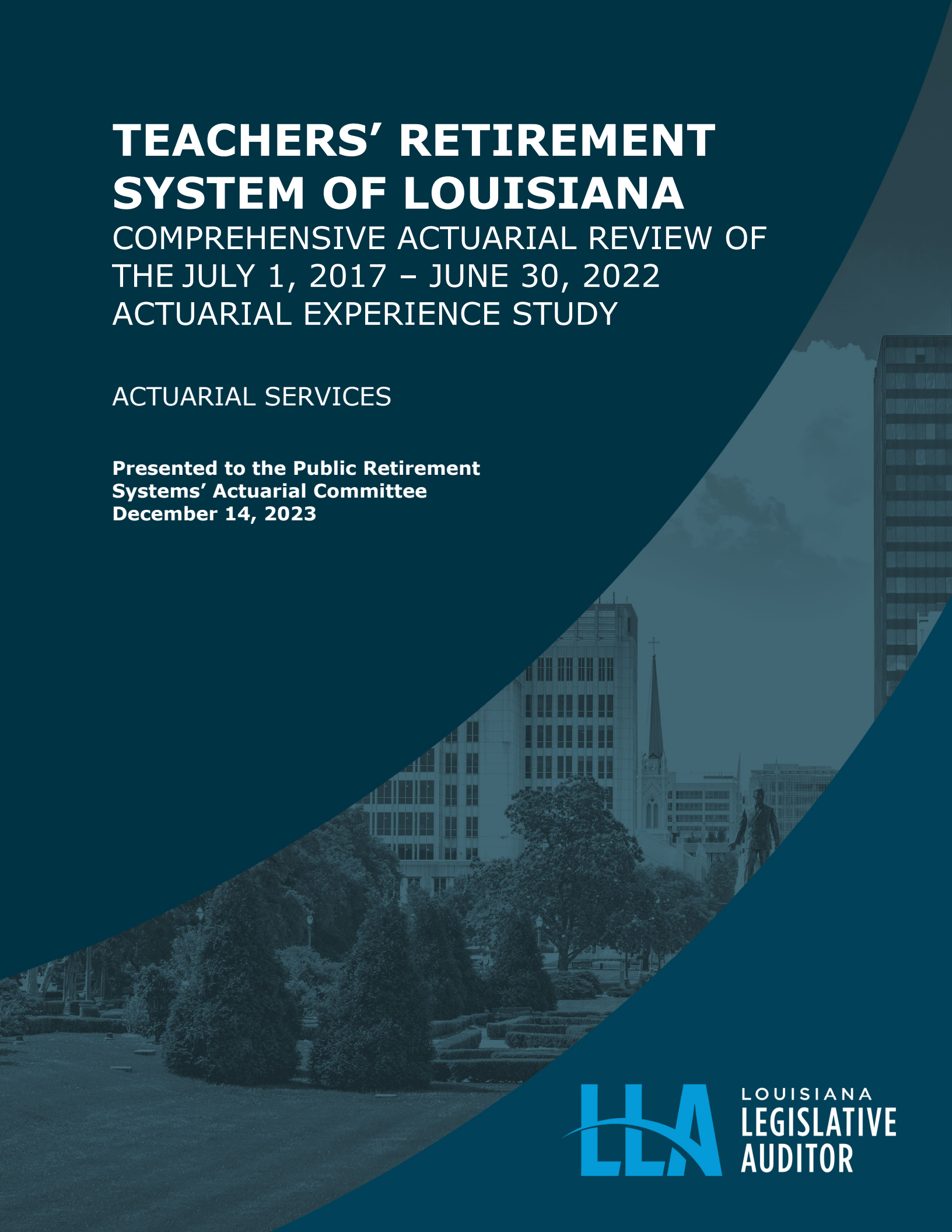
TEACHERS' RETIREMENT SYSTEM OF LOUISIANA

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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LOUISIANA LEGISLATIVE AUDITOR

December 4, 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 TRSL's 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 Teachers' Retirement System of Louisiana (TRSL or System).

The following presents the results of our Comprehensive Actuarial Review of TRSL's July 1, 2017 – June 30, 2022 Experience Study Report (2023 Experience Study) prepared by Foster & Foster Actuaries and Consultants and dated March 31, 2023. In doing so, we have reviewed certain actuarial assumptions and methods recommended by TRSL's actuary.

