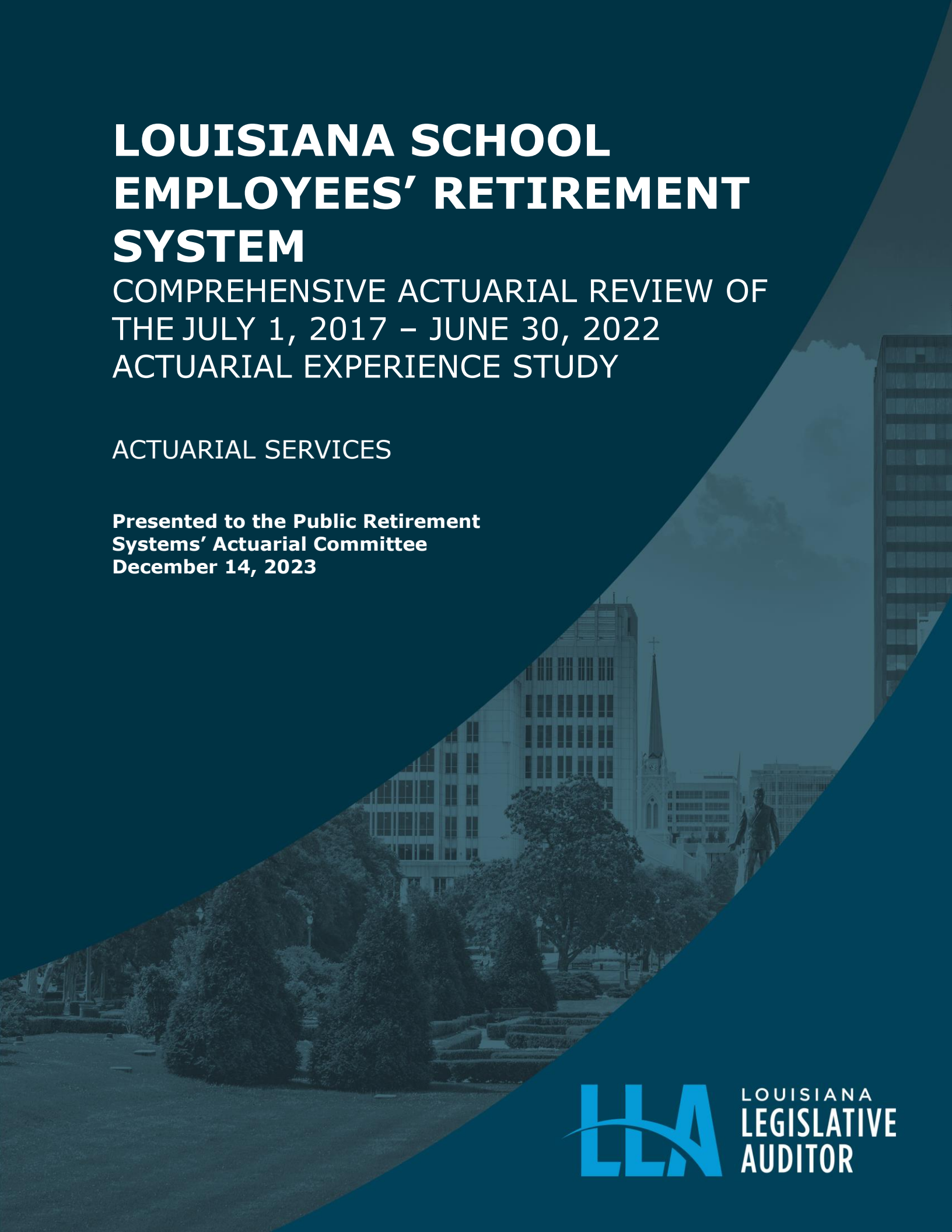
LOUISIANA SCHOOL EMPLOYEES' RETIREMENT SYSTEM

COMPREHENSIVE ACTUARIAL REVIEW OF THE JULY 1, 2017 – JUNE 30, 2022 ACTUARIAL EXPERIENCE STUDY

ACTUARIAL SERVICES

Presented to the Public Retirement Systems' Actuarial Committee
December 14, 2023



LOUISIANA LEGISLATIVE AUDITOR

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December 6, 2023

The Honorable Edward J. Price
Chairman, Public Retirement Systems' Actuarial Committee
Louisiana State Senate
Post Office Box 94183
Baton Rouge, Louisiana 70804

Re: Comprehensive Actuarial Review of LSERS 2023 Experience Study

Dear Chairman Price and PRSAC Members:

In accordance with La. R.S. 11:127(C) and 24:513(C)(1), the Louisiana Legislative Auditor has conducted a Comprehensive Actuarial Review for the Louisiana School Employees' Retirement System (LSERS or System).

The following presents the results of our Comprehensive Actuarial Review of LSERS July 1, 2017 – June 30, 2022 Experience Study Report (2023 Experience Study) prepared by Curran Actuarial Consulting, Ltd and dated April 11, 2023. In doing so, we have reviewed certain actuarial assumptions and methods recommended by LSERS' actuary.

I would like to thank LSERS' executive director, staff, and actuary for the cooperation and assistance provided for this review.

Respectfully submitted,

Michael J. "Mike" Waguespack, CPA
Legislative Auditor

MJW:kjh

cc: Mr. Charles P. Bujol, Executive Director
Louisiana School Employees' Retirement System

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Executive Summary

We performed a review of the methods used by LSERS' actuary as presented in the 2023 Experience Study. We have also reviewed the economic, demographic, and other valuation actuarial assumptions studied in the 2023 Experience Study.

Summary of Findings

In general, we did not identify any significant deficiencies in the reporting, nor did we identify any significant issues with the basis for which the assumptions were studied.

However, given the unusual nature of events surrounding the COVID-19 pandemic, the Actuary for the LLA believes that a more explicit approach to address the effects of the pandemic on the observed experience would be valuable. At a minimum, the process (or its description) could be improved by being more explicit regarding how the System's actuary has applied "professional judgment to avoid overly emphasizing certain data from the years most affected by the Covid-19 and the related school closures." Refer to Appendix B for additional illustrations pertaining to this concern.

We summarize our recommendations below with additional comments presented in the remainder of the report.

Economic Assumption Recommendations

The following economic assumptions were reviewed in the Experience Study Report:

- Inflation
- Investment Rate of Return and Discount Rate
- Rates of Salary Increase

We find the economic assumptions recommended by the LSERS actuary to be generally reasonable and adequately documented. However, we offer the following recommendations for improving the development, assessment, and/or disclosure of the economic assumptions.

Investment Return

(1) Time Horizon – Develop an investment return assumption that reflects both the mid-term (10 years) and the long-term (20-30 years) time horizons based on the plan's expected benefit stream and cash flows.

(2) Volatility of CMAs[1] and Smoothing – Consider smoothing the volatility of market-driven capital market assumptions (CMAs) used when developing a recommendation and/or assessing the reasonableness of the selected assumption. This can be done by incorporating estimates that reflect multiple recent years of CMAs from forecasters.
(3) Expert Opinions – Apply the CMAs from each independent investment firm separately to LSERS' asset allocations, to obtain separate expected returns for LERS' portfolio rather than amalgamate the CMAs.

