COMPREHENSIVE ACTUARIAL REVIEW OF THE 2017 ACTUARIAL VALUATION OF THE TEACHERS' RETIREMENT SYSTEM OF LOUISIANA

ACTUARIAL SERVICES
PRESENTED TO THE PUBLIC RETIREMENT SYSTEMS' ACTUARIAL COMMITTEE
JANUARY 9, 2018

December 15, 2017

Ms. Dana L. Vicknair, Director
Teachers' Retirement System of Louisiana
Post Office Box 94213
Baton Rouge, Louisiana 70804-9113

Re: Comprehensive Actuarial Review of the 2017 Actuarial Valuation

Dear Ms. Vicknair:

To fulfill the requirements of R.S. 11:127(C), the Louisiana Legislative Auditor (LLA) will prepare a Comprehensive Actuarial Review (CAR) every year for each of the State retirement systems.

The remainder of this letter contains the results of our comprehensive review of your June 30, 2017, Actuarial Valuation. More specifically, we have evaluated for reasonableness the actuarial assumptions and methods employed by the System and its actuary. Based on our review, we expect to recommend that the Public Retirement Systems' Actuarial Committee (PRSAC) not accept the TRSL's funding valuation prepared by Foster & Foster for June 30, 2017, and dated October 6, 2017. Instead, we will recommend that PRSAC accept the valuation prepared by the LLA.

I would like to thank you and your staff for your cooperation and assistance with this review. Your formal response to this review has been incorporated in Appendix B of this letter.

Sincerely,

Daryl G. Purpera, CPA, CFE
Legislative Auditor

DGP:PTR:ch

cc: Foster & Foster

2017 COMPREHENSIVE ACTUARIAL REVIEW FOR TRSL

Scope of Review

The 2017 Actuarial Valuation Report for TRSL for funding purposes (2017 Funding Valuation) was prepared by the actuary for TRSL's retirement board, Foster & Foster, dated October 6, 2017.

This Comprehensive Actuarial Review of that report was prepared by the actuary for the Louisiana Legislative Auditor, and includes:

1. A replication of the valuation results,

2. An evaluation and recommendations concerning key actuarial assumptions for appropriateness, and

3. An evaluation and recommendations concerning the System's actuarial method of recognizing future gain sharing cost-of-living benefits.

This Comprehensive Actuarial Review presents documented evidence for the opinions expressed herein concerning various assumptions and methods employed by the board and its actuary in the 2017 Funding Valuation.

Summary of Findings

A summary of our findings follows. Additional details on these matters are addressed in the remainder of this report.

1. **Replication of Valuation Results**. We replicated the results shown in TRSL's 2017 Funding Valuation.

   a. We were able to replicate – almost exactly – head counts, salaries, benefits, normal costs and liabilities, amortization payments, and contribution rates presented in the 2017 Funding Valuation and the supplemental details provided by the board's actuary.

   b. We recommend that more detailed exhibits be presented in valuation reports to disclose each step in maintaining the Experience Account. There are numerous statutory thresholds, triggers, caps and other rules that have formulas. The application of these should be more clearly and thoroughly disclosed in the funding valuation report.

   A step-by-step exhibit would provide interpretations made by the board, its actuary, or its legal counsel in areas requiring interpretations of statutes. For example, the order in which certain rules are applied is not clear in the statutes but makes a significant difference in valuation results.

   Refer to "Section 1: Replication of Valuation Results" of this report for more details.

2. **Return Assumption and Discount Rate**. For several years, the board has adopted an *assumed expected rate of return* on assets that differs from the *discount rate*. For FYE 2017, the board has assumed the expected return on assets to be 8.20%, while the discount rate has been assumed to be 7.70%.

The difference has occurred because of the *actuarial method* the board has chosen to reflect the cost of future gain sharing COLAs (and administrative costs up until FYE 2019). While we commend the board for advance recognition of future gain sharing COLAs in its funding valuation, this method may cause unnecessary misunderstandings.

Examples of this confusion are evident from published surveys by the National Association of State Retirement Administrators (NASRA), by studies prepared by the state of Wisconsin, and by studies prepared by the National Education Association (NEA).

Refer to "Section 2: Return Assumption versus Discount Rate" of this report for more details.

3. **Gain Sharing Recognition Methods**. Two methods for explicitly recognizing future COLAs are described in the body of this report. We recommend that the board adopt either of these alternative methods to explicitly recognize future COLAs in the actuarial valuation of costs and liabilities. These methods will reduce or eliminate the confusion and lack of transparency created by methods currently being used.

   Refer to "Section 3: Gain-sharing Recognition Methods" of this report for details.

4. **Overly Optimistic Return Assumption**. The net inflation assumption, which is one of the building blocks included within the net investment return assumption, is at the very upper end of the range of professional forecasters. The board's 8.20% net investment return assumption is outside of the consensus mainstream. It is an outlier and, in our opinion, overly optimistic.

   Refer to "Section 4: Overly Optimistic Return Assumption" of this report for details.

5. **Mortality Assumption**. The current mortality assumption is acceptable. However, the process used to determine the mortality assumption is not as current as it could be.

   Refer to "Section 5: Mortality Assumption" of this report for details.

As a result of the findings summarized above, with particular regard for the overly optimistic return assumptions, I cannot endorse the actuarial valuation prepared by TRSL. I realize that other actuaries may have different opinions on the future than I have. However, I trust you will give consideration to the robust methodology and process by which I arrived at my opinion.

I relied on research provided by Gabriel, Roeder, Smith & Company (GRS); however, I am solely responsible for my opinions. GRS bears no responsibility for the opinions I have expressed in this report. I reviewed their work carefully, as I do for any other external resource, in formulating my opinions and in drafting and signing this Comprehensive Actuarial Review. Please refer to my certification at the end of this report.

Section 1: Replication of Valuation Results

We obtained census data from the board's actuary, represented to be used in the 2017 Funding Valuation. Auditing the census data used in the 2017 valuation was not within the scope of our work but is the responsibility of the System's auditor. We programmed all benefits and eligibilities for all sub-plans and tiers in TRSL.

The purposes and value in performing a replication of the 2017 Funding Valuation include:

a. Enabling us to comply with R.S. 11:127(C), which requires the actuary for the Louisiana Legislative Auditor to prepare a separate actuarial funding valuation report of the System for submission to the Public Retirement Systems' Actuarial Committee (PRSAC);

b. Providing PRSAC and the public with a level of comfort that the calculations of the retirement board's actuary are mathematically correct and appropriately recognize all plan benefit provisions;

c. Creating an actuarial basis for evaluating the net rate of return assumptions adopted by the board for the 2017 Funding Valuation; and

d. Developing a starting point for various 30-year forecasts of future emerging unfunded actuarial accrued liabilities and future contribution rates.

Calculations

Using the census data, assumptions, and methods employed by the board's actuary, we achieved a replication that was almost exactly equal to the calculations of head counts, salaries, benefits, normal costs and liabilities, updated amortization payments, and contribution rates for the FYE 2018 and FYE 2019.

Table 1 summarizes replication results at the aggregate plan level. The close match is comforting, in that it brings a high degree of confidence in the calculations made by the board's actuary. A few of the sub-plans did not match quite as closely but were not materially mismatched.

Exhibit 1
Teachers' Retirement System of Louisiana (TRSL)
Replication Actuarial Valuation as of June 30, 2017

	Retained Actuary	LLA Before Adjustment	Adjustment Factor	LLA After Adjustment
Number of Active Members	84,228	84,228	N/A	
DROP Members	2,478	2,478	N/A	
Covered Annual Payroll	$ 3,901,627,792	$ 3,901,627,792	N/A	
Retired Members and Beneficiaries	72,978	72,978	N/A	
Total Annualized Benefit Rate	$ 1,885,056,720	$ 1,885,056,720	N/A	
Disabled Members	4,280	4,280	N/A	
Total Annualized Benefit Rate	$ 54,604,488	$ 54,604,488	N/A	
Deferred Vested Members	6,941	6,941	N/A	
Total Annualized Benefit Rate	$ 65,954,547	$ 65,954,547	N/A	
Market Value of Assets	$ 19,513,345,675	$ 19,513,345,675	N/A	
Actuarial Value of Assets	$ 19,250,178,299	$ 19,250,178,299	N/A	
Valuation Assets	$ 19,210,425,005	$ 19,210,425,005	N/A	
Present Value of Future Benefits	$ 33,468,775,290	$ 33,473,067,589	99.99%	$ 33,468,775,290
Actuarial Accrued Liability	$ 29,762,623,913	$ 29,763,160,399	100.00%	$ 29,762,623,913
Unfunded Actuarial Accrued Liability	$ 10,552,198,908	$ 10,552,735,394	99.99%	$ 10,552,198,908
Total Normal Cost	$ 473,025,011	$ 473,358,512	99.93%	$ 473,025,011

	Development of 2017-18 Contribution Rate		
	Retained Actuary	LLA Before Adjustment	Difference
Employer Portion of Normal Cost	164,503,573	164,502,890	683
Amortization Payments	1,004,883,456	1,004,883,453	3
Prior Contribution Variance	2,734,825	2,734,825	-
Total Required Employer Contribution	1,172,121,854	1,172,121,168	686
Employer Contribution Aggregate Rate (current year)	26.4%	26.4%	

Source: Valuation report prepared by Foster & Foster and validation calculations prepared by GRS.

Section 2: Return Assumption vs. Discount Rate

As indicated in the "Summary of Findings" section, the board has adopted an *assumed expected rate of return* on assets that differs from the *assumed discount rate*. For example, for FYE 2017, the board has assumed the expected return on assets to be 8.20%, while the discount rate has been assumed to be 7.70%.

This may be confusing to anyone other than an actuary; the general public typically does not have the knowledge, nor should they, to understand that the two terms are not synonymous. To the general public, the two terms and the two rates derived therefrom are frequently used interchangeably.

A Lack of Transparency

TRSL's determination, disclosure and application of its portfolio's expected return assumption, its treatment of administrative expenses, and its recognition of Experience Account transfers are ambiguous and difficult to understand. Confusion is caused, in part, by having a discount rate that differs from the assumed net rate of return on assets. Confusion is exacerbated by the fact that the discount rate is set first based on budget or other considerations. The assumed rate of return on assets is then determined by adding costs associated with plan administration and with gain sharing COLAs to the discount rate. This method implicitly determines the rate of return on assets. This is the process used by TRSL.

A method that is more explicit – and more typical – is to base the return on assets on the explicit capital market assumptions used by the System. The discount rate is then derived by subtracting the cost of plan administration and the cost of gain sharing COLAs. This method is more explicit because it is based directly on expected rates of return.

Exhibit 2
Reconciliation of the Discount Rate and the Net Expected Rate of Return Assumption

Component Assumptions	From the 2017 Funding Valuation		Comments Regarding the Component Assumptions
	Basis for the FYE 2018 Contribution Rate	Basis for the FYE 2019 Contribution Rate	
Discount Rate	7.70%	7.65%	The discount rate is set by the board, independent of, and prior to, determining an expected net investment return. For TRSL, it is based on budget constraints or other factors.
Administrative Expense	0.10%	NA	Act 94 from the 2016 regular session of the legislature created a test that will mandate the explicit recognition of plan administration costs. TRSL passed the applicable threshold on June 30, 2017. Therefore: 1. The June 30, 2016, valuation that determined the employer contribution rate for FYE 2018 will use the implicit method. 2. The June 30, 2017, valuation that determines the employer contribution rate for FYE 2019 will use the explicit method.
Gain Sharing Transfers	0.40%	0.40%	The estimated employer cost associated with gain sharing transfers was reported in the June 30, 2016, valuation as 25 basis points (bps). The estimated cost reported in the June 30, 2017, valuation was 40 bps. Both rates were implicitly determined. Neither rate has any effect on the employer contribution rate because the board first adopts a discount rate and then backs into the rate of return assumption.
Net Expected Rate of Return Assumption	8.20%	8.05%	The board backed into the net return assumption, in order to be able to keep the discount rate at the stated, pre-determined rate of 7.70%.
Source: Prepared by Gabriel, Roeder, Smith and Company.			

Page 49 of the 2017 Funding Valuation states that the discount rate is 7.70% for the June 30, 2017, funding valuation, and that two downward adjustments are made to the expected net return assumption – 40 basis points (bps) per year for gain sharing transfers into the Experience Account and 10 basis points per year for administrative expenses. This means the net return assumption is 8.20%. The June 23, 2017, letter response to the LLA's assumption request confirms (on page 5) the net return assumption at 8.20%.

- 7.70% discount rate + 10 bps + 40 bps = 8.20% return assumption, or
- 8.20% return assumption – 10 bps – 40 bps = 7.70% discount rate.

Page 49 also states that the discount rate for the June 30, 2018, funding valuation to calculate the contribution rate for the year ending June 30, 2019, will be 7.65%. Using the same methodology, the System's return assumption applicable for that calculation is 8.05%.

- 7.65% discount rate + 40 bps = 8.05% return assumption, or
- 8.05% return assumption – 40 bps = 7.65% discount rate.