I would like to thank TRSL's 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: Ms. Katherine Whitney, Director
Teachers' Retirement System of Louisiana

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Executive Summary

We performed a review of the methods used by TRSL's 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

(1) We do not believe there is sufficient information to evaluate the recommendations for the mortality, retirement, or withdrawal assumptions. Ordinarily, the approaches to developing each of these assumptions would be sufficient for the analysis; however, given the unusual nature of events surrounding COVID-19 pandemic, the Actuary for the LLA believes that, at a minimum, the experience study should include a qualitative discussion of the potential impacts of the pandemic on the observed experience.

(2) For all other recommendations, 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, we have brought up a number of possible considerations, which the TRSL Board and actuary may find beneficial if incorporated in the upcoming valuations or future experience studies.

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, aggregate for the System
- Investment Rate of Return and Discount Rate, aggregate for the System
- Rates of Salary Increase, separate for each plan

We find economic assumptions recommended by the TRSL 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 and disclose the rationale for any time horizon selected.

(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 – Include more CMA sets from large and reputable investment forecasters, like Aon, as additional references in the recommendation and assessment process.

Rates of Salary Increase

(1) Include a discussion of fit-quality for the service-based salary scales or select and ultimate scales recommended, compared to analyzing salary experience by age alone.
(2) Include a separate analysis of real rates of salary growth (net of inflation) and treat inflation as an add-on.
(3) Include a supporting discussion addressing the apparent inconsistency between the real observed salary increases, which were lower than previously assumed, and the proposed rates which are higher than both previously assumed and observed, for K-12 Teachers and Higher Education.

Demographic Assumption Recommendations

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

- Mortality rates, aggregate for the System
- Disability rates, aggregate for the System
- Retirement Rates, separate for each plan
- Withdrawal/Termination Rates, separate for each plan
- Other assumptions

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. However, the 2023 Experience Study did not include commentary on how/whether COVID-19 was factored into the analysis.

[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.

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.

Without an analysis or any discussion of the impact of the COVID-19 pandemic, we do not believe there is sufficient information to evaluate the recommendations for the mortality, retirement, or withdrawal assumptions.

Refer to the applicable sections and Appendix B for a more detailed discussion of this concern.

Rates of Retirement

(1) Include a discussion of the potential impacts of the pandemic on the observed experience.
(2) Include the actual number retiring, the assumed number retiring per the current assumption, the ratio of actual to expected, the proposed number retiring per the proposed assumption, the ratio of actual to proposed, and the actual rate of retirement/DROP.
(3) 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 is sufficient, or a different approach could provide more predictive value.

Rates of Withdrawal

Include the actual number terminating, the assumed number terminating per the current assumption, the ratio of actual to expected, the proposed number terminating per the proposed assumption, the ratio of actual to proposed, and the actual rate of terminations in the experience study.

Other Assumptions

Consider performing an analysis of DROP participants electing to continue working and accruing additional benefits.

Scope of Review

The experience study of the actuarial assumptions of the Teachers' Retirement System of Louisiana (TRSL or the System) for the period July 1, 2017 through June 30, 2022 (2023 Experience Study) was prepared by Foster & Foster Actuaries and Consultants, and dated March 31, 2023.

This Comprehensive Actuarial Review (CAR) of that report presents assessments for appropriateness and reasonableness of certain methods and key actuarial assumptions recommended by TRSL's 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 TRSL's 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 2022 assumption of 2.30% was reasonable but the System actuary recommends increasing the long-term assumption from 2.30% to 2.40%.

The System actuary based the inflation assumption recommendation on estimates from the following forward-looking sources:

- Aon, the System's investment consultant. The long-term inflation assumption used by Aon is 2.40%.
- The Horizon Actuarial Services, LLC, 2022 Survey of 40 investment firms. The average short-term inflation expected by all 40 firms was 2.46%. For the 24 firms that provided both short-term and long-term assumptions, the average short-term inflation was 2.51% and the average long-term inflation was 2.44%.
- The Survey of Professional Forecasters conducted by the Federal Reserve Bank of Philadelphia. An average inflation rate forecasted (in the fourth quarter of 2022) over the next 10 years was expected to be 2.95%.
- The Philadelphia Fed's Livingston Survey. The December 2022 report showed a median 10-year inflation expectation of 2.50%.
- The Social Security Administration's 2022 Trustees Report included an ultimate long-term (75-year) intermediate cost inflation assumption of 2.40%.
- The spread between the nominal yield on treasury securities and the inflation indexed nominal yield on inflation protected treasury bills (TIPS), called the "breakeven" rate of inflation, and information about historical inflation. The breakeven rate of inflation expected on February 1, 2023 was 2.20% for the 30-year time horizon.