Rates of Salary Increase

(1) Include a separate analysis of real rates of salary growth (net of inflation).
(2) Consider performing an analysis examining salary increases based on service and/or age.

Demographic Assumption Recommendations

The following demographic assumptions were reviewed in the Experience Study Report:

- Mortality rates
- Disability rates
- Retirement Rates
- Withdrawal/Termination Rates
- Other assumptions

We find the demographic assumptions recommended by the LSERS' actuary to be generally reasonable and adequately documented. However, we offer the following recommendations for improving the development, assessment, and/or disclosure of the economic assumptions.

Mortality

Display the number of deaths expected from the current assumption next to amounts presented in the report for actual and expected from the proposed rates.

[1] Market-driven Capital Market Assumptions (CMAs) are developed by professional investment forecasters and are comprised of (a) expected returns for each asset class, (b) expected rate of inflation, (c) expected standard deviations for each asset class and (d) expected correlation coefficients among the various asset classes. These are considered "market-driven" because the expectations are influenced by current market conditions and, thus, are subject to market volatility. These are combined with a plan's asset allocation percentages using complex mathematical finance formulas to develop a probability distribution of future expected returns for the portfolio as a whole.

Rates of Retirement

(1) Include a more explicit approach to address the effects of the pandemic. Or, at a minimum, be more explicit regarding how "professional judgment [has been applied] to avoid overly emphasizing certain data from the years most affected by the Covid-19 and the related school closures," and explain if there is a relationship between the conservatism adjustment and the potential impacts of the pandemic on the observed experience.
(2) Consider performing an analysis examining retirement rates by years since first eligible to evaluate if the current rates split by the three separate service segments and any adjustment for retirement when first eligible is sufficient, or a different approach could provide more predictive value.

Rates of Withdrawal

Include a more explicit approach to address the effects of the pandemic. Or, at a minimum, be more explicit regarding how "professional judgment [has been applied] to avoid overly emphasizing certain data from the years most affected by the Covid-19 and the related school closures," and explain if there is a relationship between the conservatism adjustment and the potential impacts of the pandemic on the observed experience.

Scope of Review

The experience study of the actuarial assumptions of the Louisiana School Employees' Retirement System (LSERS or the System) for the period July 1, 2017 through June 30, 2022 (2023 Experience Study) was prepared by Curran Actuarial Consulting, Ltd, and dated April 11, 2023.

This Comprehensive Actuarial Review (CAR) of that report presents assessments for appropriateness and reasonableness of certain methods and key actuarial assumptions recommended by LSERS' actuary. However, a full replication of the experience study was not performed. This CAR supplements the assessment with recommendations for improvements. This CAR is separate from any review evaluating results of LSERS' actuarial valuations.

Inflation

The assumed annual rate of future inflation is a component of the assumed return assumption, the salary increase assumption, and the frequency and magnitude of future Permanent Benefit Increases (PBIs). The 2023 Experience Study report indicates that the System's long-term inflation assumption is 2.50% and that the System's actuary believes that the 2.50% inflation assumption remains reasonable.

The system actuary provides the following two references in support of this inflation assumption:

- The "expectation provided by Segal Marco Advisors" is 2.40%, who serves as the system's investment consultant.
- The "consultant average inflation expectation" is 2.45%, referring to the average inflation expectation of the investment consultants included in the actuary's survey.

Conclusion – The Actuary for the LLA considers an annual rate of future inflation of 2.50% to be acceptable, based on a survey of professional inflation forecasters.

However, the Actuary for the LLA recommends more source data points for input, particularly from professional economists experienced in inflation forecasting. A sample of publicly available resources for economists' inflation expectations is in Appendix A.

Investment Return and Discount Rate

The discount rate assumption is typically the actuarial assumption with the single largest impact on the development of liabilities. As in most public sector pension valuations, LSERS' investment return assumption is also used as the discount rate.

The 2023 Experience Study recommends making no change in the 6.80% investment return assumption.

To assess the reasonableness of LSERS' return assumption, the 2023 Experience Study relied on the long-term capital market assumptions (CMAs[2]) prepared by:

- Segal Marco Advisors (one firm; LERS' investment consultant) and applied to LSERS' asset allocations directly
- A survey of investment firms, amalgamated to create a single CMA set, which is then applied to LSERS' asset allocations.

Conclusion – The Actuary for the LLA agrees that the investment return assumption (6.80%) falls within an acceptable range, based on LLA's established process for benchmarking return assumptions for Louisiana retirement systems.

However, this CAR offers the following recommendations for improving the development, assessment, and/or disclosure of an investment return assumption.

(1) Time Horizon – Develop an investment return assumption that reflects both the mid-term (10 years) and the long-term (20-30 years) time horizons based on the plan's expected benefit stream and cash flows.
(2) Volatility of CMAs and Smoothing – Consider smoothing the volatility of market-driven CMAs used when developing a recommendation and/or assessing the reasonableness of the selected assumption. This can be done by incorporating prior estimates that reflect recent years of market-driven CMAs from forecasters.
(3) Expert Opinions – Apply the CMAs from each independent investment firm separately to LSERS' asset allocations, to obtain separate expected returns for LERS' portfolio rather than amalgamate the CMAs.

[2] Market-driven Capital Market Assumptions (CMAs) are developed by professional investment forecasters and are comprised of (a) expected returns for each asset class, (b) expected rate of inflation, (c) expected standard deviations for each asset class and (d) expected correlation coefficients among the various asset classes. These are considered "market-driven" because the expectations are influenced by current market conditions and, thus, are subject to market volatility. These are combined with a plan's asset allocation percentages using complex mathematical finance formulas to develop a probability distribution of future expected returns for the portfolio as a whole.

Time Horizon

Recommendation: Develop an investment return assumption that reflects both the mid-term and the long-term time horizons based on the plan's expected benefit stream and cash flows.

The 2023 Experience Study report relied solely on long-term CMAs for its recommendations of investment returns.

Historically, the use of long-term (generally defined as 20- to 30-years) investment return expectations was common across all areas of pension actuarial practice. Over the past few decades, what was once common actuarial practice, such as the use of rolling amortization periods spanning 30, or even 40, years, has come under scrutiny. The pension actuarial community, including the public plan community have reexamined whether the long-held belief that these "perpetual" time periods are still appropriate, or even reasonable. In addition, significant changes have been made in how the financial community values, and forecasts, asset returns.

This CAR is not questioning whether the use of the assumed rate of return is appropriate for this particular measurement. The core question is: *Which is more appropriate for selecting an expected return on asset assumption, a mid-term time horizon, long-term, or somewhere in between?*

The 2023 Experience Study report disclosed its rationale for using only long-term time horizon forecasts as follows:

> In our opinion, the use of long-term investment return assumptions is most appropriate for a pension fund situated like LSERS. Such assumptions do not "time the market" by focusing too heavily on investment firms' near-term expectations which can be heavily influenced by recent investment events and a significant portion of system cash flows will occur in the distant future.