A few observations about the confusion are given below.

a. The *actuarial method* of recognizing future COLAs together with the board's process for setting its discount rate and, therefore, its return assumption, creates confusion and a lack of transparency.

b. This *actuarial method* and the retirement System's disclosures produce rates that are not comparable with rates for other retirement systems in public databases and various publications.

c. There are two inconsistencies between the board's actuarial valuations for funding and for accounting: advance-recognition of future COLAs and the net return assumption. These funding-accounting inconsistencies exacerbate the confusion.

d. This method of reducing the return assumption by some number of basis points to approximate the cost of future COLAs is an "implicit" approach. Even though it is permitted in the Actuarial Standards of Practice (ASOPs), generally speaking, implicit approaches to assumption-setting are not favored by actuaries.

As shown above, TRSL's return assumption is 8.20% because the board adopted a 7.70% discount rate, a 40 bps add-on for gain sharing COLAs, and a 10 bps add-on for administrative expenses. We understand that TRSL's actuary, by yet another methodology, has concluded and stated, "an expected long-term geometric average nominal rate of return" is 8.33%. At the end of the day, however, TRSL adopted an 8.20% assumption for its expected investment return for its portfolio of assets (net of investment related expenses) while at the same time adopted a 7.70% discount rate used to calculate present values in the 2017 Funding Valuation. For FYE 2019, the return assumption is 8.05%, and the discount rate will be 7.65% with a 40 bps differential for gain sharing COLAs.

In many state and statewide retirement systems, the discount rate actually used in the funding valuation is equal to the net investment return expected to be earned by the systems' portfolios. In those cases the two terms are synonymous.

Disclosure Issues/Inconsistent Comparisons with Other Systems

TRSL and the Louisiana State Employees' Retirement System (LASERS) are among the few large public retirement systems with a return assumption that is significantly higher than the discount rate for funding purposes. The return assumption is greater because of the number of basis points needed to be diverted to implicitly recognize gain sharing COLAs and administrative expense.

Retirement systems can be divided into two types, depending on how they treat administrative expense. The most common practice, which is supported by ASOPs, is to explicitly recognize administrative expense. The less common approach is to implicitly recognize administrative expense with an adjustment to the rate of return on assets. However, even if a system uses an implicit approach to administrative expense, the basis point adjustment is generally quite small.

Retirement systems can also be divided into two camps, depending on how they fund for gain sharing COLAs. One methodology is fund for COLAs explicitly; the other implicitly. However, there are only four or five large public retirement systems that provide for gain sharing COLAs. TRSL and LASERS are two of these systems. From our research, the only systems that implicitly recognize gain sharing COLAs are TRSL and LASERS. The implicit adjustment for TRSL's gain sharing COLAs is about 40 basis points and therefore has a significant effect on any comparisons of rates of return.

The public databases – the National Association of State Retirement Administrators (NASRA) study, the Wisconsin Study, and the National Educators Association (NEA) study – pick up TRSL's discount rate, not its net return assumption, because the net return assumption gets little exposure in the valuation reports while discount rates are prominently displayed. This oversight can be attributed to TRSL for not prominently displaying its return assumptions and to the study sponsors for not making sure their data is reliable before publishing results.

NASRA Survey Results

Furthermore, there is confusion over actuarial terminology. To the general public, the discount rate and the assumed rate of return on assets generally mean the same thing – the rate of return that a system must earn on average to maintain actuarial soundness. However, if a portion of the rate of return on assets is used to finance gain sharing COLAs and administrative expense, then the meanings of the terms differs.

    a. If there is no reduction in the assumed rate of return to account for gain sharing COLAs or for administrative expenses, the meanings of the two terms are identical.

    b. If there is a reduction, then the assumed rate of return is the rate the System assumes will be earned on the portfolio as a whole. The discount rate is the rate used to discount future expected benefit payments other than gain sharing payments and administrative expenses.
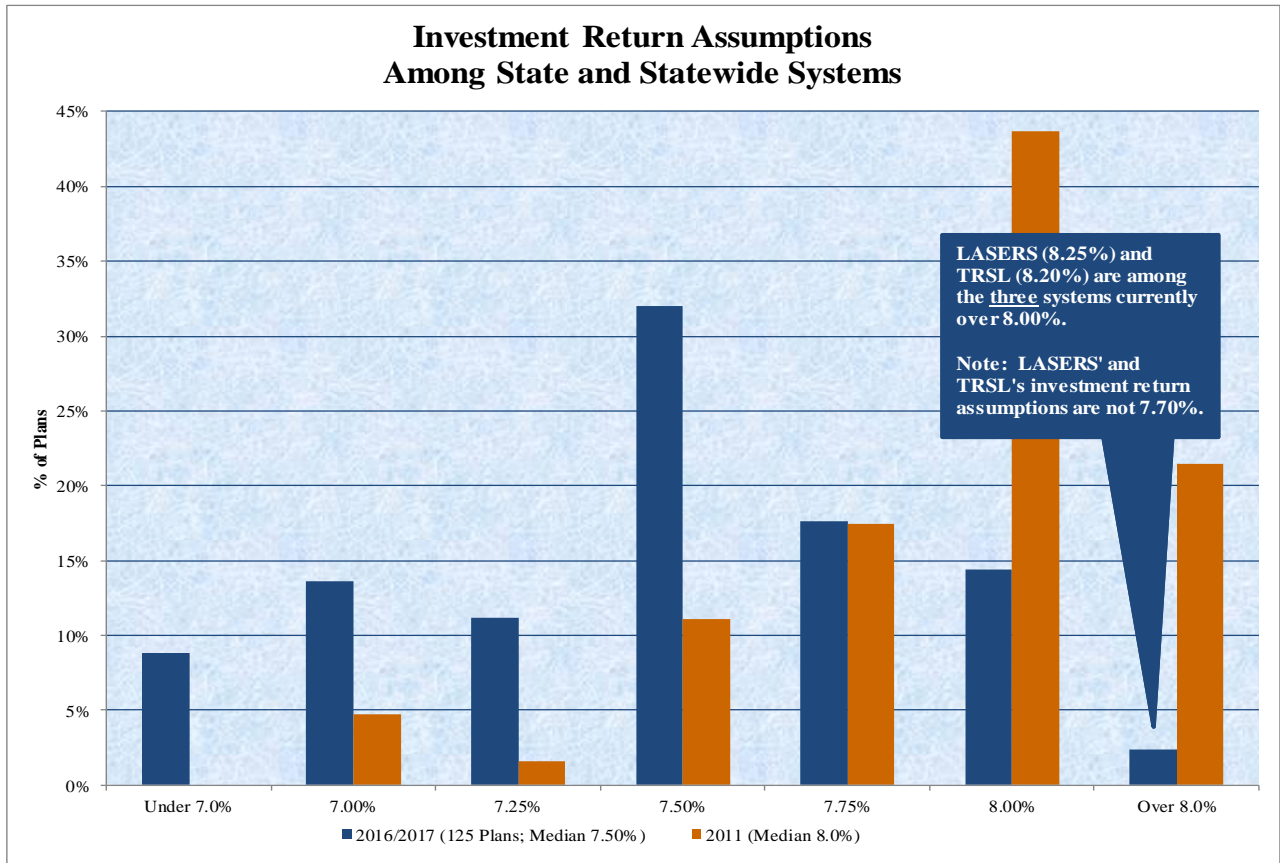
The NASRA survey is perhaps the most commonly quoted survey of public retirement systems. Although rate comparisons clearly show the term "discount rate" in exhibit titles, it is not clear from study materials whether the rates shown are truly discount rates. For example, the NASRA study shows TRSL (and LASERS) with a 7.70% discount rate, but the assumed return on the portfolio is 8.20%. A system that explicitly recognizes administrative expenses and that has no gain sharing or COLA provisions might also show a discount rate of 7.70%. But that system assumes that it can earn 7.70% on its portfolio. To the uninformed, it appears that the two systems are assuming the same rate of return.

As a result, some believe that TRSL's net return assumption is in line with other state and statewide systems. Even a representative of NASRA testified before the House Retirement Committee during the 2016 regular session of the legislature that the 2016 TRSL discount rate of 7.75% is right in the midst of rates used by other retirement systems.

However, TRSL's net return assumption <u>was not</u> 7.75%, and it is <u>not now</u> 7.70% or 7.65%. It is <u>8.20% (or 8.05%)</u>. This is evidence of the confusion that exists. TRSL's return assumption tells a very different story. TRSL's 8.20% net return assumption is an outlier among systems in the NASRA database. So is 8.05%.

Consider Exhibits 3 and 4, developed from Public Plans Data, NASRA survey, the Center for Retirement Research at Boston College, Center for State and Local Government Excellence, and supplemented by GRS research. The Exhibits present actuarial return assumptions of the 125 state and statewide retirement systems (including New York City Systems, because of their size) as of their most recent valuation date.
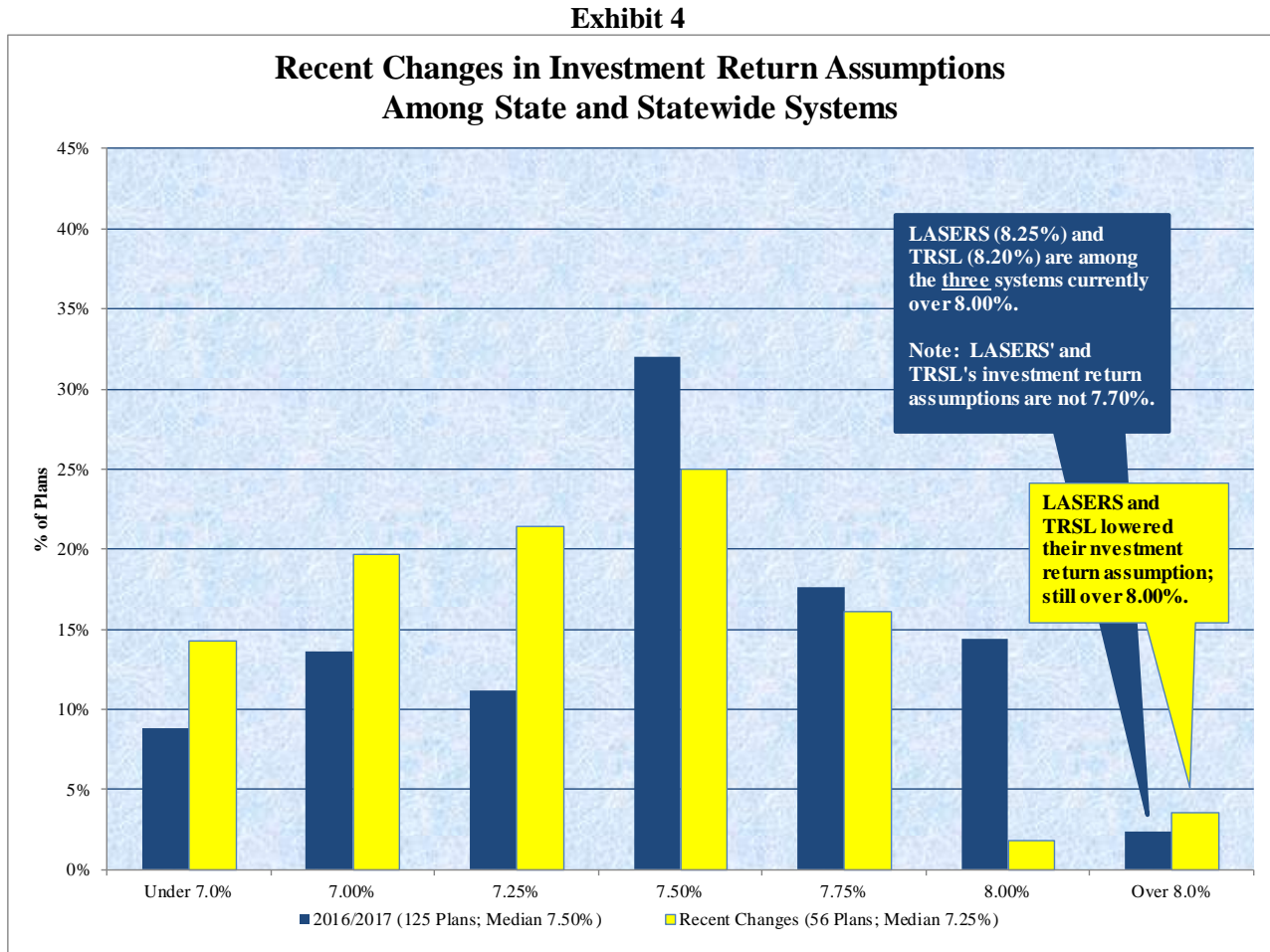
Exhibit 3

**Investment Return Assumptions
Among State and Statewide Systems**

LASERS (8.25%) and TRSL (8.20%) are among the three systems currently over 8.00%.

Note: LASERS' and TRSL's investment return assumptions are not 7.70%.

Chart categories: Under 7.0%, 7.00%, 7.25%, 7.50%, 7.75%, 8.00%, Over 8.0%

Legend: ■ 2016/2017 (125 Plans; Median 7.50%) ■ 2011 (Median 8.0%)

Source: Information extracted from the NASRA survey, compiled by the Center for Retirement Research at Boston College, and supplemented by GRS research. Return assumptions are rounded to the nearest 0.25% for display.