The System actuary also considered historical trailing compound rates of inflation for various time periods ending December 31, 2021 and 2022. In the recent past, there has been considerable volatility in actual inflation and in expected inflation.

Conclusion – The Actuary for the LLA considers the approach and results (2.40%) to be acceptable, based on the information presented in the 2023 Experience Study and our review of the forward-looking inflation forecasts presented 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. And, in most public sector pension valuations, the investment return assumption is also used as the discount rate.

Gain-Sharing and Discount Rate

At the time of the publication of the 2023 Experience Study, PBIs were funded by automatic transfers to a side fund (the Experience Account or EA) when investment gains exceed certain statutory thresholds (e.g., gain-sharing). While the PBIs funded via the EA are neither automatic nor guaranteed, the System and its actuary assumed that future PBIs would be granted when permitted and therefore reflected the value of these benefits when developing the actuarial accrued liability. TRSL does this by estimating the amount by which its total investment return over time will be reduced to account for transfers to the EA. The 2023 Experience Study recommends this margin remain at 35 basis points.

TRSL's actuary assesses the most recently adopted discount rate by comparing it against the expected investment return of professional forecasters reduced by this margin.

The LLA has written extensively regarding the chosen method for valuing the cost and liability for transfers to, and subsequent PBIs funded from, the EA. More specifically, while the Actuary for the LLA considers the method to be reasonable and meets the requirements of the ASOPs, concern has been expressed regarding the indirect nature of this approach and the potential confusion it has caused for stakeholders. A more detailed discussion regarding alternative methods for directly valuing PBIs can be found in prior Actuarial Reviews performed by the LLA, most recently in the LLA's Actuarial Review of TRSL's 2022 Actuarial Valuation dated December 9, 2022.

It should also be noted that Act 184 of the 2023 Regular Session was enacted subsequent to the publication of the 2023 Experience Study but prior to the completion of this CAR. Act 184 has a significant impact on the development and potential reasonableness of this adjustment. In addition, the changes made under Act 184 address many of the concerns expressed by the LLA related to both the development of this assumption and the indirect nature in which PBIs were funded.

Conclusion – No further opinion is being offered regarding whether 35 basis points is a reasonable estimate for this assumption either prior, or subsequent, to the enactment of Act 184. Additionally, no opinion is being offered regarding the method in which this assumption impacts the evaluation of the investment return assumption or discount rate.

Total Investment Return

As noted above, the 2023 Experience Study does not directly assess the total investment return assumption, but instead evaluates the discount rate, which is the investment return assumption net of the gain-sharing adjustment. The 2023 Experience Study recommends retaining 7.25% as the discount rate.

To assess the reasonableness of TRSL's discount rate, the 2023 Experience Study relied on the long-term capital market assumptions (CMAs[2]) prepared by:

- Aon (one firm; TRSL's investment consultant) and
- Horizon Actuarial Services' 2022 survey of 40 investment firms

Rather than follow the same process, this CAR starts with the discount rate and increases it by the gain-sharing adjustment to calculate the total implied investment return assumption:

Discount Rate Assumption	7.25%
Gain-sharing Adjustment Assumption (add-on)	0.35%
Total Investment Return Assumption (implied[3])	7.60%

Conclusion – The Actuary for the LLA agrees the total implied investment return assumption falls within an acceptable range

However, this CAR offers the following recommendations for improving the development, assessment, and/or disclosure of a potential total 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 and disclose the rationale for any time horizon selected.
(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

[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.

[3] The total investment return assumption is an "implied" assumption, as the term is commonly used in financial statistics, because it is not developed directly or explicitly from basic principles, but assigned a value from other observable or derived data and which is consistent with the discount rate assumption applied in the actuarial valuation to all other (non-PBI) benefits.

by incorporating prior estimates that reflect recent years of market-driven CMAs from forecasters.

(3) Expert Opinions – Include more CMA sets from large and reputable investment forecasters, like Aon, as additional references in the recommendation and assessment process.

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 and disclose the rationale for any time horizon selected.

The 2023 Experience Study report relied solely on long-term CMAs for its recommendations of investment returns. Further, no rationale for this selection of only a long-term time horizon was included in the analysis.

