

COMPREHENSIVE ACTUARIAL REVIEW OF THE
2020 ACTUARIAL VALUATION OF THE
FIREFIGHTERS' RETIREMENT SYSTEM



ACTUARIAL SERVICES
PRESENTED TO THE PUBLIC RETIREMENT SYSTEMS' ACTUARIAL COMMITTEE
JANUARY 19, 2021



LOUISIANA LEGISLATIVE AUDITOR
DARYL G. PURPERA, CPA, CFE

December 8, 2020

Mr. Steven Stockstill
Director and Legal Counsel
Firefighters' Retirement System of Louisiana
Post Office Box 94095 Capital Station
Baton Rouge, Louisiana 70804-9095

Re: Comprehensive Actuarial Review of the 2020 Actuarial Valuation

Dear Mr. Stockstill:

To fulfill the requirements of R.S. 11:127(C) to the Public Retirement Systems' Actuarial Committee for 2020, the Louisiana Legislative Auditor has conducted a Comprehensive Actuarial Review for the Firefighters' Retirement System (FRS or System).

The remainder of this letter contains the results of our Comprehensive Actuarial Review of your June 30, 2020 Actuarial Valuation (prepared by G.S. Curran & Company and dated November 2, 2020). More specifically, we have evaluated for reasonableness the actuarial assumptions and methods employed by the System and its actuary.

I would like to thank you, your staff, and the board's actuary for the cooperation and assistance provided for this review.

Sincerely,

Daryl G. Purpera, CPA, CFE
Legislative Auditor

DGP:JJR:ch

cc: G.S. CURRAN & COMPANY

LLA'S COMPREHENSIVE ACTUARIAL REVIEW OF FRS' 2020 ACTUARIAL VALUATION

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Scope of Review

The June 30, 2020, Actuarial Valuation Report for the Firefighters' Retirement System (FRS) for funding purposes was prepared by G.S. Curran & Company (GSC), and dated November 2, 2020.

This Comprehensive Actuarial Review (CAR) of that report was prepared by James J. Rizzo, Senior Consultant and Actuary, and Piotr Krekora, Consultant and Actuary, both employed by Gabriel, Roeder, Smith & Company (GRS). GRS is under contract with the Louisiana Legislative Auditor (LLA) to provide backup, research, calculations, actuarial services and advice to the LLA.

This CAR includes evaluations of the appropriateness of key actuarial assumptions and methods employed in the 2020 Actuarial Valuation, as well as documented support for opinions presented herein. However, a full actuarial valuation replicating the actuary's results was not performed; nor was a full actuarial valuation performed using recommended assumptions and methods.

Summary of Findings

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

- 1. Optimistic Return Assumption.** We consider the System's 2020 investment return assumption (7.00%) to be overly optimistic (a) considering the fund's asset allocation and cash flow and (b) compared to the mainstream of numerous professional forecasting organizations. Refer to *Section 1: Optimistic Return Assumption* for more details.
- 2. Treatment of Cost-of-Living Adjustments (COLAs).** The cost of future COLAs is currently not included in the 2020 Actuarial Valuation. We recommend that the board of trustees consider their likelihood of granting COLAs when permitted to do so. We recommend that the board (a) engage its actuary to model the future cost-of-living increases funded with "excess" investment earnings, as permitted by the statutory template and (b) incorporate expected future cost-of-living increases permitted under the statutes in the measurement of the plan's costs and liabilities. Refer to *Section 2: Treatment of Cost-of-Living Adjustments* for more details.
- 3. Mortality Assumption.** Careful analysis was undertaken by the board's actuary, in compliance with current actuarial literature, in assessing the degree of plan-specific mortality experience that should be recognized in the mortality tables assumed for the 2020 Actuarial Valuation. The current mortality tables are acceptable. Refer to *Section 3: Mortality Assumption* for more details.
- 4. 2020 Experience Study.** We reviewed the 2020 experience study report and found all the sections relating to the demographic and other assumptions to be described with reasonable detail and careful recognition of relevant experience. Therefore, we accept all the demographic and other assumptions proposed in the experience study report and find them fully appropriate for this 2020 actuarial valuation. Refer to *Section 4: 2020 Experience Study* for more details.
- 5. Financing Calculations.** We reviewed the 2020 Actuarial Valuation with additional emphasis on the exhibits presenting the financing calculations. All relevant and material financing calculations were reasonably complete and accurate using the board's assumptions and methods.

Section 1: Optimistic Return Assumption

This section and the Appendices set forth a disciplined process for setting or assessing a return assumption that ensures the assumption is mainstream and defensible. They set forth the details for how we arrived at our “most appropriate” net return assumption (6.00%), compared to FRS’ 2020 return assumption (7.00%). We commend the board for lowering the return assumption; but according to the mainstream of professional forecasters (as applied to FRS’ own portfolio and its own cash flow projections), this assumption is still well above a most appropriate return assumption of 6.00%.

Following are the primary reasons why our 6.00% most appropriate return assumption for the System’s 2020 Actuarial Valuation differs from the 6.50% assumption we determined to be most appropriate last year when we conducted our own 2019 actuarial valuation for the System:

- The professional inflation forecasters decreased their expectations from last year (refer to Appendix A, *Sources of Inflation Forecasts*). Last year, the consensus average of inflation forecasters was 2.16% for mid-term and 2.25% for longer-term inflation, while this year it was 2.00% for both mid-term and longer-term.
- The professional investment forecasters decreased their expectations for future returns in various asset classes represented in the System’s investment policy (refer to Appendix D, *Portfolio’s Expected Return*).
- The board of trustees changed the asset allocations in their investment policy statement (we applied board’s Long-Term Target Allocation), which had a slight increasing effect on the return assumption, but not sufficient to offset the decreasing effect of the first two factors (refer to Appendix C, *Asset Allocation*).