Takeaways from Exhibit 3:

1. The distribution of return assumptions among state and statewide plans has shifted considerably from 2011 to the 2016-17 years.

2. The median return assumption dropped from 8.00% in 2011 to 7.50% in 2016-17.

3. TRSL's return assumption is recorded in the NASRA database as 7.75%, possibly giving readers of published reports a misplaced comfort that TRSL's assumption is similar to its peer group of retirement systems.

4. However, TRSL's return assumption is actually 8.20% for the June 30, 2017 Funding Valuation and the employer contribution rate for the 2017-18 year; and is actually 8.05% for the 2018-19 year.

5. In Exhibit 3, we adjusted the underlying data to reflect TRSL's true return assumption (8.20%/8.05%), appearing in the "Over 8.0%" category at the far right, in order to reflect an apples-to-apples comparison. So, in reality, TRSL's net investment return assumption should be considered an extreme outlier compared to all other state and statewide retirement systems as of 2016-17.

TRSL has an investment portfolio with a greater-than-average risk profile (i.e., which is more likely to produce higher returns in good years and lower returns in down-market years). However, this is not sufficient to explain its outlier status. Refer to "Section 4: Overly Optimistic Return Assumption" for details on how, even after adjusting for its own allocation of assets, TRSL's return assumption is beyond the consensus mainstream of professional expert forecasters.

Consider Exhibit 4 below, which illustrates recent changes in return assumptions.

Exhibit 4

Source: Information extracted from the NASRA survey, compiled by the Center for Retirement Research at Boston College, and supplemented by GRS research. Return assumptions are rounded to the nearest 0.25% for display.

Takeaways from Exhibit 4:

1. The distribution of return assumptions among state and statewide plans has shifted considerably since 2011 due to significant reductions in the return assumptions during the last year or so.

2. The median return assumption dropped to 7.25% as a result of recent rate changes.

3. TRSL's return assumption dropped from 8.20% for the June 30, 2017, funding valuation, and the employer contribution rate for the 2017-18 year decreased to 8.05% for the 2018-19 year.

4. TRSL's return assumption did not drop due to (a) a reduction in assumed inflation (2.50% for both periods), (b) a reduction in its forecasted real returns over the future, or (c) a change in the portfolio's asset allocation. These are the typical reasons given for reductions in return assumptions. The board's expected return assumption on its portfolio dropped solely due to (i) the statutory change in the method for treating administrative expenses and (ii) the planned reduction in the discount rate which, under TRSL's process, drives the expected return on the portfolio by backing into it based on selecting the discount rate first.

5. Even at <u>8.05%</u>, TRSL's return assumption is still an <u>extreme outlier</u> compared to other state and statewide systems that reduced their return assumptions recently.

Funding vs. Accounting Inconsistencies

This confusion and lack of transparency is compounded by two inconsistencies in the board's actuarial valuations for funding and for accounting.

1. For accounting, TRSL does not recognize any future COLA benefits in its calculations, unlike it does in its funding valuation reports.

   - So, for funding, TRSL is telling taxpayers they must pre-fund the cost of future COLAs because there is an "actuarially measurable likelihood" of future COLA benefits that must be recognized in advance.

   - But for accounting, TRSL is telling users of financial statements there is no "actuarially measurable likelihood" of future COLA benefits.

   - One audience gets one message, while another audience gets another message on exactly the same topic. The two messages are inconsistent.

2. TRSL's funding and accounting valuations are both tied to a pre-selected 7.70% discount rate, with the 7.70% rate reduced 5 bps per year until it attains 7.50%.

   - For funding, TRSL adds 40 bps to recognize future COLAs (and 10 bps for administrative expenses) and tells taxpayers 8.20% is the return assumption expected on its portfolio.

   - But for accounting, TRSL does not add any basis points and tells users of financial statements 7.70% is the return assumption expected on its portfolio.

   - Once again, one audience gets one message while another audience gets another message on exactly the same long-term return assumption. The two messages are inconsistent.

If TRSL's board were to adopt either of the two alternative *actuarial methods* of recognizing future gain sharing COLA benefits described in "Section 3: Gain Sharing Recognition Methods," it could solve the funding-related problems highlighted above.

Implicit Assumptions

TRSL's method of reducing the return assumption by some number of basis points to approximate the cost of future COLAs is an "implicit" approach to recognizing future COLAs. Even though the implicit method is permitted by ASOPs, implicit approaches to assumption-setting are generally not favored by actuaries. During the late 1970s and the 1980s, the actuarial profession actually changed its standards to require assumptions to be explicit and transparent, with each assumption being reasonable individually.

For example, there was a time when actuaries routinely supported the use of no salary increases in valuations because the return assumption was deliberately set lower than expected as a separate individual assumption. The practice of adjusting one assumption to cover another has almost been eradicated. Granted, this method of lowering the return assumption to recognize gain sharing COLAs is not as egregious as the salary scale/discount rate example, because the frequency and amount of gain sharing COLAs are indeed directly related to investment earnings. Nevertheless, a lesson from the history of actuarial practice speaks to setting each assumption on its own and guides us toward an alternate *actuarial method* of recognizing gain sharing COLAs in advance.

This following section (Section 3) describes two alternative *actuarial methods* of recognizing future gain sharing COLAs, which are more explicit and transparent, and solve most of the confusion, transparency, and disclosure issues identified above.

A more appropriate approach would be to the set the net return assumption first, using a disciplined forecasting *process,* and use that as the discount rate, so that the return assumption equals the discount rate thereby removing the confusion. Under this more appropriate approach, gain sharing transfers are recognized in advance using one of two alternate explicit transparent *actuarial methods* described below. For more information on these two alternate actuarial methods for recognizing gain sharing COLAs in advance, refer to the following section, "Section 3: Gain Sharing Recognition Methods."

For more information on a disciplined forecasting process refer to "Section 4: Overly Optimistic Return Assumption."

Section 3: Gain Sharing Recognition Methods

The System and its actuary assume that future gain sharing COLAs are sufficiently likely to occur. Based on that assumption, they recognize a liability in advance for funding purposes. Or, in other words, the incidence of a gain sharing COLA being granted has actuarially measurable probabilities. And as a result, taxpayers will be required to contribute in advance for benefits that are actuarially likely to occur in the future. We agree with the TRSL's board and actuary's decision to recognize the likelihood of future gain sharing COLAs in their funding valuations.

As discussed above, the *actuarial method* currently used to recognize the cost of future COLAs is to reduce the return assumption by 40 basis points to obtain a discount rate. The 40 basis points is estimated to be the average annual amount of plan assets transferred to the Experience Account each year. Of course, such a transfer is not expected to occur every year. Some years will have none; some years will have a smaller amount; and some years will have a larger amount transferred. Regular and consistent granting of COLAs by the Legislature whenever permitted by the template causes the Experience Account to be emptied, leaving room for more transfers in future years.

However, there are other explicit (as opposed to implicit) *actuarial methods* that are more transparent and that will recognize gain sharing COLAs without the confusion and inconsistencies described above. In addition, these methods produce more reliable results. Each of these methods use the same type of Monte Carlo stochastic simulation as needed to estimate the 40 basis points.

We prepared the following alternative *actuarial methods* as part of our 2017 actuarial valuation:

1. *Single equivalent annual COLA assumption.* The simulation spins off information about the frequency and magnitude of each year's potential transfer to the Experience Account. The mean (average) transfer amount can be considered a benefit stream. Solving for x, we determined that 0.50% annual equivalent COLA has the same actuarial present value over the next 30 years as the average simulated transfer amount.
2. *Single equivalent benefit load assumption.* Dividing that same mean (average) transfer stream for each year by its regular benefits payable for that year, as spun off from the open group forecast valuation, provides an estimate of the load on benefits that approximates the average transfer amount. We determined that an equivalent a load on benefits is about 4.60%.

Either of these two alternative *actuarial methods* is acceptable and preferable, in our opinion, to TRSL's current method. The major benefit of adopting either of them is that they eliminate the confusion and the inconsistencies inherent in the current *actuarial method*. Both of these two alternatives are transparent and explicit *actuarial methods* for recognizing the actuarially measureable likelihood of future gain sharing COLAs for funding purposes.

Section 4: Overly Optimistic Return Assumption

In our opinion, the assumed rate of return used by TRSL and its actuary (8.20% for FYE 2018 and 8.05% for FYE 2019) are overly optimistic and represent an outlier relative to a consensus of independent expert investment consultants and forecasters. Our rationale for this conclusion follows.

We projected what future unfunded liabilities and employer contribution rates would look like under two scenarios: If future actual emerging returns were (a) exactly the same as currently being assumed (dotted lines in the graphs below) and (b) more in line with the mainstream of professional forecasters (solid lines in the graphs below).

Refer to the subsections below for the names of the professional forecasters who were included in the research and how their forecasts of future inflation and investment returns for TRSL's portfolio were developed from their capital market assumptions.

The forecast in the two Exhibits below apply the same "*valuation assumptions*" as used in the 2017 Funding Valuation, except for the scheduled ramp-down in the discount rate. In other words, if TRSL's actuary continues to use the same valuation assumptions in each future actuarial funding valuation (except for the scheduled ramp-down in discount rate), the exhibited forecasts show what the future liabilities and contributions would be.

"*Emerging experience*" refers to the actual emerging investment returns (for example) occurring each year in the future, which may or may not match the *valuation assumption* about returns. Emerging investment experience can be modelled (a) the same as the *valuation assumption* or (b) as something different, while keeping the *valuation assumptions* the same in each future funding valuation report.
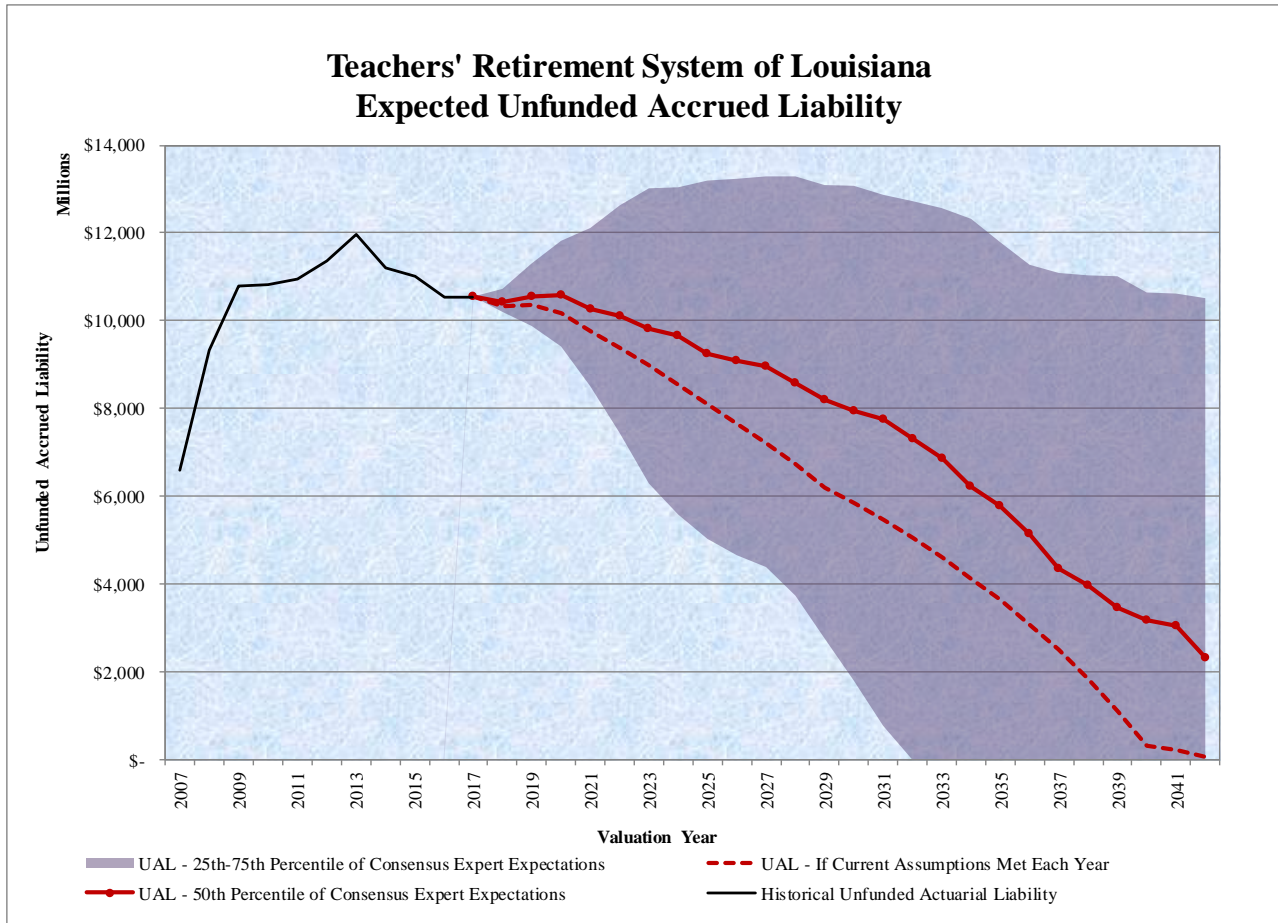
a. **TRSL's current assumptions**. The dotted lines in the graphs below show the expected path of the future unfunded liabilities and contribution rates by modelling the *emerging experience* to match the board's *valuation assumptions*, including return assumption. In other words, if the board and its actuary are right about the future returns, the dotted lines show the expected future unfunded liabilities and expected future employer contribution rates. The *emerging experience* would exactly follow the scheduled pattern in the *valuation assumptions:*

   - 8.20% return for year 1 (2017-18), i.e., 7.70% discount rate, then
   - 8.05% return for year 2 (2018-19), i.e., 7.65% discount rate, then
   - Down by 5 basis points each year until reaching and remaining at 7.90% return, i.e., 7.50% discount rate,
   - This emerging investment return experience synchronizes with the board's plan for the discount rate ramp-down (ultimately, to a 7.50% discount rate plus 40 basis points = 7.90% return)

   This is called a "deterministic forecast", because the exact return assumption is determined beforehand for each future year with no variation from the pre-determined rates.

b. **Consensus expert forecasts**. The solid lines show the 50th percentile expectation of the future unfunded liabilities and employer contribution rates by modelling the *emerging experience* using Monte Carlo simulations (simulating the next 25-year period and doing so 500 times) while keeping the board and actuary's *valuation assumptions* the same. In other words, if the independent experts are right about the future, the solid lines show the 50th percentile expectation of future unfunded liabilities and future employer contribution rates.