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 did not discuss the rationale for only using the long-term time horizon. However, following are three common arguments generally expressed in support of using only a long-term time horizon for expected returns:

(1) *"Pensions are long-term propositions."*
(2) "*Our pension plan has been around a long time and is presumed to be perpetual."*
(3) *"We invest for the long-term."*

Even if all three of these statements are true, none of them provide a financial or mathematical argument for favoring the long-term horizon over any other time period.

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 TRSL, where expected benefit payments exceed expected contributions by close to $1 billion per year (or nearly 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 TRSL's current expected accrued benefit stream is currently 9.8 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 TRSL currently occurs at 15 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 15 years out.

Finally, even if TRSL and its actuary believe the long-term time horizon remains the best way to develop and assess the investment return assumption, and even though it may not be strictly required by the ASOPs, the Actuary for the LLA believes that in light of the evolving discussion around this topic in the actuarial community, disclosing the rationale for this selection is in the best interest of stakeholders and would improve the communication of the rationale for the assumption.

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.

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. For example, Aon's forecasts for TRSL dropped considerably from December 31, 2022 to June 30, 2023. This illustrates the point that the market-driven CMAs may be too volatile to use "as is" and reinforces the rationale for adopting a smoothing approach.

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 (8.00%) and updated to estimate mid-year CMAs (7.60%), further illustrating the volatility impact.

Actuarial Valuation Date	Investment Return Assumption	Market-driven Benchmark[4]	Smoothed Benchmark[5]
June 30, 2020	7.80%	7.00%	N/A
June 30, 2021	7.75%	6.75%	N/A
June 30, 2022	7.60%	7.00%	7.10%
June 30, 2023	7.60%	8.00%[6]/7.60%[7]	7.20%

Expert Opinions

Recommendation: Include more market-driven CMA sets from large and reputable investment forecasters, like Aon, and apply them directly to TRSL's asset allocation, as additional references in the recommendation and assessment process.

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 Aon (TRSL's investment consultant) and a survey of numerous investment firms prepared by Horizon Actuarial Services (HAS).

Aon is a large and reputable firm with deep research staff for creating capital market assumptions and provides a market-driven CMA set used by the LLA as well as many other actuaries.

Horizon Actuarial Services (HAS) surveyed 40 investment firms for its 2022 survey. Having more than just the one firm for market-driven CMA inputs to the assessment process helps gain multiple opinions. However, their surveyed firms include many small and mid-size firms without the depth and credentials for research and development of market-driven CMAs that the large firms have. With so many inputs

[4] 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.
[5] Average of the last three market-driven Benchmarks re-calculated assuming the current asset allocation had been in place, 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).
[6] Based on expectations among forecasters as of the beginning of 2023
[7] With adjustments estimated to update the expectations to June 30, 2023.

from small and mid-size firms, there is also some degree of overlapping because some of them rely on the larger firms' CMAs which are already included by a direct submission from the larger firms.

In addition, HAS uses an aggregated process for developing a single CMA set, amalgamated from the submission of 40 firms. There are some advantages and some disadvantages to this aggregated approach versus utilizing the market-driven CMA set directly from the individual investment firms applied directly to TRSL's asset allocation. The primary disadvantages being the amalgamation of CMAs from different firms (a) introduces additional slippage and sources of statistical error and (b) loses useful information otherwise learned from a direct approach. The differences in methodologies and mathematical formulae can also account for some differences of opinion in final market-driven expected returns.

The issues regarding those surveyed, and the potential issues related to the aggregation method would therefore indicate the breadth of expert opinions from this survey (one of the primary advantages) is more limited than first appears. That is why this CAR recommends including additional market-driven CMA sets from large and reputable investment forecasters, and apply them directly to TRSL's asset allocation without amalgamation, in addition to the market-driven CMA sets from Aon and HAS.

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;
(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
(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. TRSL has a sufficiently large number of members to partition 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.

TRSL'S actuary indicated that the inflation component and the merit and productivity component were separated, with a recommended inflation component of 2.40%.

The 2023 Experience Study report analyzed the gross actual raw rates by service (approach 1b, above) for all the membership groups. The following table compares current assumptions to the observed and proposed aggregate rates:

Salary Increase Assumptions – Summary of Aggregate Rates

	Regular Teachers	Higher Education	Lunch Plans
Current Assumed Inflation	2.30%		
Current Assumed Real Increases	1.18%	1.44%	0.94%
Current Assumed Total Increases	3.48%	3.74%	3.24%
Observed Inflation	2.92%		
Observed Real Increases	1.07%	1.34%	2.53%
Observed Total Increases	3.99%	4.26%	5.45%
Proposed Assumed Inflation	2.40%		
Proposed Assumed Real Increases	1.42%	1.50%	1.60%
Proposed Assumed Total Increases	3.82%	3.90%	4.00%

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 21 for Regular Teachers and Higher Education. Proposed rates are generally higher than currently assumed, resulting from modest increases in assumed inflation and real rates, but lower than average rates observed for the study period.