Following are the primary reasons why our 6.00% most appropriate return assumption for the System’s 2020 Actuarial Valuation differs from the 7.00% adopted by the System for the 2020 Actuarial Valuation:

- Inflation: The consensus average expectation of professional inflation forecasters published in 2020 for the mid-term and longer-term, presented in Appendix A, *Sources of Inflation Forecasts*, lead to a 2.00% future inflation assumption embedded in the return assumption, while FRS’ board of trustees adopted a 2.50% assumption about future inflation embedded in the return assumption.
- Time Horizon: Our most appropriate return assumption is between the mid-term consensus average (a lower rate) and the longer-term consensus average (higher) of professional investment forecasters. FRS’ board of trustees adopted a straight long-term forecast, without regard to what is expected to happen during the next 10 years. We believe the mid-term expectations should be considered in the process. Appendix E, *Single Equivalent Cash-flow Adjusted Expectation* illustrates why considering FRS’s own expected benefit cash flow leads to a blending between the mid-term and long-term expected returns.
- Methodology: The Actuary for the LLA and the System’s actuary both rely on various independent professional forecasts to inform our opinions. In doing so, we both are applying

an accepted principle in forecasting science. However, our methodologies are different: (a) The Actuary for the LLA uses a more direct approach, mapping FRS' asset classes and allocations directly to each professional forecaster's capital market assumptions to obtain each forecaster's own separate opinion about FRS' portfolio, while (b) The System's actuary first develops a single *standardized* set of asset classes and capital market assumptions for all its clients based on a mapping amalgamation of the experts' capital market assumptions, then maps FRS's asset classes and allocations to those standardized asset classes and capital market assumptions. In our opinion, the direct approach is less prone to "mapping error" than an amalgamated standardized set of asset classes, but we do not know if there is a material difference or even which direction it might go. Furthermore, we did not pursue reconciling certain mathematical questions concerning internal steps in the System actuary's methodology.

- **Board Action:** The FRS board adopted a rate at the high end of its actuary's range. Earlier this year, the System's actuary reported to the board of trustees:
 - That, over 30 years, the average geometric rate of return is expected to be 6.54%.¹
 - *"Based upon a reasonable range of 6.02% to 7.07% and the Board's planned reduction in the assumed rate of return from 7.15% in the fiscal 2019 actuarial valuation to 7.10% for the fiscal 2020 actuarial valuation, it is clear that a larger reduction in the assumed rate of return is warranted."*²

Ultimately, the board decided to lower the return assumption for the 2020 Actuarial Valuation, but only to 7.00%.

A Disciplined Process

The cost of being wrong is substantial, whether it is over a 10-year period or a 30-year period, and could be detrimental to plan members (jeopardizing actuarial benefit security) and detrimental to taxpayers (unexpected contribution increases).

The process of our assessment of FRS' 2020 actuarial return assumption is captured in our treatment of the most significant factors in setting, defending or assessing the appropriateness of an assumed return:

1. Forecasts of future rates of *inflation* (forward-looking), as expected by experts who are both independent and nationally recognized in the field of inflation forecasting; refer to Appendix A (*Sources of Inflation Forecasts*) for more details;
2. Forecasts of future *investment returns* (forward-looking) and other capital market assumptions for various asset classes as expected by experts who are both independent and nationally recognized in the field of investment return forecasting; refer to Appendix B (*Sources of Investment Return Forecasts*) for more details;
3. Current and future *asset allocation percentages*, by asset class; refer to Appendix C (*Asset Allocation*) for more details;

¹ Near the top of Page 11 of the System actuary's experience study report dated June 10, 2020.

² Near the end of Page 11 of the System actuary's experience study report dated June 10, 2020.

4. *Future investment performance* of the pension fund’s portfolio: (1) as expected by each independent forecaster, (2) considering the consensus average of their 50th percentile expectation for the System’s compound return over time; refer to Appendix D (*Portfolio’s Expected Returns*) for more details; and
5. *Expected benefit cash flow* influences how much of a fund’s future earnings will be affected by mid-term forecasts versus long-term forecasts; refer to Appendix E (*Single Equivalent Cash-flow Adjusted Expectations*) for more details.

This disciplined process assures decision-makers that the result is a net return assumption that:

- a. Is unbiased, objective, free of agency risk (i.e., not influenced by what the participating agencies think is affordable);
- b. Is disciplined, robust and defensible; and
- c. Improves actuarial benefit security, intergenerational equity, and contribution stability.

Conclusion – Based on this analytical process for assessing the return assumption, we consider 6.00% to be the “most appropriate” net return assumption and consider FRS’ 2020 return assumption of 7.00% to be overly optimistic for funding purposes.

Professional inflation forecasters and professional investment forecasters are expecting future returns to be lower than what we have seen in certain time frames in the past. Expert forecasters are not guaranteed to be right, of course. However:

- There is no other source to turn for input when selecting, defending, or assessing a pension return assumption;
- It is not prudent to be out of step with the mainstream of subject matter experts;
- Just because the experts do not know for sure, that is insufficient reason to discard their opinions; trustees in the pension industry do not generally disregard the advice of other subject matter experts such as investment managers, investment consultants, actuaries or attorneys simply because they do not know for sure; actuaries do not know for sure what the future rates of turnover, retirement and mortality will be either, but the System’s actuary and the LLA’s actuary follow a disciplined and robust process to develop those recommended assumptions – both demographic and economic; and
- It is a fiduciary’s responsibility to select the best estimate of the future expectations of the System’s portfolio, with professional input and without outside influences that may detract from attaining and maintain actuarial benefit security for plan members.