Refer to the Appendix for more details on how forecasts by consensus experts, for both 10-year and 25-year periods, were used in developing the solid line forecasts.
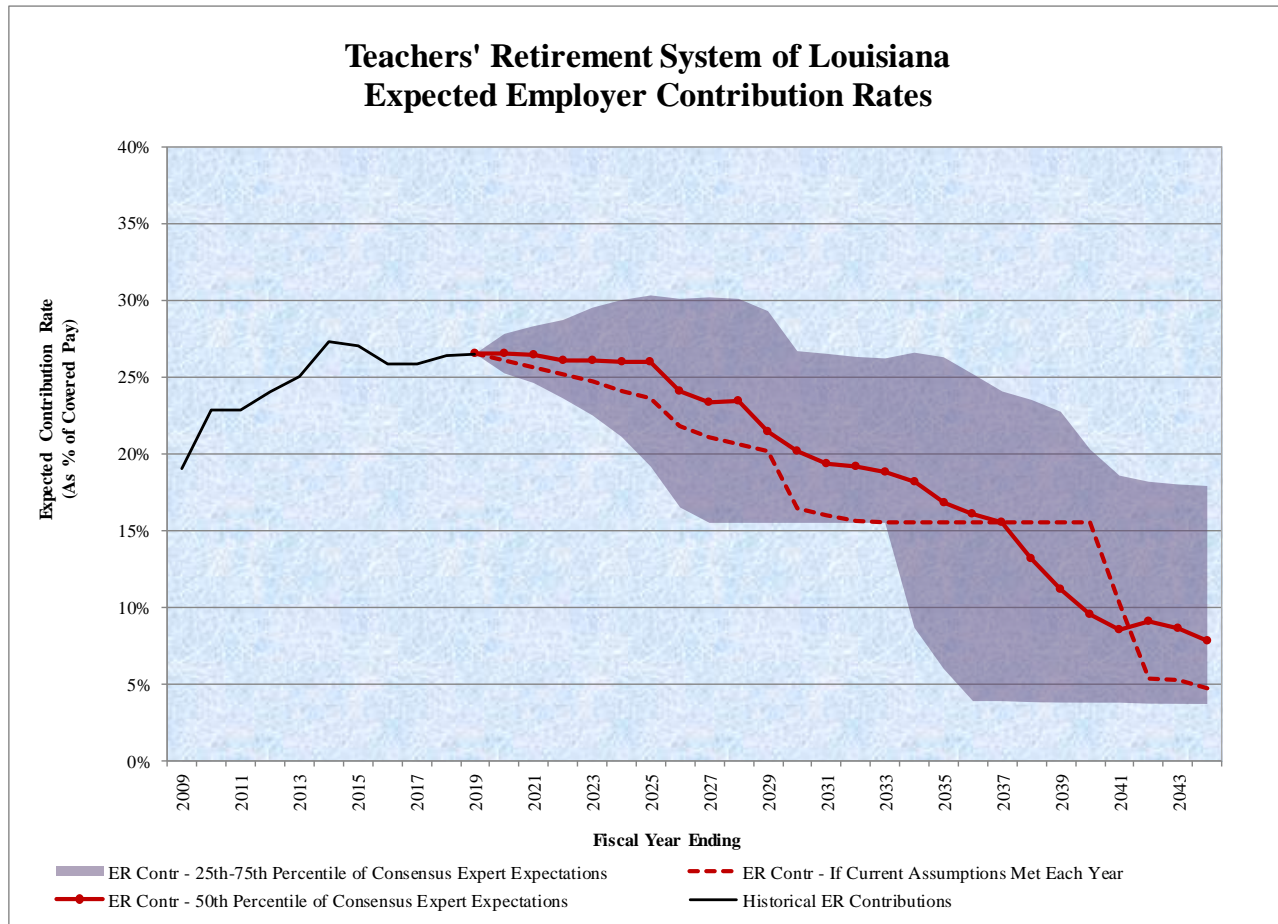
Exhibit 5

Teachers' Retirement System of Louisiana
Expected Unfunded Accrued Liability

Source: Developed by LLA actuarial staff.

Important takeaways from Exhibit 5 include:

a. Historically, unfunded actuarial accrued liabilities (UAL) have been rising, but have leveled off in recent years.

b. If *emerging experience* matches TRSL's current *valuation assumptions* (dotted line), the UAL will be paid off in approximately 2040, as planned.

c. In reality, as actual *emerging experience* unfolds in the future, the UAL might get paid off sooner than is currently being assumed, or it might never get paid off. Notice the 25th-75th percentile shaded area, based on the consensus of expert forecasters (underlying methods are discussed in more detail in subsections below).

d. Notice the current assumption's forecast is closer to the most optimistic part of the shaded region.

e. The 50th percentile of consensus expert forecasts of the future (solid line) shows that the UAL remains much higher for a longer period than expected by the current assumption.

f. If the consensus of independent experts is right about the mean of future return distributions, the current overly optimistic return assumptions will create regular increases in the UAL from systemic actuarial losses and accumulated shortfalls.

Exhibit 6

Teachers' Retirement System of Louisiana
Expected Employer Contribution Rates

Source: Developed by LLA actuarial staff.

Important takeaways from Exhibit 6 include:

a. The historical employer contributions have been rising but have leveled off in recent years.

b. If *emerging experience* matches TRSL's current *valuation assumptions* (dotted line), the employer contribution rate will level off at the normal cost for benefits and administrative expenses in approximately 2042, as planned, with no more amortization payments required.

c. In reality, as actual *emerging experience* unfolds in the future, the employer contribution rate will likely be higher than is currently being assumed and might never get down to be only normal costs. Notice the 25th-75th percentile shaded area, based on the consensus of expert forecasters (underlying methods are discussed in more detail in subsections below).

d. Notice the current assumption's forecast is closer to the most optimistic part of the shaded region.

e. The 50th percentile of consensus expert forecasts of the future (solid line) shows that the employer contribution rate will remain much higher for a longer period than expected by the current assumption.

f. If the consensus of independent experts is right about the mean of future return distributions, the current overly optimistic return assumptions will create regular increases in the employer contribution rate from systemic actuarial losses and consequent amortization payments.

The remainder of this "Section 4: Overly Optimistic Return Assumption" sets forth (a) our evaluation of TRSL's defense of 8.20% as a return assumption and (b) a disciplined process for setting a return assumption that ensures it is mainstream and defensible and provides the details for how we arrived at 6.75% as the most appropriate return assumption. We will be using 6.75% as the return assumption in our 2017 valuation of TRSL.

TRSL's support of its 8.20% assumption

Page 50 of the 2017 Funding Valuation states: "The analysis is supported by capital market assumptions provided by the Board's investment consultant, with a 2.50% inflation component, which results in an expected long-term geometric average nominal rate of return of 8.33%."

a. *Outlier forecast of private equity buyout returns.* The System's internal staff substituted the forecast of future net private equity buyout returns from its alternatives investment manager in place of the forecast of its general independent investment consultant. Forecasts of all other alternative investments and all more conventional investments were those of the board's general independent investment consultant.

   TRSL's forecast (12.0%) for private equity buyout is significantly higher than the independent consultant's long-term forecast (7.00%; Exhibit E11 attachment to the Board actuary's response to our assumption request).

   We are not investment forecasters; therefore, we defer to a *consensus* of experts in that field. But compared to major independent investment consultants (including the System's own independent investment consultant), a 12.00% private equity buyout forecast is overly optimistic and contributes to an overly optimistic net return assumption (8.20%) by the System and its valuation. It is out of the mainstream of investment consultants. The board should consider not including an outlier estimate for such a large portion of its portfolio.

b. *High forecast of inflation.* The expected future rate of inflation is a primary factor in developing a net return assumption (whether using the building block approach or not). Higher inflation expectations cause higher net return expectations. The 2017 Funding Valuation stated that its assumed rate of future inflation is 2.50% per year.

   Assuming an inflation rate of 2.50% is difficult to defend considering the mid-term and long-term expectations of investors and economists who are experts in forecasting future rates of inflation. Refer to Exhibit 9 in the *Inflation* subsection below that presents the inflation forecasts of numerous independent experts in the field of forecasting future inflation, a central consensus of which is in the range of 2.00% to 2.25%. An assumption of 2.50% is not supported by the evidence. Other actuaries may disagree, but all the evidence we have leads to a conclusion that 2.50% is at the very upper end of the range of professional forecasters. Again, refer to the *Inflation* subsection below.

Using the private equity buyout forecast of the System's own independent investment consultant (and all its other forecasts) and using a consensus inflation forecast of 2.25% and applying them to TRSL's own target asset allocation, the 50th percentile expected compound net return over 30 years is 7.42%. The difference between the board's current 8.20% assumption and 7.42% is substantial. A *consensus average* of eight major national investment forecasters shows the 50th percentile expected compound net return over the next decade years is 6.75%

In contrast, the 8.20% net return assumption is significantly out of the mainstream of expert investment forecasters for use in a pension valuation.

The cost of being wrong is substantial, especially if it is over a 10-year or 30-year period, and could be detrimental to both plan members and taxpayers. To take this evaluation of TRSL's net return assumption a step further, consider the subsection below which describes an alternative *process* for setting or evaluating a net return assumption that:

- Is unbiased, objective and free of agency risk,
- Is disciplined and robust,
- Is defensible, and
- Improves intergenerational equity, contribution stability, and benefit security of plan members.

A Disciplined Process

The most significant factors in setting or evaluating an assumed return are:

a. The horizon over which returns are expected to be satisfied,

b. Future rates of inflation (forward-looking), as expected by a consensus of experts in the field of inflation forecasting who are both independent and nationally recognized,

c. Current and future asset allocation percentages by asset class, and

d. Future investment performance (forward-looking) and other capital market assumptions for various asset classes, as expected by a consensus of experts in the field of investment forecasting who are both independent and nationally recognized.

Horizons

There is an ongoing debate over the time horizon that should be used to set the rate of return assumption. Some have posited that pension plans are long-term propositions and their return assumptions should reflect a long-term horizon, for example, 30 years. Others believe that a shorter time horizon should be used. It is our opinion that a forward-looking mid-term horizon (e.g., 10 years) should influence the final choices of return assumptions. Long-term horizon forecasts (e.g., 20-30 years) are useful for discussion purposes, but not to the exclusion of mid-term horizons. Pension funds are, indeed, usually long-term arrangements. However, in our opinion (for the reasons cited below), 30 years is too long for the selection of a pension fund's expected rate of return.

Some of the reasons supporting the use of a mid-term horizon are:
a. *Underperformance in the mid-term may not be sustainable.* If the forecasting experts are correct, there will be lower compounded returns over the next decade or two while waiting for the

following decades to bail out pension plans in order to achieve the higher long-term expectation. Undoubtedly, there will be better-than-assumed years on occasion. But a consensus of independent experts says (in various investment periodicals and in retirement conferences across the country) the next decade is expected to see compound returns below 7.00%, much lower than TRSL's current 8.20% assumed rate.

Anticipating higher returns in the long-term, while regularly suffering underperformance in the mid-term, is not sustainable. It causes repeated contribution rate increases and a lack of progress in paying down the unfunded actuarial accrued liability. It will test the patience and tolerance of taxpayers, elected representatives, and budget directors and may push them into serious consideration of proposed retirement plan designs that transfer all or some of the investment risk onto plan members.

b. *Forecasts for 30-year long-term horizons are the least reliable.* There is much less certainty in long-term forecasts than mid-term forecasts. In the face of uncertainty, investors become more conservative. Thus, decision-makers should consider being more conservative than the longest-term forecasts indicate because the longest-term forecasts are more uncertain whether in finance, election forecasting, or hurricane forecasting. Long-term forecasts are less reliable than mid-term forecasts.