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

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

(1) Although service-based salary scales are quite common, a discussion of fit quality in this approach as compared to analyzing salary experience by age alone or by a select and ultimate scale would add useful context.

(2) 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.
(3) Although the real observed salary increases were lower than currently assumed for K-12 Teachers and Higher Education, the proposed rates are higher than both previously assumed and observed. This may not be an unreasonable assumption given the post pandemic suppression of real salary increases, but should be accompanied by a supporting discussion addressing this apparent inconsistency.

Mortality Rates

The methodology employed for developing the mortality assumption recommended by TRSL's 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.

Although TRSL is among the largest retirement systems in the country, its mortality experience is not sufficient to develop System-specific mortality rates for each age. Although there is not enough data in the report to verify full credibility thresholds and resulting credibility factors for amount-weighted tables, based on the information in the experience study report (summarized in the table below), for determination of scaling factors the TRSL experience study data appears to be fully credible for the non-disabled retiree subgroups, partially credible for the active and disabled retiree subgroups, and credibility factors for the survivor subgroups were not disclosed.

Summary of Credibility Analysis			
		Deaths	Credibility Factor
Active	Male	141	26.1%
	Female	333	41.5%
Non-Disabled Retired	Male	2,754	100.0%
	Female	7,536	100.0%
Disabled Retired	Male	Unknown	22.2%
	Female	Unknown	61.2%
Survivors		Unknown	Unknown

Consequently, the TRSL 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 TRSL's member groups. The TRSL actuary also adopted amount-weighted tables.

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, TRSL'S actuary compared the actual plan experience to the un-projected PUB-2010 Total Dataset, Above-Median Income, and Below-Median Income Mortality Tables for Teachers and General Employees, separately for employees, healthy annuitants, and disabled retirees.

TRSL-derived Adjustment Factors

TRSL-derived adjustment factors to be applied to the PUB-2010 mortality tables were calculated separately for each member type. Designed to coincide with the central year of the experience study, these factors were developed by comparing the total observed number of deaths for each subgroup from the experience study to the total number of deaths expected from application of the base reference mortality table for each subgroup.

TRSL-derived Adjustment Factors		
	Adjustment Factor	
	Males	Females
Active	96.5%	94.2%
Non-Disabled Retired	117.3%	125.8%
Disabled Retired	104.3%	109.2%
Survivor	107.9%	91.9%

Based on the exhibits in the 2023 Experience Study, it was not possible to independently verify all of the details pertaining to the development of adjustment factors. However, given the information available, these adjustment factors appear reasonable for use in actuarial valuations for TRSL.

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 un-projected reference tables, future mortality improvements will be projected from 2019, the central year of the experience period.

Conclusion – There is not sufficient information to evaluate this recommendation. Ordinarily, this approach would be sufficient for the analysis; however, given the unusual nature of events surrounding COVID-19 pandemic, the Actuary for the LLA believes that at a minimum, the experience study should include a qualitative discussion of the potential impacts of the pandemic on the observed experience. Given the size of the System, key scaling factors might be derived with sufficient credibility even if the most affected year was removed from the observed experience therefore, an analysis of effects of the pandemic on the observed experience would likely improve its predictive value. Refer to Appendix B for a more detailed discussion of this concern.

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. The following table compares current assumptions to the observed and proposed aggregate rates of disability:

Disability Incidence Assumptions – Summary of Aggregate Rates	Regular Teachers	Higher Education	Lunch Plans
Current Assumed Rates	0.217%	0.038%	0.52%
Observed Rates	0.127%	0.030%	0.39%
Proposed Assumed Rates	0.166%	0.035%	0.46%

The actual disability rates during the experience period were lower than the rates currently assumed for all three groups for almost all ages. The proposed rates of disability are generally lower than the current rates of disability for most ages, but higher than actually observed.

Conclusion – There is little evidence the COVID-19 pandemic had any effect on the incidence of disability during the experience period, therefore, the Actuary for the LLA considers the approach and results for the rates of disability for all three plans 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, including TRSL in the 2023 Experience Study, evaluate DROP entry and retirement together because they have similar effects on benefit accruals and liability buildup.