The System’s trustees are to be commended for lowering the return assumption over the years. Since the return assumption selected by the System’s trustees for the 2020 Actuarial Valuation is 100 basis points above our “most appropriate” return assumption, we continue to recommend they move it even lower.

Section 2: Treatment of Cost-of-living Adjustments (COLAs)

FRS' COLAs derive from investment earnings above the valuation rate. This is a class of COLA provisions commonly called "gain-sharing" COLAs. The term "gain-sharing" derives from plan provisions that "share" certain investment gains with members. However, there is a cost to that "sharing." Using certain investment gains to improve members' benefits means they cannot be used to help reduce (indirectly) the employer's required contribution.

FRS does not currently include the value of future COLA-grants in its measurement of costs and liabilities. Future COLAs are currently recognized in the calculations of costs and liabilities only after they are granted. Investment earnings exceeding the assumed rate are needed to finance all the other plan benefits. Therefore, if they are carved off to finance special COLA benefits, the fund is being short-changed on revenue that is otherwise need to finance the core benefits in an actuarial manner.

The System's retirees are likely to receive future COLA benefit increases with some regularity. This likelihood comes from (a) the workings of the relevant state statutes, (b) the likelihood that investment performance will return to more expected levels, and (c) the likely inclination of board members to grant COLAs whenever permitted in accordance with the statutory template. Consider the following internal and external forces at play, which tend to press board members to approve COLAs when permitted:

- a. We recognize there is pressure to keep benefits and contributions down, especially from municipal and state representatives. However, there may be considerable pressure to grant COLAs to retired plan members, especially when one has not been granted in several years and when there is a mechanism for it.
- b. The statutory template was designed to prevent benefit increases during periods when investment returns fall below expectations or if the funded ratio is below certain thresholds. Board trustees may be more likely to grant COLAs when permitted, knowing that the legislative framework protects them from jeopardizing System's financial security.
- c. When the FRS pension fund has better-than-expected investment gains, board members may feel pressure to "share" those gains with retired plan members by way of the gain-sharing COLA program. That is the purpose of the program.
- d. All Social Security recipients receive regular and guaranteed cost-of-living increases. FRS plan members do not, generally, participate in Social Security. As a result, FRS is their only source of increases to help protect them from erosion of their purchasing power during retirement. This may enhance the pressure on board members to grant a COLA whenever permitted to do so under the statutory rules. Under the current assumptions, cost-of-living adjustments for FRS retirees are expected to lag behind the adjustments provided to Social Security recipients even if granted as frequently as permitted by the template.
- e. Whenever other state and statewide retirement systems grant COLAs, FRS board members may feel pressure to grant a COLA when permitted.

The following exhibit illustrates the recent history of tests and rules relating to FRS' gain-sharing COLAs. This exhibit illustrates the two statutory rules that govern how the statutes have not permitted the board of trustees in recent years to grant a gain-sharing COLA:

1. *The Window Rule.* This rule prevents a COLA from being permitted every year based on the funded ratio of the plan. Based on the current funded ratio of 75.63%, a COLA may be granted (provided other conditions are satisfied) as long as a COLA has not been granted in any of the three most recent fiscal years. The window is now "open" and would then "close" for a few years after a COLA is granted, then re-open. As the funded ratio improves in future years, the number of years the window remains closed becomes shorter, so that the window is open more frequently.
2. *The Sufficient Actuarial Return Rule.* For each of the six years ending June 30, 2020, the pension fund's actuarial rate of return has been insufficient – it has not exceeded the system's assumption. That has prevented the board of trustees from being permitted to grant a gain-sharing COLA.

For the 2020 Actuarial Valuation, the board of trustees and its actuary assume the long-term average rate of return to be 7.0%. As such, they expect the market rate of returns in any given future year to exceed that level often and fall below it often, leaving the average at 7.0%. By applying the actuarial smoothing process, the actuarial rates of returns are also expected to exceed 7.0% at times in the future and fall below at other times.

Therefore, board of trustees and its actuary, reasonably expect that the Sufficient Actuarial Return Rule will be satisfied with some frequency in the future, i.e., the actuarial rate of return will exceed the assumption numerous times in the future.

The system's failure to exceed the assumption in the recent past is no indicator that it will continue failing to exceed the assumption in the future. It is fully expected to exceed the assumption sometimes, thereby permitting the board to grant a gain-sharing COLA.

COLA History for the Firefighters' Retirement System								
Actuarial Measurement Date	Statutory Conditions for COLA Granting Under:		Authorizing Gain-sharing (G-s) COLAs Pct and Recipients ³		Amount Granted by Board	Date Approved by Board	Effective Date of COLA	Comments
	The Window Rule ⁴ for any COLA	The Sufficient Actuarial Return Rule ⁵ for G-s COLAs	R.S. 11:2260(A)(7) G-s COLA [Up to 3%, to All Elg]	R.S. 11:246 G-s COLA [2% or Nothing, to Elg Over 65]				
6/30/2020	Satisfied (For YE 2021)	Not Satisfied (4.9% vs. 7.15%)	None Permitted [To All Eligibles]	None Permitted [To Elg Over 65]	NA	NA	NA	None permitted for failure of Sufficient Investment Return
6/30/2019	Satisfied (For YE 2020)	Not Satisfied (4.5% vs. 7.3%)	None Permitted [To All Eligibles]	None Permitted [To Elg Over 65]	NA	NA	NA	None permitted for failure of Sufficient Investment Return
6/30/2018	Satisfied (For YE 2019)	Not Satisfied (5.6% vs. 7.4%)	None Permitted [To All Eligibles]	None Permitted [To Elg Over 65]	NA	NA	NA	None permitted for failure of Sufficient Investment Return
6/30/2017	Not Satisfied (For YE 2018)	Not Satisfied (5.7% vs. 7.5%)	None Permitted [To All Eligibles]	None Permitted [To Elg Over 65]	NA	NA	NA	None permitted for failure to satisfy both Rules
6/30/2016	Not Satisfied (For YE 2017)	Not Satisfied (3.1% vs. 7.5%)	None Permitted [To All Eligibles]	None Permitted [To Elg Over 65]	NA	NA	NA	None permitted for failure to satisfy both Rules
6/30/2015	Not Satisfied (For YE 2016)	Not Satisfied (6.7% vs. 7.5%)	None Permitted [To All Eligibles]	None Permitted [To Elg Over 65]	NA	NA	NA	None permitted for failure to satisfy both Rules
6/30/2014 ⁶	Satisfied (For YE 2015)	Satisfied (8.8% vs. 7.5%)	2.25% Permitted [To All Eligibles]	None Permitted [To Elg Over 65]	2.25% Granted [To All Eligibles]	12/11/2014	1/1/2015	Approved and effective during YE 2015.