Perspectives

There are two types of perspectives to consider when defending or determining assumptions for a future net rate of return of a pension fund and a future rate of inflation. One is temporal – Do we look more to historical rates to inform decision-makers; or more to forward-looking forecasts of the future? The other is social – Do we look more to what other retirement systems are doing; or look more to what expert forecasters would expect for TRSL's own portfolio in the future?

Temporal. According to current and retrospective actuarial literature, looking backwards at historical rates of return and inflation is not considered to be reliable supporting documentation for current pension actuarial assumptions of future net returns and inflation. Historical rates of return and inflation are viewed more as mere information, than used to defend or determine a current net return or inflation assumption. The past is indeed useful for understanding historical relationships among various economic forces and various statistical metrics such as standard deviations, correlation coefficients and P/E ratios; but even those have been known to change over time and may be different from their historical averages.

However, the current domestic and global environment is not like the past 10, 30, or 50 years; and the future domestic and global environment is certain to be different from the past. A forward-looking perspective should drive the defense or determination of a net return assumption for pension actuarial valuations. Strategically selecting historical returns (an X-year period ending on Y-date) to justify a net return assumption being applied to the next 10, 20, or 30 year period is not valid.

Social. Looking to what other peer retirement systems are doing is generally not a well-placed focus. Other retirement systems have their own asset allocation and expense structure and their own set of politics, protectionism, budget issues, and agency risk. They are not the best source to turn for validation of another system's net return assumption. The previous Exhibits, presenting the distributions of return assumptions among state and statewide systems, were not intended to suggest that TRSL adopt the median return assumption among their peers in the survey. It was intended only to illustrate that, contrary to what has been reported improperly using TRSL's 7.75% discount rate, TRSL's 8.20% return assumption is substantially higher than peer retirement systems on an apples-to-apples comparison.

Independent, unbiased, expert sources of inflation and investment return forecasts are the best places to look for input when setting a net return assumption for pension valuations. These are much more objective and unfiltered sources, directly from the experts themselves, to guide decision-makers.

Adopting a *process* that looks to a consensus of external subject matter experts' forward-looking forecasts is the best way to avoid the political and budget pressures that sometimes distract or influence assumption-setters away from their primary duty to set return assumptions as their unbiased best estimate of future.

Inflation

The TRSL's 2017 Funding Valuation (page 49) states: "The salary and expected investment earnings were developed using a 2.50% inflation assumption, as adopted by the Board of Trustees following the most recent Experience Study." We would prefer to see an inflation assumption closer to the 2.25% as suggested by the expected inflation rates in Exhibit 9. However, we do not find the use of 2.50% in the TRSL funding valuation to be unreasonable for the purpose at hand.

Because average historical rates of inflation over various time periods are relatively easy to calculate, and are therefore readily available, it is tempting to rely on historical rates based on the Consumer Price Index.

However, there are many professional sources available to actuaries and investment consultants that forecast inflation on a forward-looking inflation basis. In our opinion, as mentioned earlier, forward-looking forecasts are more appropriate than historical rates. Actuarial Standards of Practice (ASOP) No. 27 Section 3.4 states:

> "Relevant Data—To evaluate relevant data, the actuary should review appropriate recent and long-term historical economic data. The actuary should not give undue weight to recent experience. The actuary should consider the possibility that some historical economic data may not be appropriate for use in developing assumptions for future periods due to changes in the underlying environment."

Currently, expert professional sources for forward-looking inflation forecasts generally lie between 1.73% and 2.60%. Consider the forward-looking forecasts from the following subject matter experts.

Exhibit 7

Eight Major National Sources of Inflation Forecasts	
Bond Investors	Congressional Budget Office
Federal Reserve Bank of Philadelphia	Federal Reserve Bank of Cleveland
Federal Reserve Board	GRS Survey
HAS Survey	Social Security Trustees Report

Some of them provide multiple measures of inflation for different time horizons, making a total of 19 forecasts from eight reputable sources.

Exhibit 8

2017 Measures of Inflation		
Horizon	**Average**	**Number of Sources**
26.3 - 30 yrs	2.20%	7
20 yrs	2.06%	3
9.40 -15 yrs	2.16%	9

It has become increasingly difficult to defend inflation assumptions greater than 2.50% in the face of so many opinions to the contrary from experts in the field of inflation forecasting. Our preferred inflation assumption would currently be 2.25% because it lies more comfortably near a consensus of the expectations in the summary table above and the detailed table below. A 2.50% inflation expectation lies at the very upper end of the range of professional forecasters presented above.

Consider Exhibit 9, which shows inflation forecasts of these eight large reputable experts in the field of inflation forecasting.

Exhibit 9

Forward-looking Annual Inflation Forecasts	
(From Professional Experts in the Field of Forecasting Inflation)	
Federal Reserve Board's Federal Open Market Committee	
Current Long-run Price Inflation Objective (Since Jan 2012; Personal Consumer Expenditures)	2.00%
Congressional Budget Office: *The Budget and Economic Outlook*	
Overall Consumer Price Index (June 2017; Ultimate)	2.40%
Overall Consumer Price Index (June 2017; 11 Years)	2.36%
Personal Consumer Expenditures (June 2017; Ultimate)	2.00%
Personal Consumer Expenditures (June 2017; 11 Years)	1.98%
2017 Social Security Trustees Report	
CPI-W 15-Year Intermediate Assumption	2.60%
CPI-W 30-Year Intermediate Assumption	2.60%
GDP Deflator 15-Year Intermediate Assumption	2.20%
GDP Deflator 30-Year Intermediate Assumption	2.20%
Quarterly Survey of Professional Forecasters	
2Q2017 Federal Reserve Bank of Philadelphia 10-Year Forecast	2.30%
Federal Reserve Bank of Cleveland	
30-Year Expectation on June 1, 2017	2.13%
20-Year Expectation on June 1, 2017	1.97%
10-Year Expectation on June 1, 2017	1.73%
Bond Investors **(Excess Yield of Non-indexed Treasuries Over Indexed Treasuries)**	
30-Year Expectation on June 30, 2017	1.85%
Median 30-year Expectation over 6/30/12 - 6/30/17	2.09%
20-Year Expectation on June 30, 2017	1.77%
Median 20-year Expectation over 6/30/12 - 6/30/17	2.02%
10-Year Expectation on June 30, 2017	1.73%
Median 10-year Expectation over 6/30/12 - 6/30/17	1.96%
Investment Consultants and Forecasters	
2017 GRS Survey major national investment forecasters and consultants	
Median expectation among 8 firms (averaging 9.4 years)	2.25%
Median expectation among 4 firms (averaging 26.3 years)	2.21%
2017 HAS Survey of 12 investment advisors: Median (10 years)	2.32%
2017 HAS Survey of 12 investment advisors: Median (20 years)	2.44%

Asset Allocation

It has been generally accepted for many years that a fund's asset allocation is responsible for the vast majority of a fund's investment performance. Therefore, the asset allocation of the System is a core element in setting and evaluating the assumed future returns.

In our evaluation of the actuary's net return assumption, we relied on the 15 target asset allocation percentages set forth in the System's formal Investment Policy Statement last updated in June 2017.

Exhibit 10

2017 TRSL Target Asset Allocation			
Risk Assets		**Fixed Income Assets**	
Large U.S. Equity	20.0%	Core U.S. Fixed Income (Market Duration)	9.0%
Small Cap U.S. Equity	5.0%	High Yield Bonds	4.0%
International (Non-US) Equity (Developed)	11.0%	Non-US Developed Bond (0% Hedged)	2.0%
Emerging Markets Equity	8.0%	Emerging Market Bonds (Soc. Local)	3.5%
Private Real Estate (Core)	5.0%		
Private Real Estate (Non-Core)	5.0%	*Total Fixed Income Assets*	*18.5%*
U.S. REITS	2.0%		
Private Equity	22.0%		
Infrastructure	1.5%		
Commodities	1.0%		
Farmland - Row Crops	1.0%		
Total Risk Assets	*81.5%*	*Total Asset Allocation*	*100.0%*

Source: Current TRSL Investment Policy Statement (dated June 23, 2017)

TRSL has a large percentage (22%) of its assets invested in Private Equity. And half of that (11%) is invested in Private Equity Buyouts. We note that TRSL is using an alternative investments manager for the Private Equity Buyouts, with a much higher return forecast. TRSL is expecting a private equity buyouts return of 12% (from TRSL's alternative investments manager) over the long term, while its own investment consultant is expecting 7.0% (Exhibit E11 attachment to the Board actuary's response to our assumption request).

TRSL's asset allocation is somewhat riskier than other pension funds; but it is, therefore, expected to earn somewhat more than others with more conservative portfolios. As a result, TRSL's expected rate of return *should* be greater than other retirement systems with lowers allocations to risk assets.

Consensus of Professional Investment Forecasts

We applied the target asset allocations to the expectations in the GRS Survey of 10 major national investment consultants and forecasters. Eight of these 10 investment consultants/forecasters provided GRS with their mid-term (10 years) horizon forecasts, and four of them provided GRS with their longer-

term (20 to 30 years) horizon forecasts. Given the brevity of the descriptions of the asset classes identified, our mapping of these 15 asset classes to the investment consultant's asset classes may not be exact.

Listed below are the national firms in our 2017 GRS Survey. These are very large and reputable investment consultants and forecasters.

Exhibit 11

10 Major National Investment Consultants and Forecasters in the GRS Survey			
Aon Hewitt	BNY/Mellon*	J. P. Morgan*	Marquette Asscoiates
Mercer*	NEPC *	Pension Consulting Alliance*	Principal
R.V. Kuhns	Voya		

*Each firm has between $1 trillion and $10 trillion in worldwide assets under management or advisement; the others are large managers and advisors below $1 trillion.

We applied the investment forecasters' expected returns to TRSL's asset allocation. We replaced the investment forecasters' respective inflation assumptions with 2.25%, our preferred assumption based on the consensus of expert inflation forecasters' expectations presented above in order to normalize for a consistent inflation assumption across all forecasters.

We reduced the respective forecasts for TRSL by the expected investment-related expenses and added alpha back in to replace active management expenses above expected passive management expenses, as permitted and limited by ASOP No. 27. This leaves a net reduction estimated to be for passive investments.

This process results in normalized expected returns for any one given year in the forecast horizon (called the expected arithmetic return). Finally, we reduced the resultant one-year arithmetic returns for volatility drag in the compound return expected over time, because pensions are all about compounding in a volatile environment over the horizon.

It matters not whether the field of forecasting is for hurricanes, earthquakes, elections, or inflation and investment returns, a *consensus average* of many reputable experts is proven to be more accurate than any one of those experts.

Below are the results of this process for the mid-term horizon.

Exhibit 12
Expected Likelihood of Achieving Forecast Results
Based on a 10 Year Time Horizon

Investment Consultant 10 Year Horizon	Distribution of 10-Year Average Geometric-Compound Net Nominal Return (Percentiles)			Probability of exceeding
	40th	50th	60th	8.20%
(1)	(2)	(3)	(4)	(5)
1	4.72%	5.79%	6.86%	28.64%
2	5.45%	6.46%	7.48%	33.27%
3	5.06%	6.25%	7.46%	34.19%
4	5.78%	6.77%	7.77%	35.89%
5	5.44%	6.58%	7.72%	36.04%
6	5.61%	6.82%	8.05%	38.79%
7	5.97%	7.21%	8.46%	42.02%
8	7.13%	8.04%	8.95%	48.18%
Average	**5.64%**	**6.74%**	**7.84%**	**37.13%**

Source: Developed by LLA actuarial staff.

There are three important takeaways from Exhibit 12:

a. Over the <u>mid-term horizon</u> the range of expectations of the 50th percentile of compound average return runs from 5.79% to 8.04%.

b. The 50th percentile consensus expert <u>mid-term</u> forecast is 6.74%, or rounded to 6.75%.

c. The consensus of these experts is that there is only a 37.13% chance of achieving at least the current 8.20% over the mid-term horizon. This does not mean a 37.13% chance of achieving the 8.20% assumption in any year during the horizon; it means that the compound return over the next 10 years has a 37.13% of achieving at least the 8.20% assumption.

This is why, actuarially speaking, the 6.74% rate of return is the preferred assumption for funding because it is the 50th percentile expectation of compound returns over a mid-term horizon. The consensus is that there is a 50-50 chance of returning at least 6.74% when compounded over the next 10 years.

None of the eight major national investment consultants with <u>mid-term horizon</u> forecasts expect the 50th percentile of the compound return to be at or above the current 8.20% assumption over the next 10 years.

According to the information provided by the board, its own investment consultant expects a compound annual return over the next 5-7 years to fall far short of the board's 8.20% assumption. There are good reasons for these professionals' bleak mid-term forecasts, the details of which are beyond the scope of this report.

If the independent experts are right, the next 10-year period will likely experience a substantial shortfall, while the board hopes to be bailed out in years 11 through 30.

