** | **$ 1.25** | **$ 1.61** | **$ (0.16)** | **$ 0.11** | **$ (0.02)** | **$ 1.24** | **$ 1.00** | **$ 0.23** | **$ 8.02** |

*The Change in UAL due to the Change in Actuary for the 7/1/2013 valuation was not reported as a standalone value and is included in the Assumption value.
Source: Cheiron analysis of funding adequacy.

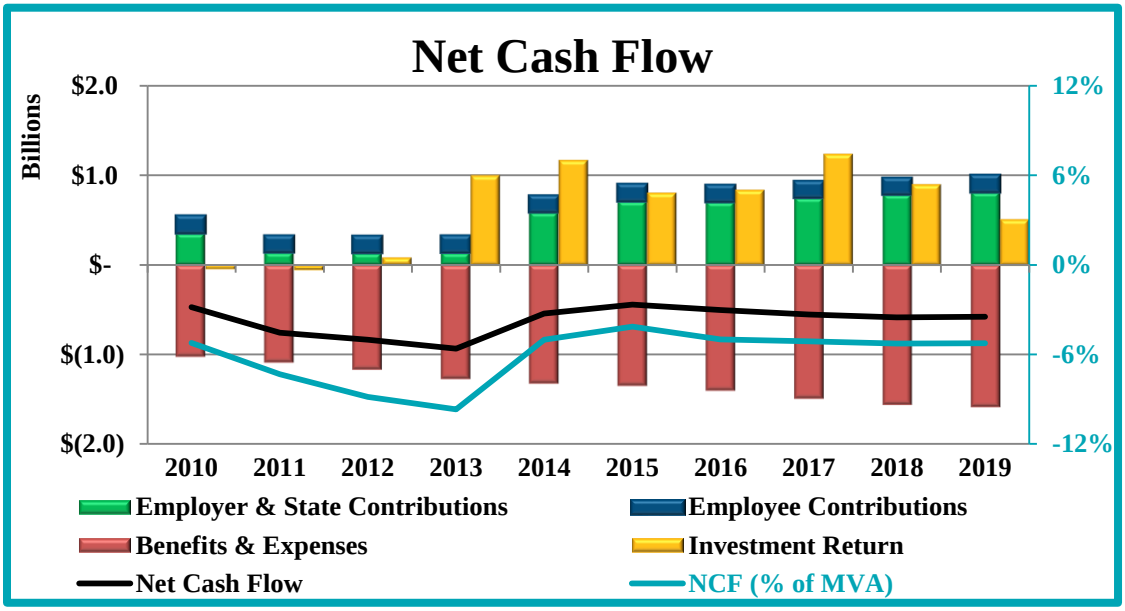
We expect that this chart will help stakeholders understand the sources of growth in the UAL over the past decade and inform discussions about the current funding requirements and adequacy.

## SECTION IV – ANALYSIS OF FUNDING ADEQUACY

### Net Cash Flow Analysis

The plan's net cash flow is defined as State and Member contributions less benefit payments and administrative expenses. The more negative net cash flow is as a percentage of the plan's assets, the more vulnerable the plan is to market downturns. When a pension plan has more payouts than contributions and suffers an investment loss, it is left with fewer assets to invest and recapture during a recovery.

Looking at the chart below, CTPF has a significant negative net cash flow (black line). If contributions increase as quickly as benefit payments, the net cash flow will remain stable. But if contributions do not continue to grow either because the plan has become better funded or because the expected contributions are not made, negative net cash flow may become even more significant issue, therefore it should continue to be monitored. The teal line shows net cash flow as a percent of Market Value of Assets on the right side axis. The greater the negative cash flows are relative to plan assets the more vulnerable a plan is to market downturns. This is because once there is a market downturn, the plan assets loses both on the return and the negative cash flow, leaving it with a lower asset base from which to recover from the loss.




Source: Cheiron analysis of funding adequacy.

## STATUS OF RECOMMENDATIONS FROM THE 2018 STATE ACTUARY'S REPORT

## Response to Recommendations in 2018

In the State Actuary's Preliminary Report on the CTPF presented December 20, 2018, 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, 2019 Actuarial Valuation.

| Recommendations to Retirement System from 2018 State Actuary Report | Status | Comments |
|---|---|---|
| 1. We recommend the Actuary in their valuation report disclose the difference between the total normal cost disclosed in the summary table of results and the normal cost shown in the *Development of Normal Cost State* Contributions *under Section 17-127(d)(1) of the Illinois Pension Code* (the difference between the values of $366,153,498 and $376,739,000). | **Implemented** | After the draft report was issued, GRS provided an additional disclosure explaining the difference between the two values shown and made clarifying edits to the Actuarial Valuation Report.<br><br>The 2018 draft report has these values broken out.<br><br>**Recommendation removed.** |
| 2. We recommend the CTPF Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation. | **Implemented** | GRS believes this recommendation is reasonable and has addressed in a supplemental report as the *2019 Actuarial Assumption Study*.<br><br>**Recommendation continued.** |
| 3. We agree with CTPF's actuary, GRS, that the two assumptions changes that were not adopted by the Board based on the Chicago Public Schools' request, continue to be monitored and assumption changes be adopted if there continue to be reductions in the active participants and if the early retirement behavior patterns continue. | **Implemented** | The additional analysis was included in the 2019 Actuarial Assumption Study in which it was demonstrated that CPS's expectation were realized and these two assumptions were not therefor changed. We agree with the conclusions based on the additional study.<br><br>**Recommendation removed.** |

# APPENDICES

# APPENDIX A
# Relevant Statutory Sections Involving the State Actuary

**Illinois State Auditing Act**

(30 ILCS 5/2-8.1)

Sec. 2-8.1. Actuarial Responsibilities.

(a) The Auditor General shall contract with or hire an actuary to serve as the State Actuary. The State Actuary shall be retained by, serve at the pleasure of, and be under the supervision of the Auditor General and shall be paid from appropriations to the office of the Auditor General. The State Actuary may be selected by the Auditor General without engaging in a competitive procurement process.

(b) The State Actuary shall:

(1) review assumptions and valuations prepared by actuaries retained by the boards of trustees of the State-funded retirement systems;

(2) issue preliminary reports to the boards of trustees of the State-funded retirement systems concerning proposed certifications of required State contributions submitted to the State Actuary by those boards;

(3) cooperate with the boards of trustees of the State-funded retirement systems to identify recommended changes in actuarial assumptions that the boards must consider before finalizing their certifications of the required State contributions;

(4) conduct reviews of the actuarial practices of the boards of trustees of the State-funded retirement systems;

(5) make additional reports as directed by joint resolution of the General Assembly; and

(6) perform any other duties assigned by the Auditor General, including, but not limited to, reviews of the actuarial practices of other entities.

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

(d) For the purposes of this Section, "State-funded retirement system" means a retirement system established pursuant to Article 2, 14, 15, 16, or 18 of the Illinois Pension Code.

(Source: P.A. 97-694, eff. 6-18-12.)

**Illinois Pension Code (Chicago Teachers' Pension Fund)**

(40 ILCS 5/17-127)

Sec. 17-127. Financing; revenues for the Fund.