³ Per R.S. 11:2260(A)(7), the Board is authorized to provide a COLA of up to 3% to all eligible pensioners. Additionally, per R.S. 11:246, the Board is authorized to provide an additional or supplemental COLA of 2% to eligible pensioners over age 65. No COLA may be provided during any fiscal year until the lapse of at least one-half of the fiscal year.

⁴ Per R.S. 107.1(D)(4)(b) and R.S. 11:243(G)(1) and (3), the Board may grant a benefit increase only if any of the following apply: (a) the system has a funded ratio of at least 90% and has not granted a benefit increase to retirees, survivors, or beneficiaries in the most recent fiscal year, (b) the system has a funded ratio of at least 80% and has not granted such an increase in any of the two most recent fiscal years, or (c) the system has a funded ratio of at least 70% and has not granted a benefit increase to retirees, survivors, or beneficiaries in any of the three most recent fiscal years. The funded ratio as of any fiscal year is the ratio of the actuarial value of assets to the actuarial accrued liability under the funding method prescribed by the office of the legislative auditor.

⁵ Per R.S. 11:2260(A)(7), the Board is authorized to use interest earnings on investments of the system in excess of normal requirements to provide a supplemental COLA of up to 3% to all eligible pensioners. Additionally, per R.S. 11:246, the Board has the authority to provide an additional COLA of 2% to eligible pensioners over age 65 if there are sufficient excess interest earnings to fund the entire 2% additional COLA.

⁶ The 6/30/14 valuation date marks the first year that Act 170 applies, after the trustees elected to be covered under R.S. 11:243 by 12/31/13.

Notice this is not a pattern of one COLA granted out of every seven years. It is a pattern of one-out-of-one, and six-out-of-six, considering that a COLA was granted in the year when it was permitted by the template and none was granted in years when not permitted.

Given the example of granting a COLA when permitted (measured at the fiscal year ending June 30, 2014), coupled with the analysis above and the pent-up demand for not having any COLAs in a while, *it is our opinion that there is a reasonable likelihood that favorable investment performance in the future will satisfy the Sufficient Actuarial Return Rule and that the FRS board will grant COLAs when permitted.* It seems reasonable to assume the granting of gain-sharing COLAs in future years when otherwise permitted.

In addition, the COLA provisions are in the Louisiana statutes for a reason: To pay COLAs – sometimes. The sponsors and other legislators voted for a mechanism to grant COLAs periodically, even if only every few years.

It is incumbent upon the actuary to recognize the possibility and likelihood that COLA benefits will be paid with some regularity, even if only every few years. That is why we believe the statutory provision is there. Failure to recognize material costs and liabilities (even if making only a rough estimate) of the statutes' COLA provisions is to deny the purpose of the statutes.

COLAs do not have to be guaranteed before adopting prudent actuarial advance-funding. COLA-granting does not have to be known with certainty in advance. Actuarial projections seldom ever involve certainties of future events.

- Traditional actuarial practice suggests that when: (a) plan provisions offer benefits to members (even with conditions attached), (b) costs and liabilities are material in their magnitude, (c) the conditions required for approval are reasonably likely, and (d) such conditions and resulting benefit amounts are actuarially measurable, they should be recognized in advance in actuarial valuations of costs and liabilities.

These tests are applied in actuarial valuations for all pension benefits, e.g., disability benefits that require a disabling event or condition and require board approval. The actuarial practice of advance-funding all benefits satisfying these conditions moves the System toward attaining and maintaining actuarial soundness as required by the Louisiana Constitution, rather than merely adopting a pay-you-go policy.