It is true mid-term forecasts are more sensitive to current market conditions than long-term forecasts. However, the general belief, and implied argument in the reasoning above, is that as a result long-term forecasts are less volatile than mid-term forecasts. Recent events illustrate that, regardless of whether that may true or not, long-term forecasts are not immune to experiencing volatility. Therefore, alternative ways to mitigate volatility, such as the example discussed in the section titled "Smoothing of Return Expectations," that specifically address the volatility concern should be used given the other issues with relying solely on long-term horizon forecasts outlined below.

Consider the following arguments against relying solely on the long-term expectation, but recognizing a blend of mid-term and long-term time horizons for expected returns.

In the Meantime

Perhaps the most important question worth asking is what happens while waiting "for the long-term to occur"?

Some professional investment forecasters only produce and publish market-driven CMAs for a 10-year period (mid-term), while others will produce both a 10-year period expectation and a long-term (20- or 30-year period) expectation. Combining the latter expectations from the same forecasters allows one to create a pattern of future expected returns that resembles a yield curve for bonds – given the nature of the time value of money and investment risk, this pattern is usually lower in years 1-10, and higher in years 11-30.

Note, while the curve has flattened in 2023 for both bond yields and for balanced portfolio expected returns. In future years, the shape of the two curves (yield curve and expected return pattern) is expected to return to "more normal" shapes.

An actuarial valuation using a long-term expected return ignores the actuarial expectation that actuarial losses are more likely to occur "in the meantime." Ignoring the sequence of return risk inherent in this approach makes decreases in funded status and increases in required contributions more likely over the near term until asset gains in the out-years "make-up" for these losses. *Is that a sustainable approach that should be considered reasonable?*

Sequence of Return Risk

On a percent basis, early investment losses require larger investment gains in later years to make up the difference, e.g., a 50% loss in year 1 requires a 100% gain in year 2 to break-even.

In addition, the traditional approach of developing the long-term assumed return on assets implicitly assumes that all current assets will be invested for the entire projection period, including assuming that short duration assets like notes and short-term bonds will perpetually be reinvested at the expected long-term rate. For a plan in a negative cash flow position, like LSERS where expected benefit payments exceed expected contributions by close to $90 million per year (approximately 4% of total assets), it is clearly not reasonable to assume that all current assets will be invested for the long-term. Undoubtedly, absent unanticipated contributions, a portion of these assets will need to be liquidated to cover benefit payments, further emphasizing why the asset gains relied upon in the out-years is not going to make up the shortfall that occurs "in the meantime."

Reliability

A general principle of forecasting science is that as the time horizon gets longer, forecasts are less reliable. This is known as the cone of uncertainty, and is frequently illustrated when describing the expected path of a tropical storm or hurricane. The same principal holds true for all forms of forecasting, including election forecasting and investment return forecasting. Furthermore, long-term CMA forecasts rely heavily on reversion to the mean, which generally requires the same conditions to

apply in the future as those that applied in the past baseline period. Unknown changes are certain to impact capital markets and expected returns, further adding to the cone of uncertainty associated with the long-term forecasts.

Evolution in Financial and Actuarial Modeling
The "duration" of a payment stream is the present value-weighted average length of time until benefit payments occur. It represents a "center of mass" of the discounted benefit stream, i.e., a weighted-average time horizon. Pension plan benefit payment durations for current participants are seldom ever 20-30 years (long-term). They are more like 8 to 15 years (i.e., mid-term, or between mid-term and long-term). Financial modeling, and actuarial practice, has evolved over time to recognize the duration of payment streams. The MacCauley Duration for LSERS' current expected accrued benefit stream is currently 8.7 years.

In the private sector, actuaries would never discount all future benefits using solely the long-term yield (nor is it permitted by Congress, the IRS, or FASB). That is why in the private sector, when the goal is to capture the full yield curve or all three segments into a single rate, plans are required to calculate a "single equivalent rate" or an "effective rate" that provides a representation that includes all points along the yield curve consistent with the plan specific benefit payment stream. The single equivalent rate (blended between mid-term and long-term forecasts) for LSERS currently occurs at 14 years out.

These changes are also recognized in the recent revisions to ASOP No 4. The description of the Low Default Risk Obligation Measure (LDROM) in §3.11 states [underline added for emphasis], "*When calculating this measure, the actuary should select a discount rate or discount rates derived from low-default-risk fixed income securities whose cash flows are reasonably consistent with the pattern of benefits expected to be paid in the future."* While this language is not directly applicable to funding valuations, it is instructive to see the Actuarial Standards Board's thinking on how to capture the effect of cash flow timing on a present value. Applying this type of ASOP No. 27 concept for LDROM to funding would peg the time horizon at 14 years out.

Smoothing of Return Expectations

Recommendation: Similar to how volatility in the market value of assets is smoothed into an actuarial value of assets, consider smoothing the volatility of market-driven CMAs when developing a recommendation and/or assessing the reasonableness of the selected assumption for an actuarial valuation. This can be done by incorporating prior estimates that reflect multiple recent years of market-driven CMAs from forecasters.

In addition, smoothing return expectations is a preferred way of mitigating volatility, instead using a long-term time horizon for expected returns.

Smoothing of volatile market-driven expected returns is no different in rationale and motivation than smoothing of the market value of assets into an actuarial value of

assets. Smoothing volatile asset-related values has a long actuarial history, and is designed to dampen volatility in factors that are expected to reverse in future years.

Prior to 2023, there was not a compelling reason to consider smoothing the market-driven return expectations because the changes were not dramatic and a smoothing algorithm would not result in a much different rate than the market-driven expectation itself. Generally speaking, these market forces moved portfolio expectations in increments of only 10-50 basis points (mostly downward), depending on the asset allocation. These were not examples of volatility, but trend.

Given, expected future returns from professional investment forecasters are substantially influenced by the current market forces and conditions (e.g., interest rates, CAPE and other P/E ratios, inflation, etc.), their forecasts issued for 2023 exhibit significant spikes in expected returns in most asset classes. This has been considered an example of volatility, not trend. This spike has prompted a reconsideration in how market-driven CMAs are used for this purpose.

To further illustrate the point, some forecasters have already lowered their forecasts since the initial 2023 forecasts were published.

The following table illustrates both the volatility exhibited by the 2023 market-driven CMAs versus prior years and the impact of adopting a 3-year smoothing period on the method used by the LLA for calculating a benchmark return assumption. Note, the market-driven benchmark for the June 30, 2023 valuation is shown based on both beginning-of-year CMAs (7.50%) and updated to estimate mid-year CMAs (7.25%), further illustrating the volatility impact.