Below are the results of this process for the <u>long-term horizon.</u>

Exhibit 13
Expected Likelihood of Achieving Forecast Results
Based on a 25 Year Time Horizon

Investment Consultant 20-30 Year Horizon	Distribution of 25-Year Average Geometric-Compound Net Nominal Return (Percentiles)			Probability of exceeding 8.20%
	40th	50th	60th	
(1)	(2)	(3)	(4)	(5)
1	6.13%	6.75%	7.38%	27.98%
2	6.34%	7.06%	7.79%	34.60%
3	6.58%	7.31%	8.04%	37.92%
4	6.93%	7.71%	8.50%	43.77%
Average	6.49%	7.21%	7.93%	36.07%

Source: Developed by LLA actuarial staff.

There are three important takeaways from Exhibit 13:

a. Over the <u>long-term horizon</u> the range of expectations of the 50th percentile of compound average return runs from 6.75% to 7.71%.

b. The 50th percentile expectation of the consensus average for the <u>long-term horizon</u> is 7.21%.

c. The consensus of these experts is that there is only a 36.07% chance of achieving at least the current 8.20% over the long-term horizon. This does not mean a 36.07% chance of achieving the 8.20% assumption in any year during the horizon; it means that the compound return over the next 25 years has a 36.07% of achieving at least the 8.20% assumption.

None of the four consultants with longer term forecasts expects a 50-50 chance of achieving the 8.20% return over 25 years.

This makes the current 8.20% assumption an outlier among the mainstream investment forecasters. According to the capital market assumptions of these investment forecasters, there is only a 37.13% chance of achieving at least the 8.20% compound annual return over the next 10-year period or and only a 36.07% chance over the next 25-year period.

For use in an actuarial valuation for pensions, where the entire measurement and funding model is built on compounding (present values and future values), the 50th percentile compound or geometric expectation over a <u>mid-term horizon</u> are the most appropriate choices of a net return assumption.

Section 5: Mortality Assumption

The board and its actuary should consider updating the process it uses to prepare its next experience study for the period ending 2017. The more analytic approach described herein would be appropriate for the 2017 study.

The 2017 Funding Valuation (page 50) states that mortality assumption for annuitant and beneficiary mortality is the "RP-2000 table with mortality improvements projected through 2025 using scale AA." The "RP" in RP-2000 is an abbreviation for Retirement Plans mortality rates. The RP table entries are the mortality rates themselves, i.e., the probability of a male age 65 dying before reaching age 66.

This is the table recommended by the board's actuary in the experience study (covering the 5-year period ending June 30, 2012, and dated March 27, 201). We reviewed the narrative and data tables set forth in the experience study that supported this recommend table.

We find the final result reasonable and do not recommend a change in mortality assumptions for the June 30, 2017 valuation. However, we suggest that the board and its actuary consider changes to the process for the next experience study (scheduled to examine the 5-year period ending June 30, 2017) to be in line with generally accepted actuarial practice for experience studies and for recognizing mortality improvements.

2012 Experience Study

The content of the 2012 experience study was an improvement over the 2007 study. The 2012 study included data tables typically found in experience studies, presenting exposures, actual and expected deaths, and actual, expected and proposed mortality rates. There were two such tables for actives: one for males and one for females; and two such tables for non-disabled retirees/inactives: one for males and one for females. However, the process and explanation were lacking robust actuarial procedures.

Nevertheless, the end result was reasonable compared to the result using more generally accepted actuarial practices. The following is the extent of the study's explanation of procedure:

> The mortality experienced by the TRSL plans for the 2007 to 2012 plan years reflects the trend of mortality improvements seen among the general population. To address this trend and allow a slight cushion for future mortality improvement, we recommend updating the mortality assumption to the RP 2000 Combined Healthy Mortality table, projected to 2025. While this table assumes heavier rates of mortality than experienced historically, given the low rates on incidence actually experienced, it represents a reasonable estimate of anticipated experience.

An Analytical Approach for the 2017 Study – Base Table

TRSL's actuary should consider the process described in this subsection when preparing the 2017 experience study. The data for each gender group is large enough to have full actuarial credibility. Base tables for males and females would be developed first, based on TRSL's own fully credible experience, and before applying projection scales for future mortality improvement. These base tables would be anchored at the central year of the next 5-year experience study (2015) and would be developed by applying TRSL's own fully credible adjustment factors to the standard RP-2014 mortality table.

These experience-driven adjustment factors are developed using the straightforward procedure more fully described in Appendix 2 of the full actuarial valuation report prepared by the Actuary for the Legislative Auditor.

An Analytical Approach for the 2017 Study – Mortality Improvement

The actuarial profession has embraced the expectation of mortality improvement in future years, beginning with the anchor year for the base tables through the valuation date and beyond.

Actuarial practice also has generally accepted the use of generational mortality improvement scales. These are different from the older Scale AA and the older/temporary Scale BB. The mortality improvement scales have been updated each year since the original MP-2014 was issued in conjunction with the RP-2014 tables. The "MP" in MP-2014 is an abbreviation for Mortality Projection rates. The MP table entries are percent decreases in the RP entries, representing annual rates of improvements (a decreased or lower mortality rate is an "improvement"). Generational mortality scales (the MP series) are (a) derived from examining mortality improvement trends over the past decade or so, (b) a more modern actuarial technology, and (c) serve as a replacement for older static projection tables.

For now, static projection to a fixed future year (e.g., valuation date plus the duration of the liability) is still allowed as acceptable actuarial practice. However, it is not preferred and it is more difficult (but not impossible) to derive a static projection scale from the generational MP scales.

As long as an actuary's software is up-to-date enough to handle generational mortality improvement scales, there may not be any good reason to deviate from the approach preferred by the Society of Actuaries.

Summary

The 2016 and 2017 actuarial valuation reports prepared by the Actuary for the Legislative Auditor changed the mortality tables from:

    a. TRSL's current mortality assumptions (RP-2000 Combined Table, projected to 2025 using Scale AA) <u>to</u>

    b. The analytical approach described above, but applied using the data from the 2012 experience study.

For TRSL's 2017 Funding Valuation, the mortality assumption used therein is acceptable because the effect of the change on mortality tables does not produce material differences. Notice the Summary and Conclusion sections of both reports.

Actuarial Certification

This report is considered to be a Statement of Actuarial Opinion. Therefore, I make the following certification:

I, Paul Richmond, am the Manager of Actuarial Services for the Louisiana Legislative Auditor. I am a member of the American Academy of Actuaries, an Associate in the Society of Actuaries, an Enrolled Actuary, and I meet the Qualification Standards of the American Academy of Actuaries necessary to render the actuarial opinions contained herein.

_____
Paul T. Richmond, ASA, MAAA, EA, FCA

_____12/15/17_____
Date

Forecasts of Contribution Rates and Unfunded Liabilities

Actuarial Standards of Practice

APPENDIX A

Forecasts of Contribution Rates and Unfunded Liabilities

We projected what TRSL's future actuarial funding valuations would show for future unfunded actuarial liabilities and future contributions rates if all the assumptions and methods continued on track in the future. We prepared Exhibits for these forecasts assuming emerging investment return experience will follow: (a) the board's inflation and return assumptions and (b) the consensus expectations for inflation and returns of the 10 investment forecasters shown in Exhibit 11 above. Both of these forecasts assume the board's actuary. Below is a detailed description of the assumptions used for forecasting future contribution rates and future unfunded liabilities over the next 25 years.

New Hires. If new hires entered would continue to use the same valuation assumptions in future valuations as were used for the 2017 Funding Valuation (except for applying the ramp-down to 7.50% by five basis points each year):

1. The plan at the same rate as members exited (for terminations, disabilities, deaths, and retirements occurring at the rates assumed in the 2017 valuation), so that the total number of actives in each subplan remained the same as June 30, 3017. All such new hires in every future year participate under the current tier of benefits for new hires.

2. *Valuation assumptions.* All demographic and economic assumptions used in the 2017 Funding Valuation were assumed to continue to be used for all future actuarial funding valuations. Since we have no way of knowing how future experience studies will affect future valuation assumptions, we retained all the same 2017 demographic valuation assumptions for use in future valuations.

   a. Except for the discount rate (and therefore the return assumption), all economic valuation assumptions in future valuations would be the same as the 2017 valuation assumptions.

   b. The valuation discount rate is assumed to drop by 5 basis points each year until it reaches 7.50% at which time it would remain at 7.50%, and the return assumption would remain at 7.90% (7.50% discount rate plus 40 basis points); this follows the scheduled valuation discount rates as adopted by the board.

3. *Emerging experience assumptions.* Actual demographic experience on the covered membership would exhibit the same as assumed in the 2017 valuation assumptions.

   a. Except for the emerging investment return experience and emerging inflation component of salary scales, other emerging economic experience would exhibit the same as assumed in the 2017 valuation assumptions.

   b. Forecasting graphs using the same emerging experience as the *board's valuation assumptions* would follow stated pattern, 8.20% for year 1, then 8.05% for year 2, down by 5 basis points each year until reaching and remaining at 7.90% (7.50% discount rate plus 40 basis points), and 40 basis points carved off for gain sharing COLAs.

   c. Forecasting graphs using the emerging experience as the *consensus opinion of the independent experts* would follow logarithmic distributions with (i) different means each year for 25 years which equal to a linear progression of the average of their one-year expected

returns in a ramping up pattern that simultaneously satisfies their 10-year average and the 30-year average of one-year rates and (ii) the same standard deviation each year for 25 years equal to their consensus average of their respective standard deviations. This way, emerging returns experienced in the mid-term match the experts' mid-term forecasts and the returns experienced in the long-term match the experts' long-term forecasts (similar to a select and ultimate emerging experience).

Actuarial Standards of Practice

ASOP No. 4 Section 3.5

3.5 Plan Provisions - When measuring pension obligations and determining **periodic costs** or **actuarially determined contributions**, the actuary should reflect all significant **plan provisions** known to the actuary as appropriate for the purpose of the measurement. However, if in the actuary's professional judgment, omitting a significant **plan provision** is appropriate for the purpose of the measurement, the actuary should disclose the omission in accordance with section 4.1(d).

ASOP No. 4 Section 3.5.3

3.5.3 Plan Provisions that are Difficult to Measure - Some **plan provisions** may create pension obligations that are difficult to appropriately measure using traditional valuation procedures. Examples of such **plan provisions** include the following:

a. Gain sharing provisions that trigger benefit increases when investment returns are favorable but do not trigger benefit decreases when investment returns are unfavorable;

b. Floor-offset provisions that provide a minimum defined benefit in the event a **participant's** account balance in a separate plan falls below some threshold;

c. Benefit provisions that are tied to an external index, but subject to a floor or ceiling, such as certain cost of living adjustment provisions and cash balance crediting provisions; and

d. Benefit provisions that may be triggered by an event such as a plant shutdown or a change in control of the plan sponsor.

For such **plan provisions**, the actuary should consider using alternative valuation procedures, such as stochastic modeling, option-pricing techniques, or deterministic procedures in conjunction with assumptions that are adjusted to reflect the impact of variations in experience from year to year. When selecting alternative valuation procedures for such **plan provisions**, the actuary should use professional judgment based on the purpose of the measurement and other relevant factors.

The actuary should disclose the approach taken with any **plan provisions** of the type described in this section, in accordance with section 4.1(i).

ASOP No. 27 Section 3.11.2

3.11.2 Cost-of-Living Adjustments—Plan benefits or limits affecting plan benefits (including the Internal Revenue Code (IRC) section 401(a)(17) compensation limit and section 415(b) maximum annuity) may be automatically adjusted for **inflation** or assumed to be adjusted for **inflation** in some manner (for

example, through regular plan amendments). However, for some purposes (such as qualified pension plan funding valuations), the actuary may be precluded by applicable laws or regulations from anticipating future plan amendments or future cost-of-living adjustments in certain IRC limits.

APPENDIX B

Management's Response

TRSL

Teachers' Retirement System of Louisiana

www.trsl.org
225.925.6446
225.925.4779
web.master@trsl.org
Post Office Box 94123
Baton Rouge LA 70804-9123

December 11, 2017

Mr. Daryl G. Purpera, CPA, CFE
Legislative Auditor
1600 North Third Street
Baton Rouge, LA 70804

Dear Mr. Purpera:

Thank you for the opportunity to respond to your office's review of TRSL's 2017 Actuarial Valuation and to include comments from Foster & Foster Actuaries and Consultants as an addendum to your final report. We have also included an independent professional actuarial opinion regarding the System's assumptions provided by actuaries from Cavanaugh Macdonald Consulting, LLC as a part of our response. Please see attachments.

While we are pleased that the LLA was able to replicate our valuation results, we recognize that differences of opinion exist, specifically in regard to the discount rate, return assumptions, and gain sharing. In summary, the methods used to prepare the valuation are actuarially sound, supported by actuarial standards of practice and our plan's experience. We welcome continued dialogue with your office and we appreciate your efforts to review our valuation.

Sincerely,

Dana L. Vicknair

Dana L. Vicknair
Director

Attachments

Toll free (outside the Baton Rouge area): 1.877.ASK.TRSL (1.877.275.8775)

TRSL is an equal opportunity employer and complies with the Americans with Disabilities Act.