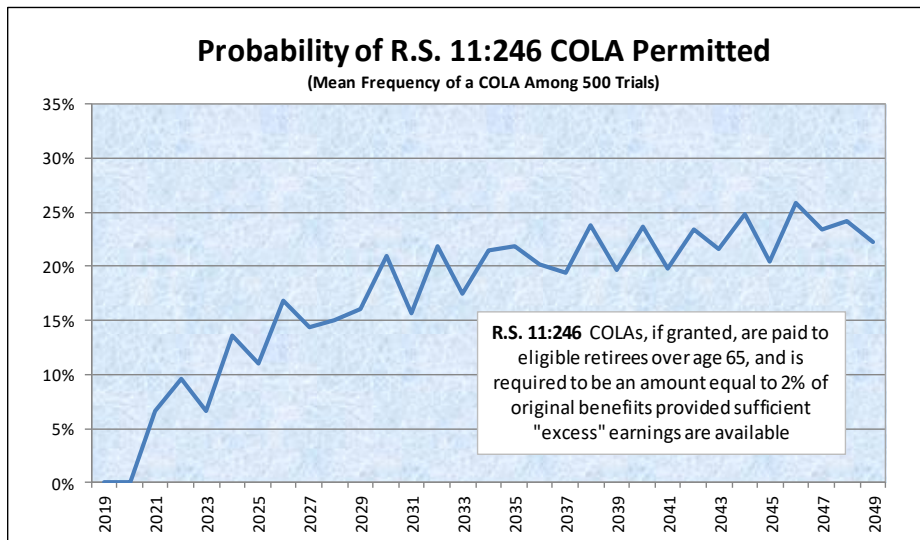
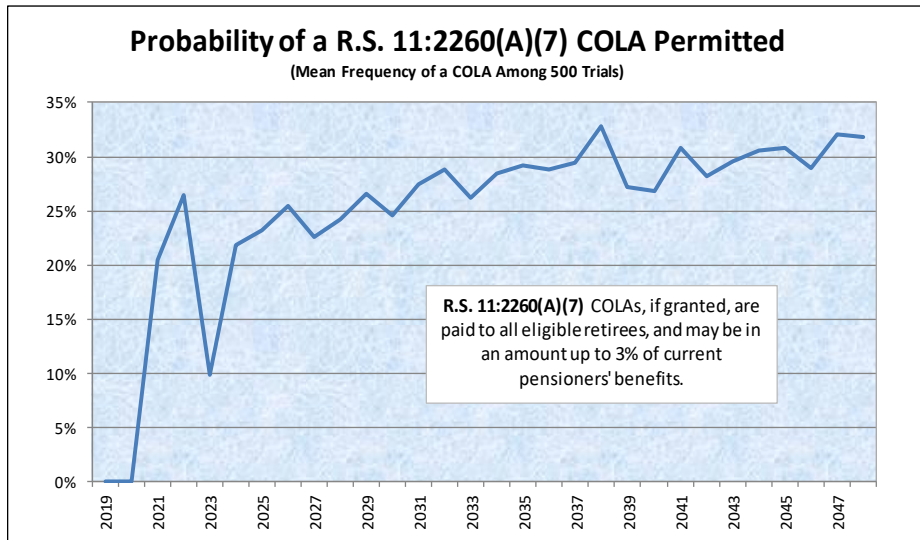
The evidence leads us to conclude that, based on (a) the historical pattern inherent in the data (meager though it is) and (b) the common-sense likelihood that COLAs *will be granted* in years that the statutory template permits the board to grant one, and that COLAs *will not be granted* for years when the statutory mechanism would not otherwise permit the board to grant one.

Last year, the Actuary for the LLA prepared a detailed analysis for the 2019 valuation report (presented in an Actuarial Valuation Report dated January 15, 2020) concerning the costs and liabilities for future COLA benefits. That actuarial analysis concluded that FRS' current complex COLA provisions are actuarially equivalent to a simplified:

- Annual COLA of 0.60% authorized under R.S. 11:2260(A)(7) plus
- Annual COLA of 0.30% authorized under R.S. 11:246 COLA.

These are actuarially reasonable approximations of the future workings of the actual statutory gain-sharing COLA template, and can be easily integrated into the System’s annual actuarial valuation to recognize FRS’ COLA provisions in advance.

Following are exhibits from last year’s actuarial valuation report prepared by the Actuary for the LLA, illustrating the actuarial likelihood of statutory (template) COLAs being permitted. This illustrates that, over the long-term, COLAs for FRS retirees are expected to be permitted in roughly one out every three or four years. This is actuarially measurable using traditional modelling techniques.



Conclusion – By not recognizing actuarially-expected future COLA benefits in the actuarial valuations, FRS is not advance-funding all the plan’s benefits appropriately. This undermines the mandate in the Constitution, in our opinion. We recommend that the FRS board: (a) engage its actuary to model the likelihood and dollar amounts of future cost-of-living increases funded with “excess” investment earnings, as permitted by the statutory template, and (b) incorporate permitted future cost-of-living increases in the measurement of the plan’s costs and liabilities.

Section 3: Mortality Assumption

The 2020 Actuarial Valuation (pages 41 and 42) states that the mortality assumption:

- For active member mortality is “Pub-2010 Public Retirement Plans Mortality Table for Safety Below-Median Employees multiplied by 105% for males and 115% for females, each with full generational projection using the MP2019 scale.”
- For annuitant and beneficiary mortality is “Pub-2010 Public Retirement Plans Mortality Table for Safety Below-Median Healthy Retirees multiplied by 105% for males and 115% for females, each with full generational projection using the MP2019 scale.”
- For disabled lives mortality: “Pub-2010 Public Retirement Plans Mortality Table for Safety Disabled Retirees multiplied by 105% for males and 115% for females, each with full generational projection using the MP2019 scale.”

To evaluate the reasonableness of the mortality assumption, we reviewed the base mortality (Pub-2010) and the plan-specific adjustment factors (for males and for females) separately from the projection scale (MP2019).

Base Mortality Table

The Pub-2010 Public Retirement Plans Mortality Tables Report was published in January 2019. This table was developed by the Society of Actuaries based on data obtained from public sector pension plans across the U.S. It is the most recent reliable broad-base mortality table available, for purposes of national estimates of mortality for public pension plans.

The observed mortality rates were compared to the standard reference table in order to set the appropriate adjustment factors to determine the best fitting table to use for the final mortality assumption. Because the plan is too small for a full statistical credibility of its own mortality experience, observed rates were blended with standard tables. The resulting adjustment factor of 105% was determined by the System’s actuary to be the best fit for males and an adjustment factor of 115% was determined by the System’s actuary to be the best fit for females.