(d) The Board shall determine the amount of State contributions required for each fiscal year on the basis of the actuarial tables and other assumptions adopted by the Board and the recommendations of the actuary. On or before November 1 of each year, beginning November 1, 2017, the Board shall submit to the State Actuary, the Governor, and the General Assembly a proposed certification of the amount of the required State contribution to the Fund for the next fiscal year, along with all of the actuarial assumptions, calculations, and data upon which that proposed certification is based.

On or before January 1 of each year, beginning January 1, 2018, the State Actuary shall issue a preliminary report concerning the proposed certification and identifying, if necessary, recommended changes in actuarial assumptions that the Board must consider before finalizing its certification of the required State contributions.

(e) On or before January 15, 2018 and each January 15 thereafter, the Board shall certify to the Governor and the General Assembly the amount of the required State contribution for the next fiscal year. The certification shall include a copy of the actuarial recommendations upon which it is based and shall specifically identify the Fund's projected employer normal cost for that fiscal year. The Board's certification must note any deviations from the State Actuary's recommended changes, the reason or reasons for not following the State Actuary's recommended changes, and the fiscal impact of not following the State Actuary's recommended changes on the required State contribution.

For the purposes of this Article, including issuing vouchers, and for the purposes of subsection (h) of Section 1.1 of the State Pension Funds Continuing Appropriation Act, the State contribution specified for State fiscal year 2018 shall be deemed to have been certified, by operation of law and without official action by the Board or the State Actuary, in the amount provided in subsection (c) and subsection (d) of this Section.

**Additions to the Illinois Pension Code from Public Act 100-0023**

Public Act 100-0023 added the same language to five Pension Code sections.

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**Sections:**

(40 ILCS 5/2-124) – General Assembly Retirement System

(40 ILCS 5/14-131) – State Employees' Retirement System

(40 ILCS 5/15-155) – State Universities Retirement System

(40 ILCS 5/16-158) – Teachers' Retirement System

(40 ILCS 5/18-131) – Judges Retirement System

**Added language:**

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

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

(i) as already applied in State fiscal years before 2018; and

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

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# APPENDIX B

# Materials Reviewed by Cheiron

Appendix B

# MATERIALS REVIEWED BY CHEIRON

Following is a listing of information reviewed by Cheiron for each of the retirement systems. This is the information Cheiron relied upon in preparing the preliminary reports of the retirement systems.

**Teachers' Retirement System:**

- Illinois Law:
  - Illinois Pension Code (40 ILCS 5/) Article 16: Teachers' Retirement System of the State of Illinois
  - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023, P.A. 100-0340, P.A. 100-0587

- Files received from the Teachers' Retirement System:
  - RVK 2011-2018 Asset Allocation/Investment Performance Presentations
  - Buck IL TRS 2012-2015 Board Meeting Presentations and Memos
  - Segal IL TRS 2016-2019 Board Meeting Presentations
  - Board Meeting Minutes and Agendas from 2013-2019
  - Buck IL TRS 2007-2015 Valuation Reports
  - Segal IL TRS 2016-2019 Valuation Reports
  - Buck IL TRS 2012-2015 Certifications of Required State Contribution
  - Segal IL TRS 2016-2019 Certifications of Required State Contribution
  - Buck IL TRS Experience Analysis Reports for 2007, 2012, 2015
  - Segal IL TRS Experience Analysis 2016, 2017, 2018
  - Buck IL TRS spreadsheet with additional details on Section 4 of 2013-2015 AVRs
  - TRS Economic Impact Study of Benefits – May 2015
  - TRS Stress Testing Scenarios

- Other:
  - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
  - *2018 National Conference on Public Employees Retirement Systems* (NCPERS) Public Retirement Systems Study issued January 2019
  - November 2019 Survey published by the National Association of State Retirement Agencies (NASRA)
  - April 2019 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)
  - Public Plans Database as of November 2019

- Survey of Professional Forecasters, Third Quarter 2019, Federal Reserve Bank of Philadelphia
- Publication H.15 Selected Interest Rates, Board of Governors of the Federal Reserve System
- CPI-All Urban Consumers, Bureau of Labor Statistics
- Quarterly Census of Employment and Wages, Bureau of Labor Statistics
- Survey of Capital Market Assumptions, 2018 and 2019 Editions, Horizon Actuarial Services, LLC

**State Universities Retirement System**

- Illinois Law:
  - Illinois Pension Code (40 ILCS 5/) Article 15 : State Universities Retirement System of Illinois
  - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023, P.A. 100-0587

- Files received from the State Universities Retirement System:
  - Board Meeting Minutes and Agendas from 2013-2019
  - GRS IL SURS 2008-2019 Valuation Reports
  - GRS IL SURS 2012 - 2019 Certifications of Required State Contribution
  - GRS IL SURS DRAFT 2014-2019 GASB 67/68 Reports
  - GRS SURS 2015 Economic Assumptions Review Presentation & Report
  - GRS SURS 2018 Experience Review Report
  - 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 2019
  - GRS IL SURS GASB 67 Plan Reporting and Accounting Schedules

- Other:
  - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
  - *2018 National Conference on Public Employees Retirement Systems* (NCPERS) Public Retirement Systems Study issued January 2019
  - November 2019 Survey published by the National Association of State Retirement Agencies (NASRA)
  - April 2019 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)
  - Public Plans Database as of November 2019
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  - Publication H.15 Selected Interest Rates, Board of Governors of the Federal Reserve System

- CPI-All Urban Consumers, Bureau of Labor Statistics
- Quarterly Census of Employment and Wages, Bureau of Labor Statistics
- Survey of Capital Market Assumptions, 2018 and 2019 Editions, Horizon Actuarial Services, LLC

**State Employees' Retirement System**

- Illinois Law:
  - Illinois Pension Code (40 ILCS 5/) Article 14: State Employees' Retirement System of Illinois
  - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023, P.A. 100-0587

- Files received from the State Employees' Retirement System:
  - SERS 2018 Experience Review for the Years July 1, 2015 to June 30, 2018
  - Board Meeting Minutes and Agendas from 2013-2019
  - GRS IL SERS 2007-2019 Valuation Reports
  - GRS IL SERS 2012-2019 Certifications of Required State Contribution
  - GRS IL SERS 2018 Economic Assumption Update Review
  - GRS IL SERS spreadsheet with additional details on Tables 4 and 7-10 from 2014 & 2015 Valuation Reports
  - GRS IL SERS DRAFT 2014-2018 GASB 67/68 Reports
  - ISBI Fund Evaluation Reports 2015-2019

- Other:
  - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
  - *2018 National Conference on Public Employees Retirement Systems* (NCPERS) Public Retirement Systems Study issued January 2019
  - November 2019 Survey published by the National Association of State Retirement Agencies (NASRA)
  - April 2019 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)
  - Public Plans Database as of November 2019
  - Survey of Professional Forecasters, Third Quarter 2019, Federal Reserve Bank of Philadelphia
  - Publication H.15 Selected Interest Rates, Board of Governors of the Federal Reserve System
  - CPI-All Urban Consumers, Bureau of Labor Statistics
  - Quarterly Census of Employment and Wages, Bureau of Labor Statistics
  - Survey of Capital Market Assumptions, 2018 and 2019 Editions, Horizon Actuarial Services, LLC

**Judges' Retirement System**

- Illinois Law:
  - Illinois Pension Code (40 ILCS 5/) Article 18: Judges' Retirement System of Illinois

- Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023

- Files received from the Judges' Retirement System:
  - JRS Experience Review for July 1, 2015 to June 30, 2018
  - Board Meeting Minutes and Agendas from 2013-2019
  - Goldstein & Associates JRS 2006 – 2011 Valuation Reports
  - GRS IL JRS 2012 – 2019 Valuation Reports
  - GRS IL JRS 2012 – 2019 Certifications of Required State Contributions
  - GRS IL JRS 2019 Valuation Results presentation
  - GRS IL JRS spreadsheet with additional details on Tables 4 and 7-10 from 2014 & 2015 Valuation Reports
  - GRS IL JRS DRAFT 2015 – 2019 GASB 67/68 Reports

- Other:
  - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
  - *2018 National Conference on Public Employees Retirement Systems* (NCPERS) Public Retirement Systems Study issued January 2019
  - November 2019 Survey published by the National Association of State Retirement Agencies (NASRA)
  - April 2019 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)
  - Public Plans Database as of November 2019
  - Survey of Professional Forecasters, Third Quarter 2019, Federal Reserve Bank of Philadelphia
  - Publication H.15 Selected Interest Rates, Board of Governors of the Federal Reserve System
  - CPI-All Urban Consumers, Bureau of Labor Statistics
  - Quarterly Census of Employment and Wages, Bureau of Labor Statistics
  - Survey of Capital Market Assumptions, 2018 and 2019 Editions, Horizon Actuarial Services, LLC

**General Assembly Retirement System**

- Illinois Law:
  - Illinois Pension Code (40 ILCS 5/) Article 2: General Assembly Retirement System of Illinois
  - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023

- Files received from the General Assembly Retirement System:
  - GARS Experience Review for July 1, 2015 to June 30, 2018
  - Board Meeting Minutes and Agendas from 2013 – 2019
  - Goldstein & Associates GARS 2006 – 2011 Valuation Reports
  - GRS IL GARS 2012 – 2019 Valuation Reports
  - GRS IL GARS 2012 – 2019 Certifications of Required State Contributions

- GRS IL GARS 2019 Economic Assumption Update Review
- GRS IL GARS spreadsheet with additional details on Tables 4 and 7-10 from 2014 – 2019 Valuation Reports
- GRS IL GARS DRAFT 2015 – 2019 GASB 67/68 Reports

- Other:
  - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
  - *2018 National Conference on Public Employees Retirement Systems* (NCPERS) Public Retirement Systems Study issued January 2019
  - November 2019 Survey published by the National Association of State Retirement Agencies (NASRA)
  - April 2019 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)
  - Public Plans Database as of November 2019
  - Survey of Professional Forecasters, Third Quarter 2019, Federal Reserve Bank of Philadelphia
  - Publication H.15 Selected Interest Rates, Board of Governors of the Federal Reserve System
  - CPI-All Urban Consumers, Bureau of Labor Statistics
  - Quarterly Census of Employment and Wages, Bureau of Labor Statistics
  - Survey of Capital Market Assumptions, 2018 and 2019 Editions, Horizon Actuarial Services, LLC

**Chicago Teachers' Pension Fund**

- Illinois Law:
  - Illinois Pension Code (40 ILCS 5/) Article 17: Public School Teachers' Pension and Retirement Fund – Cities of Over 500,000 Inhabitants
  - Public Act (P.A.) 090-0566, P.A. 090-0582, P.A. 091-0357, P.A. 100-0465

- Files received from the Chicago Teachers' Pension Fund:
  - Goldstein & Associates CTPF 2007-2011 Valuation Reports
  - Segal CTPF 2012-2016 Valuation Reports
  - GRS 2017-2019 Valuation Reports
  - 2018 Actuarial Experience Study dated May 25, 2018.

- Other:
  - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
  - November 2019 Survey published by the National Association of State Retirement Agencies (NASRA)
  - April 2019 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)
  - Public Plans Database as of November 2019
  - Survey of Professional Forecasters, Third Quarter 2019, Federal Reserve Bank of Philadelphia

- Publication H.15 Selected Interest Rates, Board of Governors of the Federal Reserve System
- CPI-All Urban Consumers, Bureau of Labor Statistics
- Quarterly Census of Employment and Wages, Bureau of Labor Statistics
- Survey of Capital Market Assumptions, 2018 and 2019 Editions, Horizon Actuarial Services, LLC

# 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 12, 2019

VIA ELECTRONIC MAIL
Mr. Joe Butcher
Office of the Auditor General
740 East Ash Street, First Floor
Springfield, IL 62703

Dear Mr. Butcher:

We have reviewed the draft report prepared by the state actuary on the preliminary 2019 actuarial valuation prepared by Segal Consulting. TRS and Segal offer the following joint response to Cheiron's recommendations.

The TRS Board met on December 10, 2019 to provide final certification to the June 30, 2019 actuarial valuation report and the FY 2021 state funding requirements.

**State Mandated Funding Method**

1. **Cheiron continues to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of TRS. Continuing the practice of underfunding future accruals increases the risk of the System becoming unsustainable. Cheiron understands that the funding method is under the jurisdiction of state law, not TRS.**

   We agree that the current funding methodology does not follow Actuarial Standards of Practice (ASOP). The TRS Board has consistently expressed concerns over inadequate funding and, in 2012, began certifying alternative state funding requirements that do conform to actuarial standards. Cheiron confirms that the alternative funding method used by the Board conforms to a goal of full funding within a reasonable period.

**Recommended Additional Disclosures for the 2019 Valuation**

2. **Cheiron recommends that Segal include a more detailed explanation of how the new entrant assumption was developed and how the assumed salaries for new entrants change from year to year.**

   Segal developed the new entrant assumption in 2016 based upon an analysis of historical data for recent new entrants. Each year, the new entrant salaries are updated by the assumed salary increase assumption. Segal plans to perform a detailed analysis of the new entrant assumption as part of next year's valuation process. Segal believes that a detailed explanation of analysis of the new entrant assumption is not appropriate to include in the valuation report, but will include this information in the next experience study report.

3. **Cheiron recommends that Segal expand the stress testing of the System in the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of stressors (e.g., membership declines, lower salary growth) can have on future state costs. Cheiron states that in particular, the tests should illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made.**

   Segal has performed stochastic modeling and stress testing for the Board, including a thorough explanation of the implication of volatile investment returns. We still believe that board meetings provide better opportunities for TRS trustees to comprehend insolvency risk and develop strategies to guide the System's response to this threat. Over the past several years, the trustees have engaged in vigorous discussions on this topic with our investment consultants, actuaries, staff, and each other.

   Determining whether required contributions to TRS are sustainable is not a judgment TRS or its consultants can make. However, we believe our current approach provides the Board with a better understanding of its most critical function, asset allocation.

**Recommended Changes for Future Valuations**

4. **Cheiron recommends that an assessment be provided for each risk that is identified by Segal and that an explanation be provided to aid the reader in understanding the calculation of maturity measures and the significance of historical values relative to each risk.**

   Segal has provided a qualitative assessment for each identified risk in the valuation report, but will continue to expand this section of the report in future valuations as warranted. In addition, Segal recommended, in the valuation report and in the October 2019 Board presentation, that a detailed risk assessment be performed. Because a detailed risk assessment was recently performed, the Board has not authorized Segal to perform another detailed risk assessment.