As is the case with other decrements, studies of rates of retirement/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 TRSL'S actuary focused attention on analyzing the plan retirement/DROP experience by age and years of service. The following table compares current assumptions to the observed and proposed aggregate rates of retirement:

Retirement/DROP Assumptions
Summary of Aggregate Rates

	Regular Teachers	Higher Education	Lunch Plans
Current Assumed	17.4%	18.3%	28.0%
Observed	15.8%	13.0%	23.1%
Proposed Assumed	16.6%	17.6%	24.7%

The current assumptions vary based on age and three separate service segments, less than 25 years of service, 25-29 years of service, and 30 or more years of service. The actual retirement/DROP rates during the experience period were:

(1) Generally lower than expected for members older than 42 and younger than 65, for *Regular Teachers*; and
(2) Varied in comparison to the expected rates for *Higher Education* and the *Lunch Plans*

The proposed rates of retirement/DROP were adjusted to better reflect the experience. No distinction was made between pre-DROP and After-DROP active members. Additionally, the service categories were reviewed and were retained since it still provides a good match of the experience.

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 – There is not sufficient information to evaluate this recommendation. Ordinarily, the approach employed for this experience study would be sufficient for the analysis; however, given the unusual nature of events surrounding COVID-19 pandemic, the Actuary for the LLA believes that at a minimum, the experience study should include a qualitative discussion of the potential impacts of the pandemic on the observed experience. Given the size of the System, retirement rates might be reliably derived even if the most affected year was removed from the observed experience, therefore, an analysis of effects of the pandemic on the observed experience would likely improve its predictive value. Refer to Appendix B for additional illustrations pertaining to this concern.

In addition, while the analysis and data provided in the 2023 Experience Study report showed the actual experience and current and proposed assumptions as percentages, exposure as well as actual and expected retirement counts were presented only for the Lunch Plan. It would be beneficial to include the actual number retiring, the assumed number retiring per the current assumption, the ratio of actual to expected, the proposed number retiring per the proposed assumption, the ratio of actual to proposed, and the actual rate of retirement/DROP in the experience study report.

Finally, we did not find any documentation or analysis of retirement/DROP pattern by year of eligibility. To some extent, the three separate service segments may reflect an increased likelihood to retire at first eligibility, regardless, additional analysis examining retirement rates by years since first eligible could provide additional 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. TRSL 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 Assumptions
Summary of Aggregate Rates

	Regular Teachers	Higher Education	Lunch Plans
Current Assumed	7.9%	13.7%	8.3%
Observed	8.3%	12.2%	12.0%
Proposed Assumed	7.9%	12.6%	10.2%

The current assumptions vary based on age and four separate service levels.

The actual withdrawal rates during the experience period varied by plan type. More specifically they were:

(1) Generally higher than the rates currently assumed for members with 3 or more years of service, for *Regular Teachers*;
(2) Generally lower than the rates currently assumed for all service tiers for *Higher Education*; and
(3) Mostly higher than the rates currently assumed for the *Lunch Plans*.

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

Conclusion – There is not sufficient information to evaluate this recommendation. Ordinarily, the approach employed for this experience study would be sufficient for the turnover analysis, however, given the unusual nature of events surrounding COVID-19 pandemic, the Actuary for the LLA believes that at a minimum, the experience study should include a qualitative discussion of the potential impacts of the pandemic on the observed experience. Given the size of the System, termination rates might be reliably derived even if the most affected year was removed from the observed experience therefore, an analysis of effects of the pandemic on the observed experience would likely improve its predictive value. Refer to Appendix B for additional illustrations pertaining to this concern.

In addition, while the analysis and data provided in the 2023 Experience Study report showed the actual experience and current and proposed assumptions as percentages, exposure numbers as well as actual and expected termination counts were presented only for the Lunch Plan. It would be beneficial to include the actual number terminating, the assumed number terminating per the current assumption, the ratio of actual to expected, the proposed number terminating per the proposed assumption, the ratio of actual to proposed, and the actual rate of terminations in the experience study.

Other Assumptions

The 2023 Experience Study report also includes the following assumptions:

- Deferral and refund assumption for Deferred Vested members
- Dependent/minor children statistics
- Spouse's age
- Marital status
- Unisex mortality rates for actuarial equivalence and service transactions
- Inputs for development of option factors
- Unused annual leave service credit adjustments
- Retiree return to work

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. There is little evidence the COVID-19 pandemic had any material effect on the incidence of these assumptions during the experience period, therefore, the Actuary for the LLA finds these assumptions mentioned acceptable.