Mortality Improvement Scale

Once the base table was found to be reasonable, we turned our attention to the projection scale used in the mortality assumption to reflect expected mortality improvements over time. The 2020 Actuarial Valuation stated that the Pub-2010 table was projected generationally using scale MP2019. We note that the projection scale MP2019 was the most recent projection scale available as of that valuation date and therefore we find the projection scale MP2019 to be appropriate for the 2020 Actuarial Valuation.

Conclusion – We consider the base mortality tables and the mortality improvement scale as applied to both non-disabled and disabled lives to be appropriate for valuations.

Section 4: 2020 Experience Study

An actuarial experience study was prepared by the System's actuary for the period from July 1, 2014, through June 30, 2019, for the Firefighters' Retirement System. The experience study report, dated June 10, 2020, summarized the results. The experience study report includes the following demographic assumptions:

- Mortality Rates
- Retirement Rates
- Disability Rates
- Withdrawal Rates
- Salary Increases
- DROP Entry Rates
- Post-DROP Retirement Rates

In addition, the experience study report includes the following other assumptions:

- Vesting Election Percentage
- Drop and Post-DROP Participation
- Family Statistics
- Actuarial Equivalence Factors

Mortality Assumption

The mortality assumption is based on the most recently developed broad-based mortality tables and on reasonable applications of actuarial credibility principles. For details of the mortality assumption, please refer to Section 3 of this 2020 Comprehensive Actuarial Review.

Other Demographic Assumptions

Without performing an actuarial audit, we reviewed the experience study report thoroughly and found all the sections relating to the other demographic assumptions to be described with reasonable detail and careful recognition of relevant experience.

Other Assumptions

We also found all the sections relating to the other assumptions to be described with reasonable detail and careful recognition of relevant experience.

Conclusion – We accept all the other demographic assumptions and other non-demographic assumptions proposed in the experience study report, and find them to be appropriate for use in the FRS' 2020 Actuarial Valuation.

Actuarial Certification

This Comprehensive Actuarial Review report constitutes a Statement of Actuarial Opinion. It has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge the information contained in this report is accurate and fairly presents information it is purported to present. All calculations have been made in conformity with generally accepted actuarial principles and practices and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

James J. Rizzo and Piotr Krekora are members of the American Academy of Actuaries. These actuaries meet the Academy's Qualification Standards to render the actuarial opinions contained herein.

The signing actuaries are independent of the Firefighters' Retirement System.



James J. Rizzo, ASA, EA, MAAA
Senior Consultant and Actuary
Gabriel, Roeder, Smith & Company

December 8, 2020

Date



Piotr Krekora, ASA, EA, MAAA, PhD
Consultant and Actuary
Gabriel, Roeder, Smith & Company

December 8, 2020

Date

Appendix A

Sources of Inflation Forecasts

An assumed rate of future inflation is a major component of both the return assumption and the salary increase assumption used in a pension valuation. Expected future inflation is a critical component of the other pension finance calculations as well. Therefore, much care and objectivity should be given to the expected future rates of inflation.

The FRS' 2020 Actuarial Valuation (page 5) states: "For 2020, an assumed rate of inflation of 2.5% was implicit in the assumed rate of return." We find an inflation assumption closer to 2.00% is more supported by the research on expected inflation rates from national experts as illustrated in the exhibits below.

What other retirement systems assume for inflation and what the past actual rates of inflation have been, are not directly pertinent to setting, defending or assessing an assumption about future inflation. Even having one expert's forward-looking opinion is not sufficient. Without having multiple inputs, a board would not know if there are other expert opinions that differ. It is well-established that a consensus average of diverse forecasters improves forecast accuracy.

Currently, expert professional inflation forecasts generally lie between 1.34% and 2.40% across mid-term (10 years) and long-term (20-30+ years) horizons. Actuaries are not generally qualified to forecast future rates of inflation. Therefore, consider the forward-looking forecasts from 11 sources published by the following organizations.

Major National Inflation Forecasters	
Congressional Budget Office	Federal Reserve Bank of Cleveland
Federal Reserve Bank of Philadelphia (2)	Federal Reserve Bank of New York (2)
Federal Reserve Board (OMC)	Social Security Trustees Report
Investment Forecaster Surveys (GRS and HAS)	U.S. Department of the Treasury

Some of these organizations provide multiple surveys and horizons for their inflation forecasts. Following is a summary of the inflation forecasts of these eight major national organizations.

Average Forward-looking Annual Inflation Forecasts						
Future Time Horizon	Number of Sources*	Mid-Yr 2020 Average	Mid-Yr 2019 Average	Mid-Yr 2018 Average	Mid-Yr 2017 Average	Mid-Yr 2016 Average
10 Years	10	1.93%	2.12%	2.23%	2.19%	2.08%
20 to 30+ Years	7	1.92%	2.12%	2.32%	2.19%	2.05%

** For the Mid-Yr 2020 forecast averages; comprised of inputs over a hundred economists and investment forecasters*

Our preferred inflation assumption would currently be 2.00% for the mid-term and longer-term horizons.

Consider the following exhibit, which shows the detailed inflation forecasts of these large reputable expert organizations in the field of inflation forecasting. A 2.50% inflation expectation currently

employed by the System higher than any of the professional forecasters presented in the summary table above and the detailed table below.