5. **Cheiron is concerned that the analysis Segal performed for the salary increase assumptions results in an assumption for salary increases that is at the very high end of a reasonable range. Cheiron recommends that the TRS Board consider reducing the salary increase assumptions in future valuations or provide additional analysis to support the increased assumption.**

   Actual salary increase experience for individual members was studied by separating merit and seniority increases from inflation. Actual salary increase experience over a relatively short period of time (such as three years used in the experience study analysis) is largely driven by prevailing inflation around that time period. For reference, actual inflation during the experience study period was approximately 1%, compared to the assumption of 2.5%. Recent actuarial gains related to salary experience outlined in the actuarial valuation reports

have primarily been related to actual inflation that was lower than assumed. The inflation assumption is evaluated every year as part of the annual economic assumption review.

Actual and expected merit and seniority increases above inflation during the experience study period were 3.05% and 2.23%, on average, respectively. The goal was to adjust the merit and seniority increase assumption such that the average increase above inflation would reflect an equal weighting of the current assumption and recent experience. The proposed merit and seniority increases above inflation were 2.65%, on average. We do not agree that the assumption is at the very high end of a reasonable range based on our methodology. A complete description of the salary increase assumption and the underlying analysis is included on pages 16 and 17 of Segal's experience study report dated September 18, 2018, which can be found on the TRS website.

6. **Cheiron recommends that Segal provide additional information about the population used in the projection such as the average age and service of the population each year.**

   Segal included detailed information about the new entrant profile in the 2019 actuarial valuation report. While Segal has additional detailed information about the new entrants, such as the average age and service for each year of the projection, Segal believes that this additional detailed information is not information that is typically included in an actuarial valuation report.

7. **Cheiron recommends the TRS Board continue to review annually the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.**

   The TRS actuaries have been reviewing the interest and inflation assumptions each year since 2013 and will continue to do so.

Thank you for Cheiron's thorough review of Segal's work. We appreciate their focus on the substantial risks caused by eight decades of TRS underfunding. Please let us know if you or Cheiron would like to discuss any of these issues.

Sincerely,

SIGNED ORIGINAL ON FILE

Richard W. Ingram
Executive Director

cc: Jana Bergschneider, TRS
Amy Reynolds, TRS
Ameen Dada, OAG
Jon Fox, OAG

Kim Nicholl, Segal Consulting
David Nickerson, Segal Consulting
Matt Strom, Segal Consulting
Tatsiana Dybal, Segal Consulting
Collin Bornhoft, Segal Consulting
Heather Powell, BKD
Bill Hallmark, Cheiron
Gene Kalwarski, Cheiron
Matt Wells, Cheiron
Michael Noble, Cheiron

S·U·R·S
STATE UNIVERSITIES RETIREMENT SYSTEM

1901 Fox Drive, Champaign, IL 61820-7333
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www.surs.org

Martin Noven, Executive Director

December 13, 2019

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

**Re: Response to the State Actuary's Report on the SURS June 30, 2019 Actuarial Valuation**

Dear General Mautino:

This is the official response from the State Universities Retirement System of Illinois (SURS) regarding the December 2019 preliminary report issued by Cheiron – The State Actuary's Preliminary Report on the State Universities Retirement System of Illinois Pursuant to 30 ILCS 5/2-8.1

What follows is a summary response to each of the recommendations. We have also enclosed a detailed response letter from our actuary, Gabriel Roeder Smith & Company (GRS).

**Proposed Certification of the Required State Contribution**

The State Actuary accepts the proposed certification of $1,996,686,000 ($1,995,767,000 revised) for the fiscal year 2021 SURS required state contribution.

**Assessment of Actuarial Assumptions Used in the 2019 Valuation**

The December 2019 report issued by the State Actuary, Cheiron, indicates that they believe that the assumptions used in the June 30, 2019, Actuarial Valuation are reasonable.

**State Mandated Funding Method**

1. **The State Actuary recommends that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SURS.**

   **Response:** The funding policy is established by the legislature and is not under the control of the Board. Please note that prior annual valuation reports and the certification letters sent to the State have addressed this concern and we plan to do so again in this year's communication.

**Recommended Additional Disclosure for the 2019 Valuation**

2. **The State Actuary recommends 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 can have on future State cost. In particular, the tests should illustrate the potential stresses on the System and is contributing sponsors so that an assessment of sustainability can be made.**

   **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 eight scenario stress tests to the State Actuary. Since the Board does not set the funding policy or the benefit provisions, and the State bears the contribution risk from the stressors, we recommend that additional stress testing be conducted at the request of and reviewed by the State. Also, given the volume of the information and number of exhibits that are already included in the actuarial valuation report, we are concerned that adding an additional section with the stress test results is likely to confuse the users. The State Actuary's recommendation was discussed with the Board and a decision made that the stress testing detail will not be included in the main body of the Actuarial Valuation. Instead the stress testing results will be included in the letter from GRS and added as an addendum to the valuation.

3. **GRS introduced a new risk disclosure section in the valuation in which they state that "additional risk assessment is outside the scope of the annual actuarial valuation". The State Actuary has the opinion that GRS should have recommended to the SURS Board that such as assessment be performed and included in this report and that failure to make the recommendation is not consistent with the requirements of ASAP 51.**

   **Response:** GRS performs stress testing each year as an additional risk assessment. We concur that the stress tests are an appropriate risk assessment, but we also agree with GRS that the actuarial standards of practice do not require that they incorporated in the actuarial valuation report. The stress testing results will be included in the letter from GRS and added as an addendum to the valuation. See discussion under recommendation #2 above.

**Recommended Changes for Future Valuations**

4. **Cheiron recommends that the Board annually review the economic assumptions (interest rate and inflation) each year prior to commencing the valuation work and adjust assumptions accordingly.**

   **Response:** Illinois statutes require that an experience study be performed every three years. GRS performed an experience study in February 2018. The Board adopted changes to assumptions based on the results of that experience study. The new assumptions were implemented in the June 30, 2018 actuarial valuation. The adopted assumptions for inflation and investment return were well within the rage of reasonable assumptions and proper to be used in the June 30, 2019 valuation. The Board will review the economic assumptions annually in subsequent years.

5. **The State Actuary recommends that GRS include additional information on risk discloser.**

   **Response:** GRS will consider the recommendations from Cheiron and make changes to the fiscal year 2020 actuarial valuation report as appropriate.

Please do not hesitate to contact me with any questions or concerns about our response.

Sincerely yours,

SIGNED ORIGINAL ON FILE

Martin Noven
Executive Director

Encl: Gabriel Roeder Smith & Company Response to State Actuary Report of 2019
cc: Michael Noble, Cheiron
Joe Butcher, Office of the Auditor General
Heather Powell, BKD, LLP

GRS Retirement Consulting

P: 312.456.9800 | F: 312.683.3271 | www.grsconsulting.com

December 5, 2019

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

**Re: Response to State Actuary's Preliminary Report on the SURS June 30, 2019 Actuarial Valuation**

Dear Members of the Board:

At your request we have reviewed the report issued by Cheiron dated December 3, 2019 – 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 consists of a review of the June 30, 2019 actuarial valuation of SURS prepared by Gabriel Roeder Smith & Company ("GRS").