Actuarial Valuation Date	Investment Return Assumption	Market-driven Benchmark[3]	Smoothed Benchmark[4]
June 30, 2020	7.00%	6.50%	N/A
June 30, 2021	6.90%	6.25%	N/A
June 30, 2022	6.80%	6.50%	6.40%
June 30, 2023	6.80%	7.50%[5]/7.25%[6]	6.70%

[3] The single equivalent expected return, between the mid-term forecasts and the longer-term forecasts, to reflect the benefit cash flow effects of reinvestment; based on previous market-driven forecasts issued at the beginning of the calendar year for the years 2020-2022.
[4] Average of the last three market-driven Benchmarks, to reflect smoothing of the market-driven return expectations (for calculating actuarial liabilities) much like smoothing of market value of assets (for calculating actuarial assets).
[5] Based on expectations among forecasters as of the beginning of 2023.
[6] With adjustments estimated to update the expectations to June 30, 2023.

Expert Opinions

Recommendation: Apply the CMAs from each investment firm independently and directly to LSERS' asset allocations, to obtain separate expected returns for LSERS' portfolio rather than amalgamate the CMAs.

Generally speaking, actuaries are not trained or experienced in developing mid-term and long-term (a) CMAs by asset class to be used in forecasting future investment returns, or (b) future inflation rates. We must turn to experts in those respective forecasting fields to provide input for recommending or assessing investment return assumptions for use in pension valuations.

In forecasting science, generally, considering multiple expert inputs is better than relying on only one. Having too few sources of market-driven CMA inputs is not optimal; neither is having too many.

The 2023 Experience Study primarily relies on CMAs from Segal Marco Advisors (LSERS' investment consultant) and on the System actuary's 2023 survey of various investment firms. The System's actuary employs an aggregation approach to distill the various CMA sets into a single CMA set by first gathering information from the following investment firms:

Raymond James	NEPC	UBS
Meketa	Segal	Consultant Y
Neuberger Berman	Verus	Blackrock

Aggregation Approach

The aggregation approach is an amalgamation of the available data from various investment firms and creates a composite CMA set (comprised of returns, standard deviations, and correlation coefficients). This is not an unreasonable process for developing or assessing a plan's investment return assumption for valuation purposes.

However, as compared to applying each firm's CMA set independently and directly to LSERS' asset allocation, the aggregation method (a) introduces additional slippage and sources of statistical error and (b) loses useful information otherwise learned from a direct approach.

In the aggregation approach, a *standardized* list of asset classes is created. Each investment firm has its own (different) list of asset classes; and each asset class from each firm has its own capital market assumptions. Each firms' asset classes and assumptions are mapped (approximately) to the standardized list, in order to collect and amalgamate the assumptions into the single *standardize*d list of asset classes. This mapping results in an amalgamated set of expected returns, standard deviation, and correlation coefficients for each asset class in the *standardized* list. This

approximate mapping and amalgamation introduce a certain amount of statistical error[7] into the final *standardized* CAM set. Having too many asset classes in the *standardized* list compounds the potential for statistical error.

Next, the asset classes in the System's own asset allocations are mapped to those in the *standardized* list.

Direct Approach

In the direct approach, the asset classes in the System's own asset allocations are mapped to each of the investment firm's own asset classes. This preserves each firm's own integrity and relationships among the three elements of their CMA (expected returns, standard deviations, and correlation coefficients).

This approach produces LSERS' own expected returns and standard deviations for its portfolio, as forecasted by each separate investment firm independently. The firms can be ranked from most conservative to most aggressive, giving a sense of the opinion-spread by expert.

[7] Even though there are nine investment firms included in the survey, less than nine are represented in the composite average for many of the standardized asset classes because of inexact mapping. Some of these correlation coefficients have even less than that, because they require pairs of asset classes to be represented. Sometimes, the firms do not adequately complete the request and sometimes the forecasts from prior years are included. Some of these sources of statistical error can be mitigated and may not have a significant effect on final results.

Rates of Salary Increase

In order to project future benefits, the actuary must project future salary increases for individual members. Salaries may increase for a variety of reasons:

- Across-the-board increases for all employees;
- Across-the-board increases for a given group of employees;
- Increases to a minimum salary schedule;
- Additional pay for additional duties;
- Step or service-related increases;
- Increases for acquisition of advanced degrees or specialized training;
- Promotions; or
- Merit increases, if available.

Actuaries commonly separate salary increases for each year in the experience period into two components:

(1) The actual inflation rate for that given year, and
(2) The excess of the actual total rate over the actual inflation rate; this represents the "real salary increase rate", or the portion of the increase representing merit and productivity increase, under the theory that workers' salary increases occur to keep up with inflation, promotions and improvements in personal skills, and general productivity in the workforce.

The actuary can further separate the actual real salary increase rates:

(1) By age during the experience period so that each age has its own actual raw salary increase rate and assumed rate, or
(2) By years of service, without regard for age; a non-actuarial advantage of this separation prevents the salary increases from showing a decline as members age, or
(3) By select and ultimate; this is built using separate rates by service for the first X years of service, then aggregated by age thereafter, or built using separate rates by age for the first X years of age, then aggregated by service thereafter, or
(4) A single rate, regardless of ages or years of service.

An actuarial analysis for deciding which of these approaches is preferable would be to examine the least squares or other measure of statistical best-predictors, i.e., which method does the best job of predicting (back-testing) the actual raw rates with the least statistical error. There may be other not-so-actuarial considerations (such as known bargaining expectations).

The first three methods require a minimum threshold number of members in each category for actuarial credibility. LSERS has a sufficiently large number of members to consider partitioning the data in these ways.

By separating the total increases experienced between inflation and merit and productivity (real) increases, the actuary can (a) decide on the most appropriate salary scale for merit and productivity (b) then decide separately on a future inflation component over a mid-term horizon of future working lifetimes that is consistent with the inflation component of the investment return assumption and any other inflation-related assumptions.

In the analysis presented in the experience study report, LSERS' actuary adopted an approach of not separating rates of salary increases between the inflation component and the merit and productivity component.

The 2023 Experience Study report analyzed the gross actual raw rates by service (approach 1b, above). Nevertheless, LSERS' actuary proposed to continue using a flat salary scale – a single salary growth rate assumption for all members without regard for age or service. Although real rates of salary increases were not analyzed in the report, the Actuary for the LLA estimated implied real rates to facilitate assessment of the appropriateness of the proposed assumption. The following table compares current assumptions to the observed and proposed aggregate rates:

Salary Increase Assumptions
Summary of Aggregate Rates

	Current Assumed	Observed	Proposed Assumed
Total Increases	3.25%	4.99%	3.75%
Inflation	2.50%	3.88%	2.50%
Real Increases	0.75%	1.11%	1.25%

The actual salary increases during the experience period were generally higher than the rates currently assumed for all durations of service, except for some durations above 27. Proposed gross rates are higher than currently assumed, resulting from increases in assumed real rates, but lower than average rates observed for the study period. The proposed real rates of salary increases are higher than both currently assumed and observed during the experience study period. LSERS' actuary supports this proposal citing post-pandemic job market and economic conditions.

Conclusion – The Actuary for the LLA considers the aggregate results for the salary scale to be acceptable.