December 11, 2017

Ms. Dana L. Vicknair
Director
Teachers' Retirement System of Louisiana
Post Office Box 94123
Baton Rouge, Louisiana   70804-9123

Ms. Vicknair:

The attached information has been prepared per your request, on behalf of the Board of Trustees, in response to the Comprehensive Actuarial Review of TRSL's 2017 Actuarial Valuation prepared by the Louisiana Legislative Auditor's office.

Please let us know if you have any questions.

Respectfully submitted,

FOSTER & FOSTER INC.

Shelley R. Johnson, ASA, MAAA   D. Patrick McDonald, FSA, EA, MAAA, FCA

Foster and Foster, Inc. Response to the Comprehensive Actuarial Review of TRSL's June 30, 2017 Actuarial Valuation

The scope of the Comprehensive Actuarial Review (CAR) prepared by Mr. Paul Richmond, actuary for the Louisiana Legislative Auditor (LLA), dated December 4, 2017, included:

- A replication of the valuation results,
- An evaluation and recommendations concerning key actuarial assumptions for appropriateness, and
- An evaluation and recommendations concerning the System's actuarial method of recognizing future gain sharing cost-of-living benefits.

The cover letter prepared by the Legislative Auditor states that the LLA expects to recommend that the Public Retirement Systems' Actuarial Committee (PRSAC) not accept the TRSL funding valuation and instead will recommend that PRSAC accept the valuation prepared by the LLA. Our response to the CAR shows that the methods and assumptions used in the TRSL 2017 valuation are appropriate for the purposes of the measurements, and have been chosen in order to comply with state law, the guidance provided by Actuarial Standards of Practice, GASB requirements, and the direction provided by the Board. The Board is following the plan to reduce the discount rate that was unanimously adopted by the PRSAC in June 2016. In addition, this plan and the methods used to determine the reasonableness of the discount rate were reviewed by an independent outside actuarial firm and determined to be appropriate.

The LLA stated that our formal response, if received prior to close of business on December 11, 2017 would be included as an addendum to the final report.

Section 1. Replication of Valuation Results

We were pleased to see that, similar to prior years, the LLA was able to "replicate – almost exactly" our valuation results. The review noted that "the close match is comforting, in that it brings a high degree of confidence in the calculations made by the board's actuary."

The LLA recommends that more detailed exhibits be presented in the valuation to disclose each step in maintaining the experience account. Each year, we have enhanced the disclosure and detail provided in the actuarial valuation reports. We plan to continue this and provide more detail regarding calculations of investment experience gains, and how these gains are allocated to the experience account, existing UAL schedules, and new UAL schedules. When the LLA has had questions regarding any calculations used in the valuation, we provide a very quick turnaround, usually less than one day, and provide a comprehensive response with detailed calculations when applicable. We are happy to provide such detail in future valuations.

Section 2. Return Assumption vs. Discount Rate

There appears to be some misunderstandings regarding the process the Board follows to determine and adopt changes to the discount rate. The underlined portions of the following statements in the CAR are incorrect:

"Confusion is exacerbated by the fact that the <u>discount rate is set first based on budget or other considerations</u>." (Page 5)

"The discount rate is set by the board, independent of, and prior to determining an expected net investment return. For TRSL, <u>it is based on budget constraints or other factors</u>." (Chart on Page 6)

The assumed basis points to be transferred to the experience account do not have "any effect <u>on the employer contribution rate </u>because the board first adopts a discount rate and then backs into the rate of return assumption." (Chart on Page 6)

"The board backed into the net return assumption, <u>in order to be able to keep the discount rate at the stated, pre-determined rate of 7.70%.</u>" (Chart on Page 6)

These statements ignore information we have previously provided to the LLA that clearly demonstrate that the discount rate is not set "first based on budget or other considerations." Each of the discount rate changes have been supported by long-term market expectations. The use of a discount rate that differs from the assumed rate of return is consistent with the guidance provided by the Actuarial Standards of Practice (ASOP) (see below for more specific comments regarding the perceived inconsistency by the LLA). We provide a brief, very high-level overview of the recent changes to the discount rate to illustrate this point.

PRSAC increased the discount rate from 7.50% to 8.25% in 1992. Our understanding is that this rate did not explicitly include adjustments for gain-sharing or administrative expenses (statutes did not provide for direct funding of administrative expenses). The legislature did not provide for specific funding for COLAs, but intended for the cost of COLAs to be funded by a portion of returns above the discount rate.

In 2012, the Board requested that we recommend an appropriate discount rate. We recommended lowering the discount rate from 8.25% to 7.75% in 0.25% increments. This recommendation was developed considering the long-term expected return based on the current asset allocation using the investment consultant's (Aon Hewitt) capital market assumptions, then reducing for returns to be used for purposes other than funding plan benefits (gain-sharing and administrative expenses). At the time, the gain-sharing reduction was 0.5% and the administrative expense reduction was 0.10%-0.15%. This led to an inherent gross expected return which was supported by the current gross expected return assumption at that time.

The actuary for the LLA advocated for further reductions to the discount rate. Although the return expectations were supported by the investment consultant's expectations, we

and the TRSL Board agreed to reduce the discount rate from 8.0% to 7.75% in 2014. Act 497 of 2014 resulted in significant reductions in expected future gain-sharing. The changes reduced the margin needed for gain-sharing from 0.5% to 0.25%. Therefore, the expected return inherent in the valuation, for which we would opine on the reasonableness, was 7.75% + 0.25% + 0.10% = 8.10%.

In 2016 discussions with TRSL executive staff and the Board, we proposed to reduce the discount rate from 7.75% to 7.50%. In order to minimize the impact to employers, the Board chose to make the reductions in 0.05% annual increments. The Board sought a second opinion from Cavanaugh Macdonald, an independent actuarial firm that has many large public plan clients around the country. John Garrett, who is Principal and Consulting Actuary with the firm, concluded that our methods and assumptions are reasonable and in compliance with ASOPs, and additionally concluded that the proposed incremental reductions were reasonable. His conclusions were presented at the June 2016 PRSAC meeting, where both our methods and the LLA's methods were discussed. In June 2016, PRSAC expressed its desire to support the Board's plan to reduce the discount rate in this manner. Although we understand the legislative auditor had reservations regarding the slow implementation of the reduction, the plan was unanimously recommended by PRSAC. Initially, the Board considered commencing the reductions beginning July 1, 2016, but at PRSAC's request, commenced the reductions beginning July 1, 2017.

Also in 2016, we completed a more robust analysis of the returns expected to be allocated to the experience account. The result was an increase from 0.25% to 0.40%.

The 2017 valuation met the provisions in Act 94 of 2016 that trigger direct funding of administrative expenses, thus eliminating the need for this margin between the discount rate and the return assumption.

We address the review of the reasonableness of the 2017 discount rate in Section 4.

As a minor clarification to some of the comments in the CAR, the Board only adopts a discount rate, not an expected rate of return. Since the discount rate is net of returns expected to be used for other purposes (gain-sharing and administrative expenses), we determine the overall expected return inherent in the valuation as the discount rate plus the return expected to be used for other purposes. We evaluate the reasonableness of the expected return inherent in the valuation, and thus the discount rate, based on current capital market assumptions, which vary annually.

Inconsistency Between the Discount Rate and Return Assumption

As explained in each of our valuations, the reasonableness of the discount rate is determined by reducing the long-term expected rate of investment return by the amount of needed returns to offset administrative expenses and expected earnings to be credited to the experience account. Thus, the reasonability of the discount rate is dependent upon the reasonability of the expected investment return and the adjustments for gain-sharing and administrative expenses.

Section 2 of the CAR addresses concerns regarding the use of a discount rate that differs from the return assumption. The report states that the use of different assumptions may be confusing to the public, since these terms are often used interchangeably, and that consistent terms are more transparent. We maintain that the current method is appropriate and transparent for the following reasons:

- Actuarial Standard of Practice (ASOP) No. 27, which pertains to the selection of Economic Assumptions for Measuring Pension Obligations, addresses the investment return assumption in section 3.8 and separately addresses the discount rate in section 3.9. Thus, the ASOP inherently acknowledges that the return assumption and the discount rate are not necessarily the same measurement. In fact, the ASOPs provide guidance on when these assumptions may differ and directly address adjusting economic assumptions for gain-sharing and administrative expenses as follows:

  Gain-sharing: ASOP No. 27, paragraph 3.5.1 states that "the actuary may determine that it is appropriate to adjust the economic assumptions to provide for considerations such as … plan provisions that are difficult to measure." ASOP No. 4 (Measuring Pension Obligations and Determining Pension Plan Costs or Contributions) includes gain-sharing in its description of "provisions that are difficult to measure."

  Administrative expenses: ASOP No. 27, paragraph 3.8.3.e states that to the extent that administrative expenses which are paid from plan assets "are not otherwise recognized, the actuary should reduce the investment return assumption to reflect these expenses."

- The assumptions are fully disclosed in Appendix D of the valuation report, including a description of the discount rate and how it differs from the expected investment return (see pages 54 and 55).

- It is our understanding that the TRSL Board understands and is comfortable with this method. We discuss the difference between the assumptions in the numerous hours of education we provide to the Board and we do not encounter the confusion suggested in the CAR report. Instead, we find that the Board, TRSL executive and investment staff, TRSL's investment consultants, legislative staff, and the members of PRSAC with whom we have discussed this all understand the difference.

  While it is possible for those preparing national surveys to misinterpret the assumptions, many retirement systems' nuances are glossed over in an attempt to summarize complex subject matter. One example of this is each system's asset allocation, which is a critical component of determining the reasonableness of the discount rate. Our primary concern with the selection of assumptions is to minimize future gains and losses, not to minimize misunderstandings that may be unintentionally derived from survey results.

The actuary for the LLA has advocated for several years for a different approach to valuing the gain-sharing provisions. We provide additional comments regarding the different approaches to valuing the gain-sharing provisions in Section 3. We note that it is not unusual for several actuaries to reach different conclusions as to the most appropriate way to value these provisions, as evidenced by the fact that three different actuaries preparing valuations for the Louisiana state plans utilize three different approaches, or choose not to value the gain-sharing provision.

Funding vs. Accounting Inconsistencies

As stated above, the 7.70% discount rate for the funding valuation represents the net return to be used to fund plan benefits, i.e. it is adjusted for the gain-sharing and administrative expenses. The requirements for financial reporting set forth by the Governmental Accounting Standards Board (GASB) Statement 67 and 68 specify that the discount rate should be based on the long-term expected rate of return, and does not allow for an adjustment to recognize the gain-sharing provision or administrative expenses. We were faced with the decision of which assumption to use for the discount rate, the expected return inherent in the funding valuation (currently 8.15%), or the discount rate (currently 7.70%). Prior to making a decision, we met with the external auditors and TRSL staff. We agreed that the discount rate for both purposes is an estimate and as long as the assumptions used are reasonable, there is no reason to require that each be based on a single overall long-term expected rate of return. Using the lower discount rate is a more conservative measure of expected return. Therefore, we agreed it was preferable to use the same discount rate for funding and GASB reporting, despite the inherent differences in the total return expectation of each. Therefore, this recommendation was made to the Board and adopted.

The CAR states on page 11 that the inconsistent use of the discount rate in the funding and financial reporting (GASB) valuations results in confusion and lack of transparency. There is no requirement that the assumptions for GASB reporting be consistent with the assumptions for funding, but each must be reasonable for the purposes of each measurement. We believe that our assumptions meet this description.

ASOP 27 regarding the Selection of Economic Assumptions for Measuring Pension Obligations specifically allows the use of different assumptions for different purposes. Paragraph 3.6.2., titled "Range of Reasonable Assumptions" states "The actuary should recognize the uncertain nature of the items for which assumptions are selected and, as a result, may consider several different assumptions reasonable for a given measurement. The actuary should also recognize that different actuaries will apply different professional judgment and may choose different reasonable assumptions. As a result, a range of reasonable assumptions may develop both for an individual actuary and across actuarial practice."

While we understand that the differences may not be obvious to the general public, we describe the discount rate used for both funding and financial reporting (GASB reporting) in Appendix D, pages 49 and 50 of the TRSL 2017 actuarial valuation.

Section 3. Gain-Sharing Recognition Methods

We are pleased that the CAR acknowledges that our valuation recognizes the likelihood of future cost-of-living adjustments (COLAs) by reducing the expected return assumption.

The CAR proposes two alternative actuarial methods in order to "eliminate the confusion and inconsistencies inherent in the current actuarial method." As addressed in Section 2 above, our valuation fully discloses and explains the current method. In our experience with frequent conversations with the Board, System staff and investment consultants, legislative staff and Retirement Committee Chairs, and discussions at PRSAC committee meetings, we do not find that this confusion exists. Also, as stated above, we believe our approach is consistent with the guidance provided by ASOP No. 27, which specifically addresses modifying the assumptions to address provisions that are difficult to measure, such as gain-sharing.

The two alternative methods addressed by the LLA actuary involve explicit assumptions regarding future benefit increases. Although there are subtle differences, the method that involves using a single equivalent COLA assumption is essentially actuarially equivalent to the current method. However, given that the legislature has made clear through recent legislation that it specifically has the authority to not grant a COLA even when funds are available in the experience account, we are more comfortable recognizing the required gain-sharing provision rather than explicitly assuming all future ad hoc COLAs will be granted when the provisions provided by the template are met. It's a subtle difference, but we believe an important one.