**Assessment of Actuarial Assumptions and Methods Used in the 2019 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, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

**Proposed Certification of the Required State Contribution**

In this section, the State Actuary notes that they have verified the arithmetic accuracy of the required State contribution calculated by GRS and the assumptions on which it was based, and accepted the GRS projections of payroll, normal cost, contributions and benefit payments and expenses.

**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 fully fund plan benefits and discontinue the systematic underfunding of SURS. (**Recommendation #1)**

The funding method used in the June 30, 2019 actuarial valuation of SURS is prescribed in accordance with Article 15 of the Illinois Pension Code (as noted by Cheiron) and is not under the actuary or the Board's control; therefore, no action is required. We note that GRS, in our 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.



120 North LaSalle Street | Suite 1350 | Chicago, Illinois 60602-3495

**Conformance to Statutory Funding Changes of Public Act 100-0023**

Cheiron describes the provisions from Public Act 100-0023 (phase-in of the contribution impact of assumption changes, optional hybrid plan and contributions in excess of the Governor's pay). They do not note any recommendations in this section. With regard to contributions in excess of the Governor's pay, Cheiron states, "We have verified that GRS has reflected these additional employer contributions in the development of the net State Contribution."

**Conformance to Statutory Funding Changes of Public Act 100-0587**

Cheiron describes the provisions from Public Act 100-0587 (accelerated pension benefit payment option). They do not note any recommendations in this section and state, "We believe this approach is reasonable" regarding the assumption used in the June 30, 2019 actuarial valuation of no participants electing the accelerated pension benefit payment option and that GRS will continue to monitor actual experience.

**Assessment of Actuarial Assumptions Used in the 2019 Valuation**

Cheiron states, "We have reviewed all the actuarial assumptions used in the State Universities Retirement System's draft June 30, 2019 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us."

**Recommended Additional Disclosures for the 2019 Valuation**

**Recommendation #2** is to include stress testing results within the actuarial valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors can have on future State costs. Cheiron notes, "Stress testing should be performed to better understand these risks and the potential advantages of additional contributions in the near term to maintain the sustainability of the system."

GRS included language in the actuarial valuation report of the implications of assumptions not being met and liquidity concerns if there is a significant market downturn and has recommended and calculated contributions under an alternate funding policy which would increase contributions in the near term to improve the sustainability of the System. GRS is also providing stress testing scenarios to SURS in a separate letter based on the June 30, 2019 actuarial valuation (and will continue to do so annually).

At the Board's request and with their concurrence, we can include the stress testing analysis that we have been performing each year as an additional section in the actuarial valuation report to the extent that the Board's timing requirements for finalizing the report permit. However, given the extreme volume of information and number of exhibits that are already included in the actuarial valuation report, we are concerned that adding an additional section to what is already a very complex report is likely to confuse the users of the actuarial valuation report.

**Recommendation #3** is that Cheiron disagrees with the following statement in the actuarial valuation report and that GRS should have recommended to the SURS Board that an assessment be performed and included in the report "Additional risk assessment is outside the scope of the annual actuarial valuation."

GRS performs stress testing each year as an additional risk assessment. Cheiron suggests that in addition to performing stress testing each year, GRS should explicitly recommend performing stress testing as part of the valuation and include it in the valuation report. We concur that the stress tests are an appropriate risk assessment; however, we observe that the actuarial standards of practice do not require that they be

incorporated in the actuarial valuation report. We do not think there is any inconsistency with the requirements of ASOP No. 51. We will review the language used in the report regarding risk assessment.

In addition to our qualitative discussion of contribution risk, we have identified and discussed liquidity risks faced by the plan each year in the actuarial valuation report since before ASOP No. 51 required such disclosures. In our opinion, these risks have been specifically addressed and have been at the forefront of our risk assessments for some time.

**Recommended Changes for Future Valuations**

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

Illinois statutes require that an experience study be performed every three years. GRS performed an experience study and the Board adopted changes to assumptions that were implemented in the June 30, 2018 actuarial valuation. The adopted assumptions for inflation (2.25 percent) and investment return (6.75 percent) were well within the range of reasonable assumptions when adopted in 2018. GRS internally reviewed and confirmed the reasonability of the assumptions prior to commencing work on the June 30, 2019 actuarial valuation.

**Recommendation #5** is that GRS include additional information on risk disclosure.

GRS will consider the recommendations from Cheiron and make changes to the 2020 actuarial valuation report, as appropriate.

**GASB 67 and 68**

Cheiron indicates, "We find that the assumptions and methods used to prepare the 2019 SURS GASB 67 and 68 schedules are reasonable based on the evidence provided to us."

Sincerely,

SIGNED ORIGINAL ON FILE

Lance J. Weiss, EA, MAAA, FCA
Senior Consultant and Team Leader

SIGNED ORIGINAL ON FILE

Amy Williams, ASA, MAAA, FCA
Senior Consultant

AW:kb

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

December 12, 2019

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, 2019 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, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable."** In addition, Cheiron found "**the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Listed are Cheiron's recommendations and SERS management's responses to those recommendations. In addition, attached are the GRS responses to the recommendations.

**Proposed Certification of the Required State Contribution**

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

   Response: The SERS Board of Trustees and management will discuss the need for a full scope actuarial audit prior to the next valuation. It should be noted the SERS valuations are reviewed annually by the State Actuary, and the Commission on Government Forecasting and Accountability (CoGFA) prepares a parallel valuation annually using the SERS membership data, assumptions and methodology.

**State Mandated Funding Method**

2. **Cheiron continues to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SERS. Continuing the practice of underfunding future accruals such that the Unfunded Liability is expected to continue to grow and targeting a funded percentage less than 100% 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.**

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 a 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 actuarial valuation and the annual certifications of the required statutory State contribution.

**Recommended Additional Disclosures for 2019 Valuation**

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

   Response: SERS and GRS will make the recommended changes to the FY 2019 valuation report.

4. **Cheiron recommends the description of the mortality assumption in the valuation report include an indication that the mortality assumptions are fully generational and the mortality improvement scale used.**

   Response: SERS and GRS will make the recommended changes to the FY 2019 valuation report.

**Recommended Changes for Future Valuations**

5. **Cheiron recommends GRS provide additional explanation and justification for methods used to develop the mortality assumptions used in the valuation.**

   Response: The recommended explanation and justification will be added to the FY 2020 valuation report.

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

   Response: The Board of Trustees will continue to annually review the economic assumptions in a timely manner so adjustments to the assumptions will be included in the next valuation. GRS reviewed all assumptions for the 3-year period ended June 30, 2018, and those recommended assumptions were used in the June 30, 2019 valuation report.

**7. For future risk disclosure we recommend:**

- **An assessment should be provided for each risk that is identified by GRS.**
- **An explanation should be provided as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified by GRS.**
- **Historical values that are significant to understanding the risks identified by GRS should be disclosed along with an explanation of how they help the reader understand the risks identified by GRS.**

Response: The recommended additions regarding risk disclosure will be added to the FY 2020 valuation 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
State Employees' Retirement System

GRS Retirement Consulting

P: 312.456.9800 | F: 312.683.3271 | www.grsconsulting.com

December 13, 2019

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 2019 — 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 5/2-8.1. This report contains a review of the June 30, 2019, actuarial valuation for SERS.