However, we recommend analysis of DROP participants electing to continue working and accruing additional benefits.

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. However, the 2023 Experience Study did not include commentary on how/whether COVID-19 was 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.

Some relevant passages from the ASOPs:

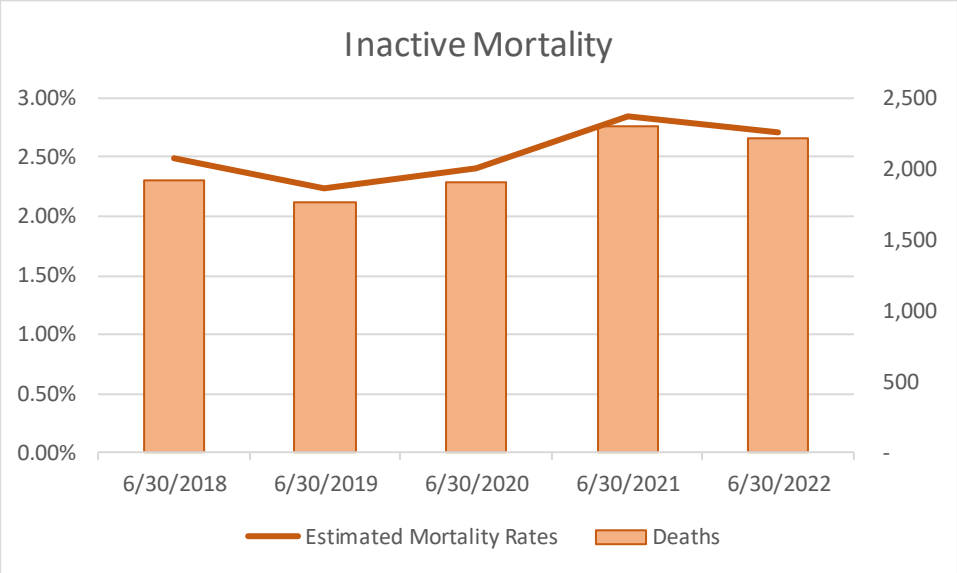
- ASOP No. 41 §3.2 Actuarial Report - "… In the actuarial report, the actuary should state the actuarial findings, and identify the methods, procedures, assumptions, and data used by the actuary with sufficient clarity that another actuary qualified in the same practice area could make an objective appraisal of the reasonableness of the actuary's work as presented in the actuarial report. …"
- ASOP No. 35 §3.2.4 Select the Specific Assumptions - "… The actuary should take into account factors specific to the measurement when selecting assumptions. Such factors are as follows: … d. relevant factors known to the actuary that may affect future experience. … In addition, the actuary should not give undue weight to experience that may not be relevant to future expectations;"
- ASOP 35 §4.1.2 Rationale for Assumptions - "For each demographic assumption that has a significant effect on the measurement and that the actuary has selected, the actuary should disclose the information and analysis used to support the actuary's determination that the assumption is reasonable. … These disclosures may be brief but should be pertinent to the plan's circumstances. … For example, the actuary may disclose any specific approaches used, sources of external advice, and how past experience and future expectations were considered in determining the assumption to be reasonable."

Although detailed analysis was not performed, below we offer some illustrations and comments based on statistical information presented in the five valuation reports issued during the period covered in the experience study.

Mortality

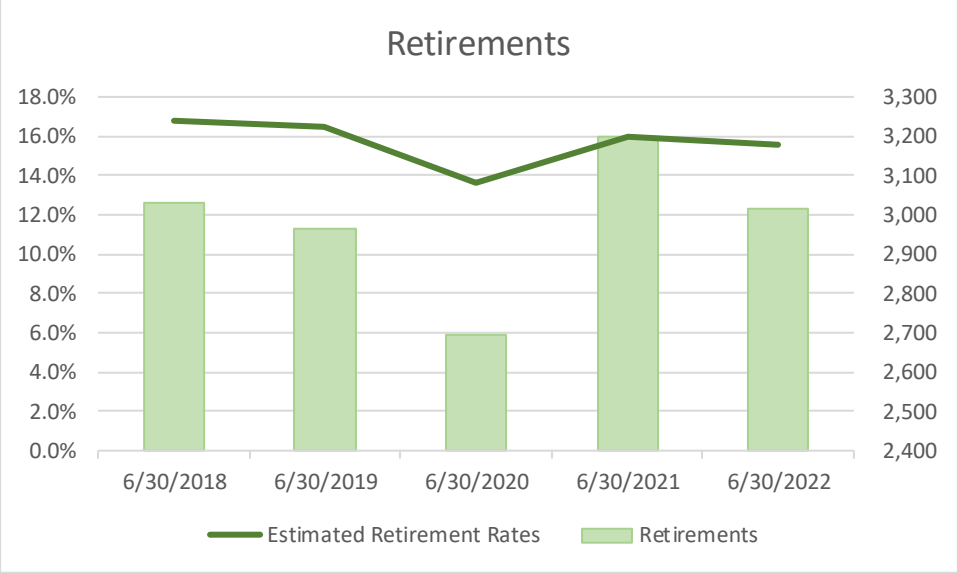
Blended rates of mortality among participants collecting benefits seem to have increased for years ending 6/30/2021 and 6/30/2022 by at least 10% as compared to pre-pandemic experience. As such, scaling factors developed for TRSL might result