Forward-looking Annual Inflation Forecasts					
Professional Experts in the Field of Forecasting Inflation	Mid-Yr 2020	Mid-Yr 2019	Mid-Yr 2018	Mid-Yr 2017	Mid-Yr 2016
Federal Reserve Board's Federal Open Market Committee Current "Long-run" Price Inflation Objective (<10 years): Objective since Jan 2012; Personal Consumer Expenditures (PCE) Consumer Price Index Inflation Objective (CPI = PCE + approx 30-40 bps)	2.00% 2.30%	2.00% 2.40%	2.00% 2.40%	2.00% 2.40%	2.00% 2.40%
Congressional Budget Office: <i>The Budget and Economic Outlook</i> Overall Consumer Price Index (10 Years)	2.24%	2.39%	2.38%	2.36%	2.33%
Social Security Trustees Report CPI-W 75-Year Intermediate Assumption	2.40%	2.60%	2.60%	2.60%	2.60%
Federal Reserve Bank of Philadelphia Livingston Survey: 10-Year Median Forecast Survey of Professional Forecasters: 10-Year Median Forecast	2.00% 2.14%	2.26% 2.20%	2.28% 2.30%	2.33% 2.30%	2.25% 2.20%
Federal Reserve Bank of New York's Trading Desk Survey of Market Participants: 10-Year Median Expectation Survey of Primary Dealers: 10-Year Median Expectation	1.87% 2.05%	2.05% 2.16%	2.12% 2.10%	2.14% 2.35%	2.00% 2.12%
Federal Reserve Bank of Cleveland 10-Year Expectation 20-Year Expectation 30-Year Expectation	1.34% 1.63% 1.85%	1.67% 1.88% 2.05%	2.09% 2.23% 2.32%	1.85% 2.04% 2.18%	1.63% 1.87% 2.04%
U.S. Department of the Treasury 10-Year Breakeven Inflation 20-Year Breakeven Inflation 30-Year Breakeven Inflation	1.24% 1.41% 1.71%	1.70% 1.74% 1.90%	2.12% 2.12% 2.16%	1.73% 1.85% 2.00%	1.44% 1.38% 1.77%
GRS Survey of Investment Consultants and Forecasters Median expectation (averaging a 10-year horizon) Median expectation (averaging a 25-30-year horizons)	2.18% 2.27%	2.21% 2.41%	2.23% 2.31%	2.25% 2.21%	2.23% 2.38%
HAS Survey of Investment Consultants and Forecasters Median expectation (identified as a 10-year horizon) Median expectation (identified as a 20-year horizon)	1.97% 2.16%	2.21% 2.29%	2.24% 2.47%	2.23% 2.44%	2.16% 2.31%

Appendix B

Sources of Investment Return Forecasts

As with inflation forecasting, actuaries are not investment forecasters and are not qualified to forecast capital market assumptions⁷ for all asset classes over mid-term and longer-term horizons. Therefore, we must turn to reputable professional forecasters that specialize in that field.

Again, it is not reliable practice to simply look to the past rates of return to guide current decisions about assumed returns for the future. It may also be tempting for board members to be influenced by (a) what boards of trustees of other retirement plans have decided concerning their return assumption or (b) whether the resulting contribution is affordable for the current year's budget. However,

- Other retirement plans have different asset allocation targets.
- Other retirement systems have different investment-related fees and cash flow projections.
- Boards of trustees of other retirement systems have their own agency risks and influences, as well, that are not necessarily best practices.

Retirement system fiduciaries should decide on actuarial assumptions with an emphasis on actuarial benefit security for the plan members and other funding objectives by relying more on mainstream forecasts of what the portfolio is expected to earn rather than what rate looks similar to other systems or what rate would make the contributions more affordable to current taxpayers.

It may be useful information to know what the past has produced and what other retirement systems' return assumptions are; but these should not influence decisions about this System's actuarial return assumption.

As with inflation, in our opinion it is best to obtain input concerning future rates of return over the mid-term and longer-term horizons based on forward-looking forecasts from several large reputable professional forecasters. Following are the professional forecasting organizations that provide us input concerning forward-looking capital market assumptions. These 13 organizations have significant depth in their research staff and are trusted sources of investment expertise. They also have significant experience with public sector pension funds.

Participating Investment Forecasters			
Aon/Hewitt ^{IC}	Blackrock ^{IM}	BNY/Mellon ^{IM}	Callan ^{IC}
Cambridge ^{IC}	J.P. Morgan ^{IM}	Marquette ^{IC}	Meketa ^{IC}
Mercer ^{IC}	RVK ^{IC}	NEPC ^{IC}	VOYA ^{IM}
	Wilshire ^{IC}		

^{IC} In the top 25 largest investment consultants, according to the most recent survey from P&I.

^{IM} In the top 75 largest investment managers, according to the most recent survey from P&I/WTW.

⁷ Capital market assumptions include expected returns (either geometric or arithmetic) and standard deviations for each asset class, expected correlation coefficients across asset classes, and expected rate of inflation. These may be expectations over a mid-term horizon, a longer-term horizon, or both.

Appendix C 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, FRS' asset allocation is a core element in the process of setting and evaluating assumed future returns.

We relied on the long-term target asset allocation percentages set forth in System's formal Investment Policy Statement (IPS) last updated June 11, 2020.

2020 FRS Long-term Target Asset Allocation			
Risk-oriented Assets		Fixed Income Assets	
Large Cap U.S. Equities	24.5%	Core Fixed Income	23.0%
Small to Mid Cap U.S. Equities	7.4%	US TIPS	3.0%
International Equities	15.0%	Emerging Market Debt (Local Currency)	5.0%
Emerging Markets Int'l Equities	7.1%		
Private Equity	9.0%		
Real Estate	6.0%		
		<i>Total Fixed Income Assets</i>	<i>31.0%</i>
<i>Total Risk-oriented Assets</i>	<i>69.0%</i>		
		<i>Total Asset Allocation</i>	<i>100.0%</i>

Source: Current FRS Investment Policy Statement (updated June 11, 2020). The Policy's 10% allocation to Global Equity was distributed among U.S. Equities (59%), Intl Equities (30%) and Emerging Markets (11%), for a more refined estimate.