**Assessment of Actuarial Assumptions and Methods Used in the 2019 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, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Page 1 of the transmittal letter of the draft GRS Actuarial Valuation report states:

The System's current contribution rate determined under the statutory funding policy may not conform to the Actuarial Standards of Practice. Therefore, the Board adopted an actuarial funding policy to be used to calculate the Actuarially Determined Contribution ("ADC") under GASB Statement Nos. 67 and 68 for financial reporting purposes.

Although the statutory contribution requirements were met, the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution. Meeting the statutory requirement does not mean that the undersigned agree that adequate actuarial funding has been achieved. We recommend the adherence to a funding policy, such as the Board policy used to calculate the ADC under GASB Statements Nos. 67 and 68, that funds the normal cost of the plan as well as an amortization payment that seeks to pay off any unfunded accrued liability over a closed-period of 25 years.

**Proposed Certification of the Required State Contribution**

In **item 1**, the State Actuary recommends that the Board have an independent full replication actuarial audit performed.


120 North LaSalle Street | Suite 1350 | Chicago, Illinois 60602-3495

The type and timing of actuarial audits is a matter of Board policy, and we will leave the response to the Board. For reference, the Government Finance Officers Association (GFOA) recently updated their Best Practice on Actuarial Audits (http://www.gfoa.org/actuarial-audits).

**State Mandated Funding Method**

In **item 2**, the State Actuary recommends that: "the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of SERS. Continuing the practice of underfunding future accruals such that the unfunded liability is expected to continue to grow and targeting a funded percentage less than 100% 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 2019 Valuation**

In **item 3**, the State Actuary recommends that the actuarial valuation report include a section with stress testing information. Stress testing for SERS has been performed. The stress testing analysis includes scenarios with significant market downturn or significant volatility in investment returns, volatility in future active population and volatility in salary growth. Stress testing, if done completely and properly, can provide useful information on the level of statutory contributions and funded position of the System under adverse economic conditions. For example, stochastic modeling could be used to project the funded status and statutory contributions, over 5,000 random investment trials, in order to evaluate the likelihood that the funded ratio or contributions will exceed certain limits.

Our Stress Test letter shows the impact to the funded ratio and contributions under the following scenarios:

- Assets earn the 25$^{th}$ percentile return of 3.65 percent on a static basis and alternatively a volatile basis.
- Assets earn the 40$^{th}$ percentile return of 5.18 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 development of the 25$^{th}$ and 40$^{th}$ percentile returns were developed in conjunction with the 2018 Actuarial Experience Study covering the period from July 1, 2015, through June 30, 2018. The volatile investment return scenario is based on one random trial.

The Stress Test letter is included in the Appendix of the updated June 30, 2019, actuarial valuation report.

In **item 4**, the State Actuary recommends that the description of the mortality assumption in the valuation report include an indication that the mortality assumptions are fully generational and the morality improvement scale used.

We agree with the State Actuary's recommendation to indicate that the mortality assumptions are fully generational. While page 2 of the actuarial report indicates the improvement scale used in the valuation, we agree with the State's Actuary that the scale should also be disclosed in the Actuarial Methods and Assumptions Section E of the valuation report.

**Recommended Changes for Future Valuations**

In **item 5**, the State Actuary recommends that GRS provide additional explanation and justification for methods used to develop the mortality assumptions used in the valuation.

We agree with the State Actuary's recommendation and will expand our discussion of the development of mortality assumptions in future experience studies and actuarial valuation reports. In future experience study reports we will provide more detailed analysis and rationale to support any adjustments made to a base mortality table.

In **item 6**, 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 7**, the State Actuary recommends additional risk disclosures, which include:

- An assessment for each risk that is identified by GRS,
- An explanation as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified by GRS, and
- A review of historical values that are significant to understanding the risks identified by GRS along with an explanation of how they help the reader to understand the risks identified by GRS.

Appendix A of the updated actuarial valuation report provides stress testing which measures certain risks such as: (i) change in investment return assumption, (ii) change in covered population, and (iii) change in wage inflation assumption. We will consider expanding stress and sensitivity testing in the next actuarial valuation report. We will also consider how we can expand our explanation of the impact of different risk and maturity measures. We can provide a review of the historical funded ratio, statutory contributions, actuarially determined contributions, benefit payments, investment gains/losses, demographic gains/losses and other related risk factors in the next actuarial valuation.

Respectfully submitted,

**Gabriel, Roeder, Smith & Company**

SIGNED ORIGINAL ON FILE
Alex Rivera, FSA, EA, MAAA, FCA
Senior Consultant

SIGNED ORIGINAL ON FILE
Heidi Barry, ASA, MAAA, FCA
Senior Consultant

SIGNED ORIGINAL ON FILE
Jeff Tebeau, FSA, EA, MAAA
Consultant

December 12, 2019

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, 2019 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, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable."** In addition, Cheiron found "**the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Listed are Cheiron's recommendations and JRS management's responses to those recommendations. In addition, attached are the GRS responses to the recommendations.

**Proposed Certification of the Required State Contribution**

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

   Response: The JRS Board of Trustees and management will discuss the need for a full scope actuarial audit prior to the next valuation. It should be noted the JRS valuations are reviewed annually by the State Actuary, and the Commission on Government Forecasting and Accountability (CoGFA) prepares a parallel valuation annually using the JRS membership data, assumptions and methodology.

**State Mandated Funding Method**

2. **Cheiron continues to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of JRS. Continuing the practice of underfunding future accruals such that the unfunded liability is expected to continue to grow and targeting a funded percentage less than 100% 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.**

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 a 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 actuarial valuation and the annual certifications of the required statutory State contribution.

**Recommended Additional Disclosures for 2019 Valuation**

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

   Response: JRS and GRS will make the recommended changes to the FY 2019 valuation report.

**Recommended Changes for Future Valuations**

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

   Response: The Board of Trustees will continue to annually review the economic assumptions in a timely manner so adjustments to the assumptions will be included in the next valuation. GRS reviewed all assumptions for the 3-year period ended June 30, 2018, and those recommended assumptions were used in the June 30, 2019 valuation report.

5. **For future risk disclosure we recommend:**

   - **An assessment should be provided for each risk that is identified by GRS.**
   - **An explanation should be provided as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified by GRS.**
   - **Historical values that are significant to understanding the risks identified by GRS should be disclosed along with an explanation of how they help the reader understand the risks identified by GRS.**

     Response: The recommended additions regarding risk disclosure will be added to the FY 2020 valuation 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

GRS Retirement Consulting

P: 312.456.9800 | F: 312.683.3271 | www.grsconsulting.com

December 13, 2019

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 2019 — 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 contains a review of the June 30, 2019, actuarial valuation for JRS.

**Assessment of Actuarial Assumptions and Methods Used in the 2019 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, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Page 1 of the transmittal letter of the draft GRS Actuarial Valuation report states:

The System's current contribution rate determined under the statutory funding policy may not conform to the Actuarial Standards of Practice. Therefore, the Board adopted an actuarial funding policy to be used to calculate the Actuarially Determined Contribution ("ADC") under GASB Statement Nos. 67 and 68 for financial reporting purposes.

Although the statutory contribution requirements were met, the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution. Meeting the statutory requirement does not mean that the undersigned agree that adequate actuarial funding has been achieved. We recommend the adherence to a funding policy, such as the Board policy used to calculate the ADC under GASB Statement Nos. 67 and 68, that funds the normal cost of the plan as well as an amortization payment that seeks to pay off any unfunded accrued liability over a closed-period of 25 years.