However, the following are recommendations for improving the process (or its description):

(3) There was no mention of separately analyzing real rates of salary growth, after netting out observed inflation. A separate analysis of real rates of salary growth would improve the outcome.
(4) Although flat salary scales are not uncommon for smaller retirement plans, assumptions based on service or age (or both) may be more appropriate for a system of LSERS' size.

Mortality Rates

The methodology employed for developing the mortality assumption recommended by LSERS' actuary included two components:

- base mortality tables, and
- mortality improvement scales.

This the most common approach currently used by pension actuaries.

Credibility

Actuarial credibility pertains to the statistical confidence in the results of an experience study for projecting future mortality rates.

For the purpose of the experience study, the credibility was assessed separately for males and females, for actives and retirees, and also for healthy and disabled retirees. In order to be fully credible, the experience study for each group for which rates are developed is required to observe more than 1,000 deaths during the exposure period, with the exact threshold depending on the choice of table type.

Broadly speaking, mortality tables may be developed by analyzing numbers of members dying during the study period (headcount-weighted tables), or analyzing discontinuation of payments (amount-weighted tables). The decision for which type is used, should lead to obtaining the most appropriate result for the particular application at hand. For the measurement of most pension obligations, tables weighted by amount (salary for active employees and benefit amount for those in payment status) generally produce the most appropriate results.

LSERS' mortality experience is not sufficient to develop system-specific mortality rates for each age. Information presented in the experience study report (summarized in the table below) indicates that number of deaths amongst retirees supports a partial credibility of the system experience for determination of scaling factors.

Summary of Credibility Analysis			
		Deaths	Credibility Factor
Non-Disabled Retired	Male	1,169	72%
	Female	1,406	82%
Active	No separate analysis		
Disabled Retired	No separate analysis		
Survivor	No separate analysis		

Consequently, the LSERS actuary adopted a common approach of selecting reference tables based on a larger population, and scaling mortality rates from these tables using aggregate experience of the relevant LSERS' member groups. The LSERS actuary also adopted amount-weighted tables. System data for other membership subpopulation was deemed not sufficient to facilitate development of separate scaling factors.

Base Mortality Tables

The Retirement Plans Experience Committee (RPEC) of the Society of Actuaries published PUB-2010 tables in January 2019. Although not the newest broad-based tables, PUB-2010 were developed exclusively from experience of public-sector retirement systems, and as such constitute the most appropriate standard reference tables available for purposes of national estimates of mortality for public pension plans.

In preparing the experience study, LSERS' actuary compared the actual plan experience for retirees to the PUB-2010 General Healthy Retiree, Below-Median Income, projected to 2018 (the middle point of the study period).

LSERS-derived Adjustment Factors

LSERS-derived adjustment factors to be applied to the PUB-2010 mortality tables were calculated only for retirees. Designed to coincide with the central year of the experience study, these factors were developed by comparing the total observed number of deaths for the group from the experience study to the total number of deaths expected from application of the base reference mortality table. Because data for active employees, disabled retirees, and survivors wasn't sufficient to facilitate separate analysis, factors derived for retirees are proposed to be used for other subgroups in combination with appropriate reference tables.

LSERS-derived Adjustment Factors			
	Adjustment Factor		
	Males	Females	Reference Table
Active	125%	135%	General Employee, Below-Median Income
Non-Disabled Retired	125%	135%	General Healthy Retiree, Below-Median Income
Disabled Retired	125%	135%	Total Dataset Non-Safety Disabled
Survivor	N/A	N/A	General Healthy Retiree, Below-Median Income

Exhibits in the 2023 Experience Study report support our conclusion that these adjustment factors appear reasonable for use in actuarial valuations for LSERS.

It is worth noting that LSERS' actuary excluded deaths occurring during the COVID-19 pandemics from the above analysis. In order to maintain sufficient volume of data while excluding period most affected by the pandemic, observations are based on a

five-year period ending June 30, 2020 (beginning and ending two years earlier than the experience study period). The Actuary for LLA finds this approach to be prudent and appropriate for the purpose of setting assumptions regarding future experience.

Mortality Improvement Scale

The 2023 Experience Study report used the Society of Actuaries recommended approach – application of the generational mortality improvement scale MP-2021. This is the most recent experience-based improvement scale published by the Society of Actuaries. Because the adjustment factors were determined for reference tables projected to the central year of the study period, future mortality improvements will be projected from 2010, the central year of the period used in development of reference tables.

Conclusion -- The Actuary for the LLA considers the process and resulting mortality assumptions to be acceptable.

However, the process (or its description) could be improved by displaying the number of deaths expected from the current assumption next to amounts presented in the report for actual and expected from the proposed rates.

Rates of Disability

The disability incidence assumption is the probability that a member will become disabled while actively participating in the plan. Disability rates are commonly assumed to vary by age.

LSERS actuary uses scaled disability rates developed for the Railroad Retirement System, with a scaling factor determined from the overall disability LSERS experience. Because the LSERS' own data is in sufficient to develop the system specific disability table, the current rates were calculated by scaling the disability rates used for the 21st valuation of the Railroad Retirement System for individuals with 10-19 years of service with a 55% factor. Similarly, the proposed rates are the same as rates used for the 28th valuation of the Railroad Retirement System for individuals with 10-19 years of service (100% scaling factor). The following table compares current assumptions to the observed and proposed aggregate rates of disability:

Disability Incidence Assumptions – Summary of Aggregate Rates	Current Assumed	Observed	Proposed Assumed
Composite Disability Rates	0.89%	0.74%	0.78%

The actual disability rates during the experience period exhibited a high degree of volatility but, on average, were lower than the rates currently assumed. The proposed rates of disability are generally lower than the current assumed rates for most ages, but higher than actually observed average for the study period.

Conclusion -- The actuary for the LLA considers the approach and results for the rates of disability to be acceptable.

Rates of Retirement

As with most other decrements, rates of retirement from active employment can be undertaken using a few approaches. An entry to a Deferred Retirement Optional Plan (DROP) is a form of retirement as the eligibility for entering the DROP is often conditioned on meeting eligibility for retirement and, like retirement, it results in cessation of benefit accruals. Many retirement systems evaluate DROP entry and retirement together because they have similar effects on benefit accruals and liability buildup. Other systems, including LSERS in the 2023 Experience Study, analyze DROP rates separately from retirement. In addition, LSERS actuary analyzed retirement experience of post-DROP members separately from regular retirements.

As is the case with other decrements, studies of rates of retirement and DROP can be undertaken using a few approaches. A robust and explicit approach would start by determining which rate is most likely to be the best predictor of future experience, and by analyzing the rates:

(1) By age, during the experience period, so that each age has its own actual raw retirement/DROP rate and assumed rate;
(2) By years of eligibility, without regard for age;
(3) By a combination of age and years of service;
(4) By select and ultimate; this is built using separate rates by year of eligibility for the first X years, then aggregated by age thereafter, or built using separate rates by age for the first X years of age, then aggregated by year of eligibility thereafter; or
(5) A single retirement/DROP age, sometimes expressed in terms of eligibility for retirement/DROP (this approach is less and less common with advancements in valuation systems).