An alternative method used for Louisiana School Employees Retirement System and Louisiana State Police Retirement System is to recognize the ad hoc COLA only when granted. If this method is considered acceptable, in part due to the use of a lower discount rate, then it is equivalent to our method if the discount rate is less than a reasonable assumed rate of return by a margin equivalent to expected future allocations to the experience account.

We believe that discussions of alternative methods are healthy and lead to a greater understanding by the various stakeholders. However, we believe that the first questions to be addressed are whether (1) the current method is actuarially sound for funding purposes; and (2) the method used for financial reporting meet GASBs requirements. We firmly believe that the answer to both of these questions is yes.

Section 4. Overly Optimistic Return Assumption

The CAR states on page 20 that "independent, unbiased, expert sources of inflation and investment return forecasts are the best places to look for input when setting a net return assumption for pension valuation. These are much more objective and unfiltered sources, directly from the experts themselves, to guide decision-makers." The report then describes a process of obtaining a consensus of 10 major national investment

consultants and forecasters. We prefer that the information used to determine the expected return assumption and the discount rate is consistent with the information used by the Board of Trustees to set the target allocation of the assets. TRSL's investment consultant serves as a fiduciary. As noted by John Garret, in his review of both our method and that of the LLA actuary, to use different assumptions opens the possibility that a different asset allocation would have resulted based on the different assumptions.

Inflation

The CAR states that the LLA actuary would prefer to see an inflation assumption closer to 2.25%, but does not find the current 2.50% assumption to be unreasonable. The information provided below provides further support for the 2.50% assumption.

Following ASOP No. 27, which provides guidance on the selection of economic assumptions such as inflation, our determination of an appropriate inflation assumption includes a review of recent and long-term historical inflation, without giving undue weight to recent experience. The table below shows the average annual change in inflation, based on historical changes in the CPI-U, over various periods.

Periods Ending Dec. 2016	Avg. Annual Increase in CPI-U
Last 5 years	1.3%
Last 10 years	1.8%
Last 20 years	2.1%
Last 30 years	2.6%
Last 40 years	3.7%

Source: Bureau of Labor Statistics, CPI-U, all items, not seasonally adjusted

The spread between the nominal yield on treasury securities and the inflation-indexed nominal yield on inflation-protected treasury bills (TIPS) of the same maturity is referred to as the "breakeven rate of inflation" and represents the bond market's expectation of inflation over the period to maturity. The current spread (as of 1/18/2017) for both 10 and 30 years to maturity is between 2.0% and 2.1%.

The Federal Reserve Bank of Philadelphia conducts a quarterly survey of the Society of Professional Forecasters and publishes a mid-term expectation. Their most recent forecast (second quarter of 2017) predicts average inflation over the next 10 years (2017-2026) will be 2.30%.

The Social Security Administration's 2017 Trustees Report includes the Office of the Chief Actuary's projection of ultimate long-range average annual inflation. The intermediate cost assumption is 2.60%. The report provides a low-high range of 2.00%-3.20%.

Although our recommendation is not based on the assumptions used by other retirement systems, we note that a wide range of inflation assumptions is currently being employed by other similar public retirement systems, ranging from 2.50% to 3.75%, based on the

most recent valuations available. (Most of the systems with an inflation assumption at 3.0% or above have recently lowered their assumption to 2.75% or 2.50%.)

Based on the information provided above, we are comfortable with a 2.50% long-term inflation assumption.

Horizon

The CAR states that TRSL's net return assumption is "outside of the consensus of mainstream professional forecasters." The two primary reasons that the LLA actuary's investment return assumption is lower than TRSL's assumption is that (1) the actuary for the LLA prefers a mid-term horizon (10 years) rather than a long-term horizon (30 years) and (2) the underlying inflation assumption. We provide support for our inflation assumption above. We prefer to use a 30-year horizon for the return assumption for the following reasons:

- The use of 30-year capital market assumptions is consistent with generally accepted actuarial practice and is how most public plans set their assumptions. When compared to the methodology used by other ongoing retirement systems, the use of a short- or mid-term horizon would be an outlier.

- A 30-year horizon is more appropriate for discounting long-term pension liabilities which require benefit projections of 80 or more years for some members. This is particularly true for ongoing pension plans, as opposed to closed plans.

- The primary purpose of the measurement of liabilities in a funding valuation is to determine funding requirements. Mid-term assumptions tend to be more volatile, which would result in more volatility in funding requirements.

- Due to the volatility of mid-term expected returns there will be periods of time when mid-term expected returns will exceed 30-year expected returns. We believe it would not be appropriate to increase the discount rate when this occurs. We are interested in knowing if the LLA actuary would recommend increasing the discount rate when the mid-term assumption exceeds the 30-year assumption. If not, then this exposes a bias. Our preference for the use of 30-year investment return assumptions is unbiased, since we prefer this approach regardless of whether or not the mid-term assumption is lower.

LLA Consensus 50th Percentile with 2.50% Inflation Assumption

Exhibit 13 on page 26 of the CAR provides the LLA actuary's expected return based on a 25-year time horizon. The report states that "over the long-term horizon the range of expectations of the 50th percentile of compound average return runs from 6.75% to 7.71% with a consensus average of 7.21%." If a 2.50% inflation assumption had been utilized, which is less than the long-term expectation provided in the Social Security Administration's Trustees Report, the range would be 7.00% to 7.96% with a consensus average of 7.46%.

We understand that the LLA actuary prefers a shorter horizon and an inflation assumption of 2.25%. We provide this example to show that if a 2.50% inflation assumption is considered reasonable, and if a long-term horizon is considered reasonable, which we believe both are, then using all other information provided by the LLA actuary yields a range of 7.00% to 7.96%, and a consensus average of 7.46%. The Board's plan to gradually move to a 7.50% discount rate, which equates to a 7.90% expected return after considering gain-sharing, is within the range provided by the LLA's experts (using a 2.5% inflation assumption).

Development of the Expected Return

We considered the following when determining a reasonable expected return assumption for the 2017 valuation:

Our current long-term (30-year) geometric return expectation for TRSL is 8.33%. This is based on Aon Hewitt's 2017 Capital Market Assumptions by asset class for TRSL's portfolio allocation, except for the private equity buyout assumption, which is provided by Hamilton Lane, TRSL's alternative investment manager. We note that Aon Hewitt expects an additional 0.4% returns due to active management. While we believe it is possible for active management to result in additional returns above that of passive management (alpha), we have excluded this adjustment as a conservative measure when determining the expected returns used to evaluate the reasonableness of the discount rate.

The expected return inherent in the funding valuation is the discount rate (7.70%) plus the additional returns needed to offset gain-sharing costs (40 basis points) and administrative expenses (10 basis points). Therefore, the resulting expected return inherent in the funding valuation is 8.20%. We note that since administrative expenses will be directly funded beginning July 1, 2018, the additional margin for these expenses is not needed prospectively. Given our current expected long-term return of 8.33%, we conclude that the current return assumption inherent in the valuation and discount rate is reasonable.

Despite our differences in opinion regarding the reasonableness of assumptions and methods outlined above, we agree in general with the idea of lowering the discount rate, as we have seen the long-term capital market assumptions decline in recent years, suggesting there is general consensus by investment professionals that future returns are likely to be lower than previously expected. We plan to continue to evaluate the capital market assumptions annually to determine the continued reasonableness of these assumptions.

Section 5. Mortality Assumption

The CAR states that the current mortality assumptions are acceptable and do not produce material differences from the assumptions used in the LLA's funding valuation.

The CAR addresses the methods used to prepare the mortality assumptions adopted following the prior experience study and provides recommendations for consideration in the next experience study. In preparing this study, which will be completed following the June 30, 2017 valuation, we plan to consider the resources regarding credibility theory that are described in a Practice Note provided by the American Academy of Actuaries and other resources provided by the Society of Actuaries.   And we have taken several opportunities to educate the Board on recent actuarial topics regarding mortality assumptions such as the use of generational tables to project mortality improvement.

However, we maintain the reasonableness of the current assumptions and note that the method described by the LLA to determine a recommended table is "a" generally accepted method, not "the" generally accepted method of reflecting mortality experience. Note the following statement included in the introduction of the Practice Note that addresses this method: "This practice note is not a promulgation of the Actuarial Standards Board, is not an Actuarial Standard of practice (ASOP) or an interpretation of an ASOP, and is not meant to be a definitive statement as to what constitutes generally accepted practice in the area under discussion. Actuaries are not in any way bound to comply with practice notes or to conform their work to the practices described in practice notes."

SUMMARY

Our intent in this response is to make clear that the current methods and assumptions have been chosen in order to comply with state law, actuarial standards of practice, GASB requirements, and the direction provided by the Board and PRSAC. It is expected that the LLA's Comprehensive Actuarial Review of the TRSL valuation identifies many difference in opinion regarding assumptions and methods utilized in the valuation, as we have discussed these differences at length.   We believe that in large part, these differences can be narrowed as the Board continues to reduce the discount rate, if necessary, below the current target of 7.50%. We will continue to monitor and opine on the reasonableness of these assumptions. Our hope is that in the near future we can agree upon assumptions and methods that are generally accepted by all involved parties.

Shelley is an Associate in the Society of Actuaries and Pat is a Fellow in the Society of Actuaries. Shelley and Pat are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. The reports referenced in this letter are an integral part of the actuarial opinions and should be considered a part of the opinions expressed in this letter.

Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

September 20, 2017

Ms. Cindy Rougeou
Executive Director
Louisiana State Employees' Retirement System
Post Office Box 44213
Baton Rouge, LA 70804-4213

Ms. Maureen H. Westgard
Director
Teachers' Retirement System of Louisiana
Post Office Box 94123
Baton Rouge, LA 70804-9123

Re: Professional Actuarial Opinion Regarding the Systems' Assumptions for the Rates of Inflation and Rates of Investment Return

Dear Ms. Rougeou and Ms. Westgard:

Our firm was engaged in March of 2016 to provide a report of our opinion concerning the development of the assumed rates of investment return (also used as the discount rate for liabilities) utilized by the Louisiana State Employees' Retirement System (LASERS) and the Teachers' Retirement System of Louisiana (TRSL). Our report was delivered in May of 2016 and was based on our review of each Systems' latest experience study and the information used as a basis in developing each Systems' assumed rate of investment return. The report found: "... ***the assumed 7.75% discount rates of both systems to be well within a reasonable range for this assumption.***"; and the Systems' actuary, Foster and Foster, Inc., work resulted in "***reasonable assumptions developed in compliance with applicable actuarial standards and generally accepted practices.***"

Since our report, the Systems' have adopted changes to their economic assumptions. Both LASERS and TRSL adopted a 0.25% discount rate reduction from an annual rate of 7.75% to 7.50% and are utilizing a five-year phase-in of the rate reduction. In May of 2017, LASERS' Board adopted a decrease to the assumed rate of inflation (a component of both the discount rate and the rate of wage inflation) from 3.00% to 2.75% based on their actuary's recommendation. We have reviewed the analysis and material prepared by Ms. Shelley Johnson of Foster and Foster, Inc., the Systems' actuary, that was the basis for the recommendation to the LASERS Board to reduce the inflation rate to 2.75%. We concur with Ms. Johnson's recommendation and we find that the basis of her recommendation complies with the guidance of applicable standards of practice and meets with generally accepted practices. It is our opinion that the current range for a reasonable inflation assumption is from 2.00% to 3.00% and the current Board adopted assumptions of both LASERS (2.75%) and TRSL (2.50%) are well within this range.

Finally, in our May 2016 report on the reasonableness of the Systems' discount rate assumptions, we concluded: *"In our opinion, a funding policy which continues the trend in gradually decreasing the plans' assumed rate of investment return and discount rate, … would enhance the expectation of continued improvement in the funded positions of both LASERS and TRSL."* We noted that several other large public retirement systems were utilizing a phase-in approach to gradually lower their system's discount rate over periods typically ranging from 3 to 5 years. We understand the Boards of both Systems adopted a five-year phase-in of a reduction in their system's discount rates from 7.75% to 7.50%. Our opinion concerning the development of the assumption for each System's discount rate and the phase-in of the decrease to the discount rate over five years remains unchanged from our prior reported findings. In our opinion, the assumptions and methods utilized by Foster and Foster, Inc. are reasonable and conform to the applicable actuarial standards and generally accepted practices.

In summary, these are assumptions of future economic experience. The selection of any assumption of future economic outcomes inherently exposes the valuation results to the likelihood of gains and losses. It will be pure coincidence that the actual rates in any future year will exactly match the assumed rates. This, however, is not the objective of assumption selection. For public plans, where the valuation results are used to determine required future funding levels, the best assumption is not the assumption which most likely produces annual gains, but rather it is the assumption which can be expected to minimize the net impact of future gains and losses. We concur with the approach for the selection of unbiased, reasonable assumptions utilized by Foster & Foster, Inc. and as implemented by both LASERS and TRSL.

Please let us know if you have any further questions.

Sincerely,

John Garrett, ASA, FCA, MAAA
Principal and Consulting Actuary

Jonathan Craven, ASA, EA, FCA, MAAA
Consulting Actuary