**Proposed Certification of the Required State Contribution**

In **item 1**, the State Actuary recommends that the Board have an independent full replication actuarial audit performed.


120 North LaSalle Street | Suite 1350 | Chicago, Illinois 60602-3495

The type and timing of actuarial audits is a matter of Board policy, and we will leave the response to the Board. For reference, the Government Finance Officers Association (GFOA) recently updated their Best Practice on Actuarial Audits (http://www.gfoa.org/actuarial-audits).

**State Mandated Funding Method**

In **item 2**, the State Actuary recommends that: "the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of JRS. Continuing the practice of underfunding future accruals such that the unfunded liability is expected to continue to grow and targeting a funded percentage less than 100% 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 2019 Valuation**

In **item 3**, the State Actuary recommends that the actuarial valuation report include a section with stress testing information. Stress testing for JRS has been performed. The stress testing analysis includes scenarios with significant market downturn or significant volatility in investment returns and volatility in future System participation. Stress testing, if done completely and properly, can provide useful information on the level of statutory contributions and funded position of the System under adverse economic conditions. For example, stochastic modeling could be used to project the funded status and statutory contributions, over 5,000 random investment trials, in order to evaluate the likelihood that the funded ratio or contributions will exceed certain limits.

Our Stress Test letter shows the impact to the funded ratio and contributions under the following scenarios:

- Assets earn the 25$^{th}$ percentile return of 3.65 percent on a static basis and alternatively a volatile basis.
- Assets earn the 40$^{th}$ percentile return of 5.18 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 development of the 25$^{th}$ and 40$^{th}$ percentile returns were developed in conjunction with the 2018 Actuarial Experience Study covering the period from July 1, 2015, through June 30, 2018. The volatile investment return scenario is based on one random trial.

The Stress Test letter is included in the Appendix of the updated June 30, 2019, 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 additional risk disclosures, which include:

- An assessment for each risk that is identified by GRS,
- An explanation as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified by GRS, and
- A review of historical values that are significant to understanding the risks identified by GRS along with an explanation of how they help the reader to understand the risks identified by GRS.

Appendix A of the updated actuarial valuation report provides stress testing which measures certain risks such as: (i) change in investment return assumption, and (ii) change in wage inflation assumption. We will consider expanding stress and sensitivity testing in the next actuarial valuation report. We will also consider how we can expand our explanation of the impact of different risk and maturity measures. We can provide a review of the historical funded ratio, statutory contributions, actuarially determined contributions, benefit payments, investment gains/losses, demographic gains/losses and other related risk factors in the next actuarial valuation.

Respectfully submitted,

**Gabriel, Roeder, Smith & Company**

SIGNED ORIGINAL ON FILE

Alex Rivera, FSA, EA, MAAA, FCA
Senior Consultant

SIGNED ORIGINAL ON FILE

Heidi Barry, ASA, MAAA, FCA
Senior Consultant

SIGNED ORIGINAL ON FILE

Jeff Tebeau, FSA, EA, MAAA
Consultant

December 12, 2019

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, 2019 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, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable."** In addition, Cheiron found "**the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Listed are Cheiron's recommendations and GARS management's responses to those recommendations. In addition, attached are the GRS responses to the recommendations.

**Proposed Certification of the Required State Contribution**

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

   Response: The GARS Board of Trustees and management will discuss the need for a full scope actuarial audit prior to the next valuation. It should be noted the GARS valuations are reviewed annually by the State Actuary, and the Commission on Government Forecasting and Accountability (CoGFA) prepares a parallel valuation annually using the GARS membership data, assumptions and methodology.

**State Mandated Funding Method**

2. **Cheiron continues to recommend that the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of GARS. Continuing the practice of underfunding future accruals such that the unfunded liability is expected to continue to grow and targeting a funded percentage less than 100% 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.**

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 a 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 actuarial valuation and the annual certifications of the required statutory State contribution.

**Recommended Additional Disclosures for 2019 Valuation**

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

   Response: GARS and GRS will make the recommended changes to the FY 2019 valuation report.

**Recommended Changes for Future Valuations**

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

   Response: The Board of Trustees will continue to annually review the economic assumptions in a timely manner so adjustments to the assumptions will be included in the next valuation. GRS reviewed all assumptions for the 3-year period ended June 30, 2018, and those recommended assumptions were used in the June 30, 2019 valuation report.

5. **For future risk disclosure we recommend:**

   - **An assessment should be provided for each risk that is identified by GRS.**
   - **An explanation should be provided as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified by GRS.**
   - **Historical values that are significant to understanding the risks identified by GRS should be disclosed along with an explanation of how they help the reader understand the risks identified by GRS.**

     Response: The recommended additions regarding risk disclosure will be added to the FY 2020 valuation 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
General Assembly Retirement System

GRS Retirement Consulting

P: 312.456.9800 | F: 312.683.3271 | www.grsconsulting.com

December 13, 2019

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 2019 — 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 5/2-8.1. This report contains a review of the June 30, 2019, actuarial valuation for GARS.

**Assessment of Actuarial Assumptions and Methods Used in the 2019 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, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Page 1 of the transmittal letter of the draft GRS Actuarial Valuation report states:

The System's current contribution rate determined under the statutory funding policy may not conform to the Actuarial Standards of Practice. Therefore, the Board adopted an actuarial funding policy to be used to calculate the Actuarially Determined Contribution ("ADC") under GASB Statement Nos. 67 and 68 for financial reporting purposes.

Although the statutory contribution requirements were met, the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution. Meeting the statutory requirement does not mean that the undersigned agree that adequate actuarial funding has been achieved. We recommend the adherence to a funding policy, such as the Board policy used to calculate the ADC under GASB Statement Nos. 67 and 68, that funds the normal cost of the plan as well as an amortization payment that seeks to pay off any unfunded accrued liability over a closed-period of 20 years.

**Proposed Certification of the Required State Contribution**

In **item 1**, the State Actuary recommends that the Board have an independent full replication actuarial audit performed.


120 North LaSalle Street | Suite 1350 | Chicago, Illinois 60602-3495

The type and timing of actuarial audits is a matter of Board policy, and we will leave the response to the Board. For reference, the Government Finance Officers Association (GFOA) recently updated their Best Practice on Actuarial Audits (http://www.gfoa.org/actuarial-audits).

**State Mandated Funding Method**

In **item 2**, the State Actuary recommends that: "the funding method be changed to fully fund plan benefits and discontinue the systematic underfunding of GARS. Continuing the practice of underfunding future accruals such that the unfunded liability is expected to grow and targeting a funded percentage less than 100% 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 2019 Valuation**

In **item 3**, the State Actuary recommends that the actuarial valuation report include a section with stress testing information. Stress testing for GARS has been performed. The stress testing analysis includes scenarios with significant market downturn or significant volatility in investment returns and volatility in future System participation. Stress testing, if done completely and properly, can provide useful information on the level of statutory contributions and funded position of the System under adverse economic conditions. For example, stochastic modeling could be used to project the funded status and statutory contributions, over 5,000 random investment trials, in order to evaluate the likelihood that the funded ratio or contributions will exceed certain limits.