It appears that LSERS' actuary focused attention on analyzing the plan retirement and DROP experience by age. Proposed retirement rates for Tiers 3 and 4 members (first hired after July 1, 2010) are farther partitioned in three service ranges, (up to 10 years, 11-20 years, more than 20 years) representing a change in a rate structure. The following table compares current assumptions to the observed and proposed aggregate rates of retirement for Tier 1 and 2 members.:

Retirement/DROP Assumptions
Summary of Aggregate Rates

	Retirement	DROP	Post-DROP Retirement
Current Assumed	24.3%	18.3%	24.8%
Observed	16.7%	13.0%	21.1%
Proposed Assumed	18.4%	17.6%	23.3%

The current assumptions for Tiers 1 and 2 vary based on age, separately for regular retirement, DROP entry, and post-DROP retirement. The actual retirement/DROP rates during the experience period were generally lower than currently assumed.

The proposed rates of retirement/DROP were adjusted to better reflect the experience. They are generally based on smoothed actual rates with some allowance made for the current assumption and are higher than the actual, but lower than the current, rates.

The current assumptions for Tiers 3 and 4 vary by age, separately for regular retirement, DROP entry, and post-DROP retirement, similar to Tiers 1 and 2. However, the proposed rates of regular retirement and DROP entry are partitioned based on service at retirement:

- 10 years or less,
- 11-20 years, and
- more than 20 years of service

Rates of regular retirement for Tiers 3 and 4 are based on limited experience observed for Tier 3 members with manual adjustments based on professional judgment of the LSERS actuary. Rates of DROP entry and post-DROP retirement are generally based on experience of Tier 1 and 2 members with adjustments to account for lower benefit accrual rates, and more restrictive retirement eligibility. Resulting proposed rates and are generally higher than the actual but lower than the current rates.

Finally, while overall retirement rates during the covered period generally appear lower than previously assumed, it is not clear how much this decrease was affected by the events associated with the COVID-19 pandemic.

Conclusion – The Actuary for the LLA considers the retirement assumptions to be acceptable. However, given the unusual nature of events surrounding the COVID-19 pandemic, the Actuary for the LLA believes that a more explicit approach to address the effects of the pandemic on the observed experience would be valuable. Given the size of the system, retirement rates might be reliably derived even if the most affected year was removed from the observed experience or by using a period prior to the pandemic, similar to the analysis completed for mortality.

At a minimum, the process (or its description) could be improved by being more explicit regarding how the System's actuary has applied "professional judgment to avoid overly emphasizing certain data from the years most affected by the Covid-19 and the related school closures," and if there is a relationship between the conservatism adjustment and the potential impacts of the pandemic on the observed experience. Refer to Appendix B for additional illustrations pertaining to this concern.

Finally, we did not find any explicit documentation or analysis of retirement pattern by year of eligibility for Tiers 1 and 2. Additional analysis examining retirement rates by years since first eligible could provide valuable insight into retirement patterns.

Rates of Withdrawal

Withdrawal rate experience studies can be undertaken using a few approaches. In a robust and explicit approach, the actuary can separate the actual raw withdrawal rate:

(1) By age during the experience period so that each age has its own actual raw withdrawal rate and assumed rate;
(2) By years of service, without regard for age;
(3) By a combination of age and years of service;
(4) By select and ultimate; this is built using separate rates by service for the first X years of service, then aggregated by age thereafter, or built using separate rates by age for the first X years of age, then aggregated by service thereafter; or
(5) A single rate, regardless of ages or years of service (this is rarely used for withdrawal rate assumptions).

An actuarial analysis for deciding which of these approaches is preferable would be to examine the least squares or other measure of statistical best-predictors, i.e., which method does the best job of predicting (back-testing) the actual raw rates with the least statistical error. There may be other not-so-actuarial considerations.

The first four approaches require a minimum threshold number of members in each category for actuarial credibility. LSERS has a sufficiently large number of members to partition the data in these ways. The following table compares current assumptions to the observed and proposed aggregate rates of withdrawal from active service:

Withdrawal (Including Early Retirement) Assumptions
Summary of Aggregate Rates

	Current Assumed	Observed	Proposed Assumed
Composite Termination/ Early Retirement	6.9%	8.3%	7.8%

The current assumptions vary based on age.

The actual withdrawal rates during the experience period varied by service:

a. Generally actual rates were higher than the rates currently assumed for members with 18 or fewer years of service, and
b. Actual rates were mostly lower than the rates currently assumed for members with 19 or more years of service.

The proposed rates were set to strike a balance between the current rates and the actual experience.

Finally, while the overall relation between assumed and observed termination experience during the covered period varied between age groups, it is not clear how much the actual termination patterns were affected by the events associated with the COVID-19 pandemic.

Conclusion – The Actuary for the LLA considers the withdrawal assumptions to be acceptable. However, given the unusual nature of events surrounding the COVID-19 pandemic, the Actuary for the LLA believes that a more explicit approach to address the effects of the pandemic on the observed experience would be valuable. Given the size of the system, withdrawal rates might be reliably derived even if the most affected year was removed from the observed experience or by using a period prior to the pandemic, similar to the analysis completed for mortality.

At a minimum, the process (or its description) could be improved by being more explicit regarding how the System's actuary has applied "professional judgment to avoid overly emphasizing certain data from the years most affected by COVID," and if there is a relationship between the conservatism adjustment and the potential impacts of the pandemic on the observed experience. Refer to Appendix B for additional illustrations pertaining to this concern.

Other Assumptions

The 2023 Experience Study report also includes the following assumptions:

- Dependent/minor children statistics
- Spouse's age
- Marital status
- Unisex mortality rates for actuarial equivalence and service transactions
- Inputs for development of option factors

We reviewed the sections of the 2023 Experience Study report relating to the assumptions mentioned above and found them to be described with reasonable detail and careful recognition of relevant experience. Therefore, we find these assumptions mentioned acceptable.

APPENDIX A – Inflation Forecasts

The LLA used the following forward-looking inflation forecasts from economists in its review of the 2023 Experience Study.