in overstated future mortality with a decreasing impact on valuation results. While it is not clear what levels of mortality can be expected in the future, it may be more appropriate to base expectations on pre-pandemic mortality experience, or assign lower weights to data from the affected years.



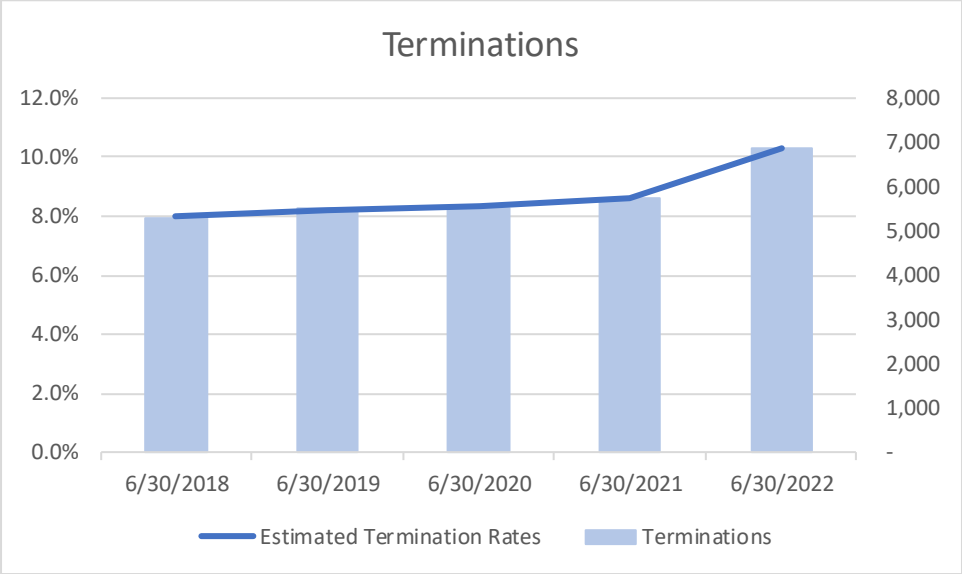
Retirement

Blended rates of retirement exhibited an irregular pattern, dropping significantly for the year ending 6/30/2020 and returning closer to 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. An alternative approach that assigns lower weight, or excludes, retirements observed during the year ended 6/30/2020 may 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 TRSL might result in overstated future terminations with a decreasing impact on valuation results. 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, it would be prudent to either omit some of the inputs, or assign lower weights to observations collected during years ending 6/30/2022, 6/30/2021, and perhaps even 6/30/2020.

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).

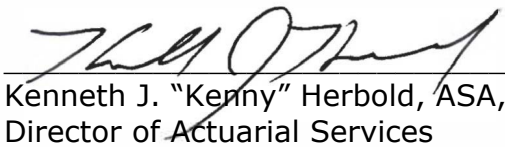
At the time of this writing, we consider the 2023 forecasts of the future inflation and capital market assumptions (including future investment returns) from the subject matter experts to be suitable for development of the benchmark return assumption used in this Actuarial Review.

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.



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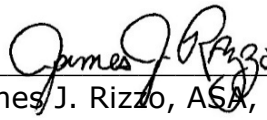
Louisiana Legislative Auditor

December 4, 2023
Date



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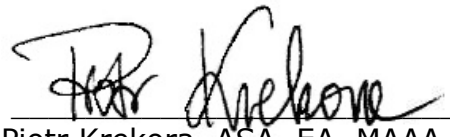

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December 4, 2023
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