Our Stress Test letter shows the impact to the funded ratio and contributions under the following scenarios:

- Assets earn the 25$^{th}$ percentile return of 3.65 percent on a static basis and alternatively a volatile basis.
- Assets earn the 40$^{th}$ percentile return of 5.18 percent on a static basis and alternatively a volatile basis.
- 75 percent of future active members opt-out of System participation.
- 100 percent of future active members opt-out of System participation (Closed System).

The development of the 25$^{th}$ and 40$^{th}$ percentile returns were developed in conjunction with the 2018 Actuarial Experience Study covering the period from July 1, 2015, through June 30, 2018. The volatile investment return scenario is based on one random trial.

The Stress Test letter is included in the Appendix of the updated June 30, 2019, 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 additional risk disclosures, which include:

- An assessment for each risk that is identified by GRS,
- An explanation as to how the maturity measures calculated and disclosed by GRS help the reader to understand the risks identified by GRS, and
- A review of historical values that are significant to understanding the risks identified by GRS along with an explanation of how they help the reader to understand the risks identified by GRS.

Appendix A of the updated actuarial valuation report provides stress testing which measures certain risks such as: (i) change in investment return assumption, and (ii) change in future active members opting out of the System. We will consider expanding stress and sensitivity testing in the next actuarial valuation report. We will also consider how we can expand our explanation of the impact of different risk and maturity measures. We can provide a review of the historical funded ratio, statutory contributions, actuarially determined contributions, benefit payments, investment gains/losses, demographic gains/losses and other related risk factors in the next actuarial valuation.

Respectfully submitted,

**Gabriel, Roeder, Smith & Company**

SIGNED ORIGINAL ON FILE

Alex Rivera, FSA, EA, MAAA, FCA
Senior Consultant

SIGNED ORIGINAL ON FILE

Heidi Barry, ASA, MAAA, FCA
Senior Consultant

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Jeff Tebeau, FSA, EA, MAAA
Consultant

Chicago Teachers' Pension Fund

425 S. Financial Place, Suite 1400 | Chicago, IL 60605-1000

December 10, 2019

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

Mr. Joe Butcher
Audit Manager
Illinois Office of the Auditor General
740 E. Ash Street
Springfield, Illinois 62703

Mr. Gene Kalwarski
Principal Consulting Actuary
Cheiron, Inc.
200 West Monroe Street, Suite 1800
Chicago, Illinois 60606

Mr. Mike Noble
Principal Consulting Actuary
Cheiron, Inc.
200 West Monroe, Suite 1800
Chicago, Illinois 60606

RE: **Response to the State Actuary's Draft Preliminary Report on the Public School Teachers' Pension and Retirement Fund of Chicago Pursuant to Illinois Public Act 100-0465 Regarding Gabriel, Roeder, Smith & Company's Draft June 30, 2019 Actuarial Valuation**

This letter and attachment from Gabriel, Roeder, Smith & Company ("GRS") serves as formal notice of the response of the Public School Teachers' Pension and Retirement Fund of Chicago ("CTPF" or the "Fund") to the State Actuary's Draft "Preliminary Report on the Public School Teachers' Pension and Retirement Fund of Chicago Pursuant to Illinois Public Act 100-0465 Regarding Gabriel, Roeder, Smith & Company's Draft June 30, 2019 Actuarial Valuation.

The State Actuary's Recommendations and Report Comment are set out, below:

## Recommended Changes for Future Valuations

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

2. We recommend 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 illustrate the potential stresses on the System and its contributing sponsors that may add to the potential for additional funding subsidies from the State.





Members: 312.641.4464 General: 312.604.1400 Fax: 312.641.7185 www.ctpf.org

Report Comment for CTPF Consideration:

*1. Actuarial Cost Method*

The System uses the projected unit credit cost method (PUC) to assign costs to years of service, as required under the Pension Code (40 ILCS 5/17). **We have no objections with respect to using the PUC method, although we, as GRS does, would prefer the Entry Age Normal (EAN) cost method as it is more consistent with the requirement in 40 ILCS 5/17-129 for level percent of pay funding.**

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

The two report recommendations will be put forth for approval by the CTPF Board of Trustees at the December 19, 2019 Board of Trustees meeting. GRS has been directed by CTPF to include stress testing in future valuation reports and to include a thorough explanation that changes in investment returns and other stressors will have on future State costs. In addition, as to the Report Comment, the CTPF Board appreciates and supports the effort by the State Actuary to improve the financial condition of the Fund as demonstrated by the call for using a more appropriate statutory actuarial cost method.

If you have any questions, please do not hesitate to contact me at 312-604-1402.

Best regards,

**SIGNED ORIGINAL ON FILE**

Charles A. Burbridge
Executive Director

Enclosure

Cc: (with enclosure)

Lance Weiss – GRS, CTPF Actuary
Mary Cavallaro – CTPF, Deputy Executive Director
Alise White – CTPF, Chief Financial Officer
Daniel Hurtado – CTPF, Chief Legal Officer

GRS Retirement Consulting

P: 312.456.9800 | F: 312.683.3271 | www.grsconsulting.com

December 5, 2019

Board of Trustees
Public School Teachers' Pension and Retirement Fund of Chicago
425 South Financial Place, Suite 1400
Chicago, Illinois 60605

**Re: Response to 2019 State Actuary Preliminary Report**

Dear Members of the Board:

In accordance with you request, we have reviewed the State Actuary's Preliminary Report (dated December 3, 2019) on the Public School Teachers' Pension and Retirement Fund of Chicago ("CTPF") Pursuant to Illinois Public Act 100-0465. This preliminary report consists of a review of the June 30, 2019 actuarial valuation prepared by Gabriel, Roeder, Smith & Company ("GRS").

We are very pleased that this report, issued by the State Actuary, Cheiron, states "**In summary, we believe that the assumptions and methods used in the draft June 30, 2019 Actuarial Valuation, which are used to determine the required Fiscal Year 2021 State contribution, are reasonable. We also find that the certified portion of the contribution which the State is responsible for was properly calculated.**"

Cheiron had the following two recommendations:

**Recommended Changes for Future Valuations**

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

   GRS RESPONSE: GRS prepared a 2019 Actuarial Assumptions Study in September of 2019 that reviewed the following assumptions:

   - Price inflation;
   - Investment return;
   - Retirement; and
   - Projected future active members

   GRS believes this recommendation is reasonable and we will continue to work with the Board to annually review these same assumptions prior to commencing the valuation work.

2. We recommend GRS include stress testing of the System within the actuarial 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 illustrate the potential stresses on the System and its contributing sponsors that may add to the potential for additional funding subsidies from the State.

   GRS RESPONSE: GRS provided alternative stress testing scenarios to CTPF in a separate letter issued in April of 2019 (i.e., not in the actuarial valuation report).

   GRS believes this recommendation is reasonable and we will continue to provide alternative stress testing scenarios to CTPF. At the Board's request and with their concurrence, we can include the stress testing analysis as an additional section in the actuarial valuation.

   However, given the extreme volume of information and number of exhibits that are already included in the actuarial valuation report, we are concerned that adding an additional section to what is already a very complex report is likely to confuse the users of the actuarial valuation report.

Sincerely,

**SIGNED ORIGINAL ON FILE**

Lance J. Weiss, EA, MAAA, FCA
Senior Consultant and Team Leader

**SIGNED ORIGINAL ON FILE**

Amy Williams, ASA, MAAA, FCA
Senior Consultant

LJW/AW:ah

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

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