2023 Forward Looking Forecasts of CPI Inflation		
Time Horizon	**Median**	**No. of Sources**
10 years	2.38%	10
20-30+ years	2.26%	9

2023 Forward Looking Forecasts of CPI Inflation (From Professional Experts in the Field of Forecasting)	
Federal Reserve Board's Federal Open Market Committee (reaffirmed Dec 2022)	
Current "Long-run" Price Inflation Objective (<10 years):	
Objective since Jan 2012; Personal Consumer Expenditures (PCE) Deflator	2.00%
Consumer Price Index Inflation Objective (CPI = PCE + approx. 30 bps)	2.30%
Congressional Budget Office: *The Budget and Economic Outlook*	
Overall Consumer Price Index (February 2023; 10 Years)	2.53%
Overall Consumer Price Index (June 2023: 30 Years)	2.26%
2023 Social Security Trustees Report	
CPI-W Ultimate (Long-term) Intermediate Assumption	2.40%
Federal Reserve Bank of Philadelphia	
Livingston Survey: 10-Year Median Forecast (June 2023)	2.40%
Survey of Professional Forecasters: 10-Year Median Forecast (2Q2023)	2.36%
Federal Reserve Bank of New York's Trading Desk (May 2023)	
Survey of Market Participants: 10-Year Median Expectation	2.40%
Survey of Primary Dealers: 10-Year Median Expectation	2.45%
Federal Reserve Bank of Cleveland (June 2023)	
10-Year Expectation	1.75%
20-Year Expectation	1.96%
30-Year Expectation	2.11%
Federal Reserve Bank of St. Louis; FRED (June 2023)	
10-Year Expectation	2.20%
20-Year Expectation	2.48%
30-Year Expectation	2.23%
U.S. Department of the Treasury (Avg in June 2023)	
10-Year Breakeven Inflation	2.10%
20-Year Breakeven Inflation	2.40%
30-Year Breakeven Inflation	2.19%
2023 GRS Survey of Investment Firms	
Median expectation among 11 firms (averaging a 10-year horizon)	2.50%
Median expectation among 7 firms (averaging a 27-year horizon)	2.60%

APPENDIX B - COVID-19 Pandemic

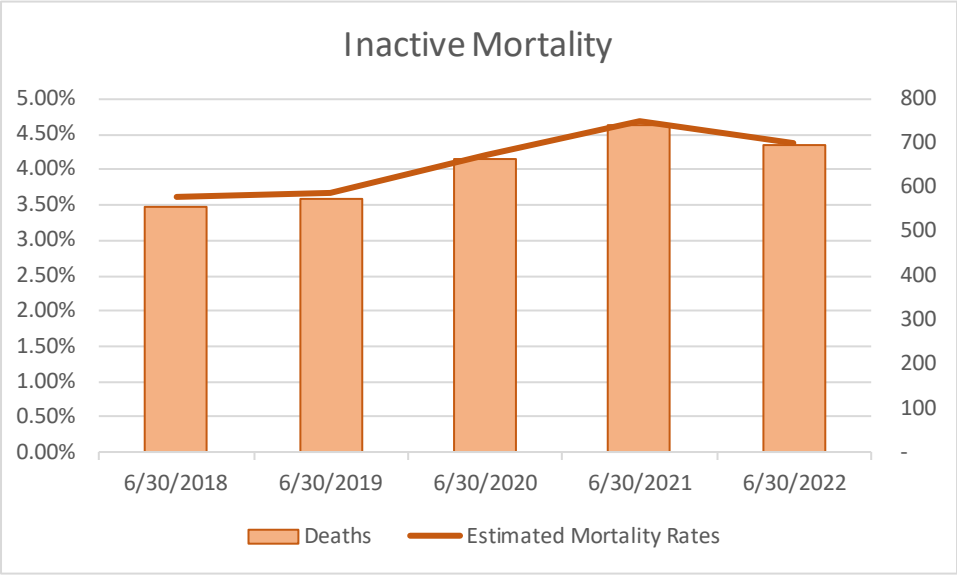
Events surrounding COVID-19 may have impacted the actual experience of the plan during the experience period of this experience study (June 30, 2017, to June 30, 2022) and anticipated outlook. The 2023 Experience Study included commentary on how/whether COVID-19 was partially factored into the analysis.

Even today, it is difficult to ascertain the impact of COVID-19 and related events on key economic and demographic assumptions. However, at a minimum, a qualitative discussion of the potential impact on decrement patterns should be included.

Although detailed analysis was not performed, below we offer some illustrations and comments based on information presented in the five valuation reports issued during the period covered in the experience study. This analysis is based on statistical exhibits presented in the respective valuation reports and as such is intended to illustrate high level comments. It lacks the precision necessary to develop assumptions.

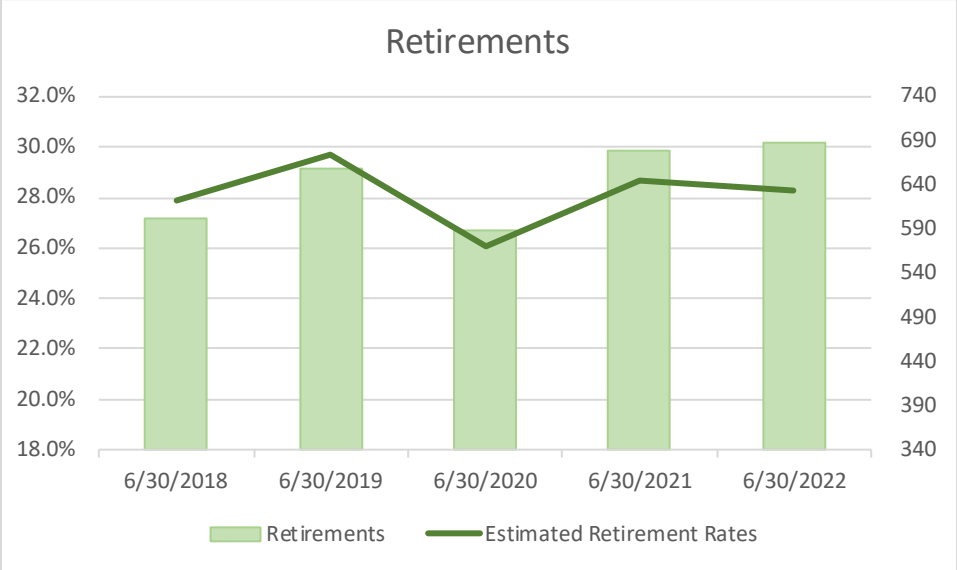
Mortality

Blended rates of mortality among participants collecting benefits seem to have increased for years ending 6/30/2021 and 6/30/2022 by approximately 10% as compared to pre-pandemic experience. This is consistent with observations made by the LSERS actuary. As such, the Actuary for the LLA concurs with the LSERS actuary decision to base scaling factors development on experience that excluded fiscal years ending 6/30/2021 and 6/30/2022 (and supplement data with earlier experience). While it is not clear what levels of mortality can be expected in the future, it seems appropriate to base expectations on pre-pandemic mortality experience.



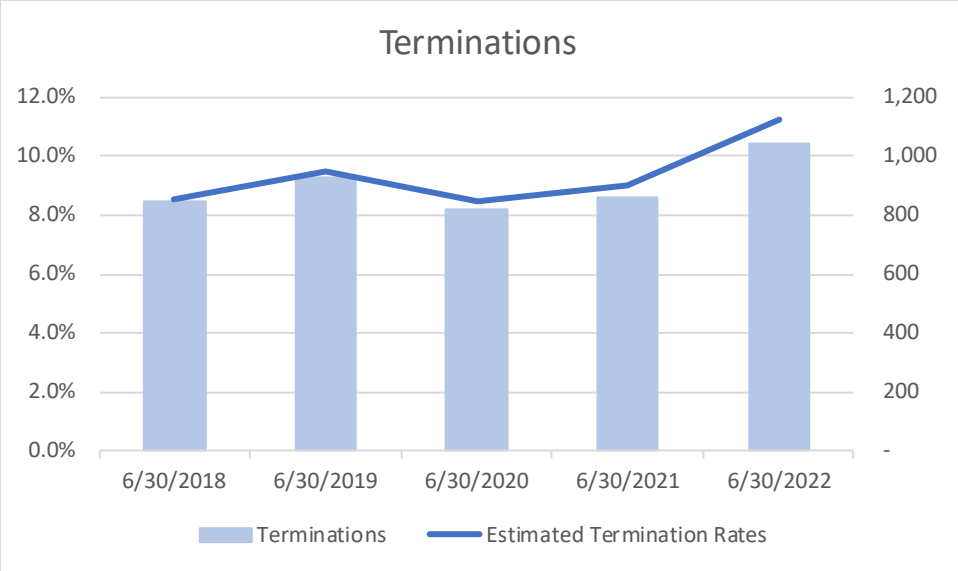
Retirement

Blended rates of retirement exhibited an irregular pattern, dropping significantly for the year ending 6/30/2020 and returning to levels consistent with pre-pandemic levels for the next two years. Retirement rates based on this experience might result in underestimating future retirements with unclear impact on valuation results. A 10% conservatism load applied in this experience study appears to adequately address the pandemic related suppression of retirements. An alternative approach that assigns lower weight, or excludes, retirements observed during the year ended 6/30/2020 may also be considered for implementation.



Terminations

Blended rates of terminations increased significantly (more than 20% compared to pre-pandemic levels) for the year ending 6/30/2022, sometimes dubbed as a "great resignation." As such, termination rates developed for LSERS might result in overstated future terminations with a decreasing impact on valuation results. A 95% conservatism adjustment factor applied in this experience study appears to adequately address the pandemic related suppression of retirements. While it is not clear if events surrounding the pandemic will have a lasting effect on future termination patterns, it may be more appropriate to base expectations on pre-pandemic termination experience, or assign lower weights to data from the last year studied.



Although the mid-term or long-term impact of COVID-19 pandemic on demographic experience after 6/30/2022 will not be known for many years, the Actuary for LLA finds LSERS actuary's approach to setting mortality assumption to be prudent. It would be also beneficial to address the existence of a connection between adjustments for conservatism made to rates of termination and retirement and the potential effect of COVID on the observed experience. .

APPENDIX C – Actuarial Disclosures

Intended Use

This Actuarial Review was prepared in accordance with La. R.S. 11:127(C) and 24:513(C)(1). This Review is intended for use by PRSAC and those designated or approved by PRSAC. This Actuarial Review may be provided to parties other than PRSAC only in its entirety and only with the permission of PRSAC. The Louisiana Legislative Auditor is not responsible for unauthorized use of this Actuarial Review.

This Actuarial Review should not be construed as providing tax advice, legal advice, or investment advice. It should not be relied on for any purpose other than the purposes described herein. This Actuarial Review assumes the continuing ability of the System to collect the contributions necessary. A determination regarding whether or not the System is actually willing and able to do so in the future is outside our scope of expertise and was not performed.

Actuarial Data, Methods and Assumptions

The findings in this Actuarial Review are based on data and other information as of the date of the 2023 Experience Study, and forecasts published for 2023. This Actuarial Review was based upon information furnished by the System, the System's investment consultant, the System's actuary, and by numerous external inflation and investment forecasters. We checked for internal reasonability and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by outside parties.

For certain calculations that may be presented herein, we have utilized commercially available valuation software and/or are relying on proprietary valuation models and related software developed by our actuarial contractor. We made a reasonable attempt to understand the intended purpose of, general operation of, major sensitivities and dependencies within, and key strengths and limitations of these models. In our professional judgment, the models have the capability to provide results that are consistent with the purposes of the analysis and have no material limitations or known weaknesses. Tests were performed to ensure that the model reasonably represents that which is intended to be modeled.

To the extent that this Actuarial Review relies on calculations performed by the Systems' actuaries, to the best of our knowledge, no material biases exist with respect to the data, methods or assumptions used to develop the analysis other than those specifically identified. We did not audit the information provided, but have reviewed the information for reasonableness and consistency with other information provided by or for the affected retirement System.

Conflict of Interest

There are no known conflicts that would compromise the ability to present an unbiased statement of actuarial opinion.

Risks Associated with Measuring Costs

This actuarial note is an actuarial communication, and is required to include certain disclosures in compliance with Actuarial Standards of Practice (ASOP) No. 51.

A full actuarial determination of the retirement System's costs, actuarially determined contributions and accrued liability require the use of assumptions regarding future economic and demographic events. The assumptions used to determine the retirement System's contribution requirement and accrued liability are summarized in the 2023 Experience Study being reviewed.

The actual emerging future experience, such as a retirement fund's future investment returns, may differ from the assumptions. To the extent that emerging future experience differs from the assumptions, the resulting shortfalls (or gains) must be recognized in future years by future taxpayers. Future actuarial measurements may also differ significantly from the current measurements due to other factors: changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period; or additional cost or contribution requirements based on the System's funded status); and changes in plan provisions or applicable law.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

(1) Investment risk – actual investment returns may differ from the expected returns (assumptions);
(2) Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
(3) Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
(4) Longevity and life expectancy risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed;
(5) Other demographic risks – members may terminate, retire or become disabled at times or with benefits at rates that differ from what was assumed, resulting in actual future accrued liability and contributions differing from expected.

The scope of this Actuarial Review does not include an analysis of the potential range of such future measurements or a quantitative measurement of the future risks of not achieving the assumptions. In certain circumstances, detailed or quantitative assessments of one or more of these risks as well as various plan maturity measures and historical actuarial measurements may be requested from the actuary. Additional risk assessments are generally outside the scope of an actuarial review. Additional assessments may include stress tests, scenario tests, sensitivity tests, stochastic modeling, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability.

However, the general cost-effects of emerging experience deviating from assumptions can be known. For example, the investment return since the most recent actuarial valuation may be less (or more) than the assumed rate, or a cost-of-living adjustment may be more (or less) than the assumed rate, or life expectancy may be improving (or worsening) compared to what is assumed. In each of these situations, the cost of the plan can be expected to increase (or decrease).

At the time of this writing, we consider the 2023 forecasts of the future inflation and capital market assumptions (including future investment returns) from the subject matter experts to be suitable for development of the benchmark return assumption used in this Actuarial Review.

The use of reasonable assumptions and the timely receipt of the actuarially determined contributions are critical to support the financial health of the plan. However, employer contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

Certification

All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board and with applicable statutes.

Kenneth J. Herbold, Jim J. Rizzo, and Piotr Krekora are Associates of the Society of Actuaries (ASA), Members of the American Academy of Actuaries (MAAA), and Enrolled Actuaries (EA) under the Employees Retirement Income Security Act of 1974 and meet the US Qualification Standards necessary to render the actuarial opinion contained herein.

Kenneth J. "Kenny" Herbold, ASA, EA, MAAA
Director of Actuarial Services
Louisiana Legislative Auditor

December 6, 2023
Date

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