Appendix D

Portfolio's Expected Return

We applied the System's target asset allocations to the expectations (asset class by asset class) of each of the 13 major national investment forecasters. We replaced the investment forecasters' respective inflation assumptions with 2.00%, 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 FRS' portfolio slightly, by the expected investment-related expenses. This process results in expected returns for the System in any one given year in the forecast horizon (called the expected arithmetic return). Finally, we reduced the resultant one-year arithmetic returns for the correlation among asset classes and the volatility drag in the compound return expected over time, because pensions are all about compounding in a volatile environment over the horizon.

This produces probability distributions of possible compound average returns over the relevant time period by each of the 13 professional forecasters. The most useful metrics for the relevant time period from these probability distributions are (a) the 50th percentile expectation of the compound average return (the 50-50 chance of success) and (b) the probability of achieving the assumption.

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.

Investment Forecaster	Distribution of 10-Year Compound Average Percentile Expectations			Probability of exceeding 7.00%
	40th	50th	60th	
(1)	(2)	(3)	(4)	(5)
1	3.12%	4.04%	4.96%	21.01%
2	4.19%	5.22%	6.26%	33.29%
3	4.42%	5.25%	6.08%	29.79%
4	4.56%	5.39%	6.21%	31.15%
5	4.48%	5.53%	6.60%	36.37%
6	4.65%	5.62%	6.61%	36.14%
7	4.77%	5.70%	6.64%	36.31%
8	4.75%	5.72%	6.70%	37.03%
9	4.86%	5.85%	6.85%	38.54%
10	4.94%	5.96%	6.99%	39.94%
11	5.11%	6.02%	6.95%	39.43%
12	5.25%	6.10%	6.96%	39.50%
13	5.62%	6.58%	7.55%	45.63%
Average	4.67%	5.61%	6.57%	35.70%

There are three important takeaways from the exhibit above:

- a. Over the mid-term horizon the range of expectations of the 50th percentile of compound average return runs from 4.04% to 6.58%. The System's current 7.00% is well-above the expectations of all the professional forecasters for the next 10 years.
- b. The 50th percentile consensus average mid-term forecast is 5.61%. In other words, the consensus opinion is that there is a 50-50 chance of returning at least 5.61% when compounded over the next 10 years.
- c. The consensus of these experts is that there is only a 35.70% chance of achieving at least the current 7.00% adopted by FRS over the mid-term horizon. This does not mean a 35.70% chance of achieving the 7.00% assumption in any one year during the time horizon; it means that the compound return over the next 10 years has only a 35.70% chance of achieving at least the 7.00% assumption.

This is not a forecast opinion of the Actuary for the LLA. This is the consensus average of the opinions many national experts in forecasting inflation and investment returns, i.e., it is the mainstream of professional forecasters' opinions concerning FRS' portfolio in the next 10 years.

Mid-term and Longer-term

In addition, we applied a similar process to longer-term forecasts (averaging 27 years) which resulted in a consensus average 50th percentile of the compound average return over the next 27 years of 6.30%. The System's current 7.00% is also above the expectations of all the professional forecasters for the next 30 years.

However, as discussed in the next section, we do not have to choose between the mid-term and long-term horizons. The most appropriate return is somewhere in between the two horizons, derived by recognizing the plan's own expected benefit stream.

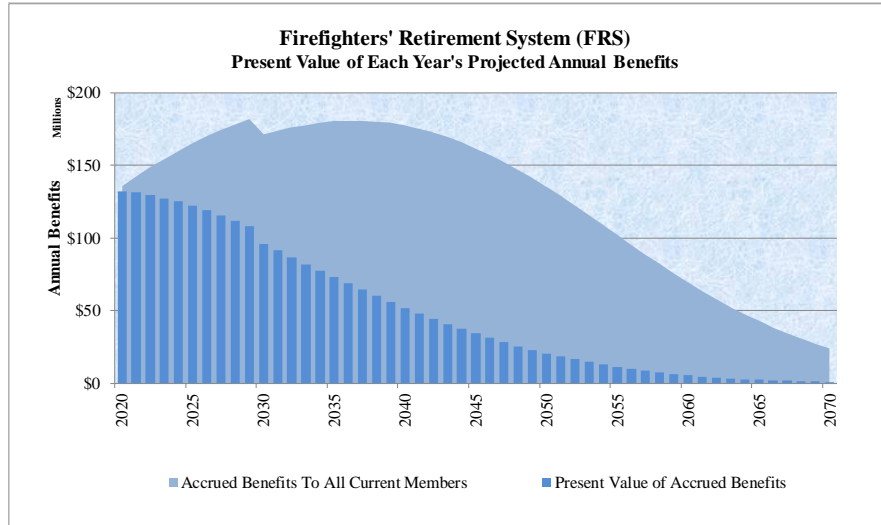
Consider a new pension plan with very little in benefits payable until the third decade. Such a plan can comfortably use a long-term horizon for setting its return assumption. But a pension plan, like FRS, with a large proportion of its future benefits expected to be paid in the first decade or two should adopt a return assumption that is somewhere between the mid-term and the long-term. This derives from basic actuarial principles. Adopting long-term forecasts without any adjustment for cash flow is not appropriate for a plan that will be paying substantial benefits out of the fund in the next 10 to 20 years.

If the forecasters are right, years 1-10 will have a compound average of 5.61% per year, but years 1-27 have a compound average 6.30% per year. Mathematically, that means that years 11-27 will have a compound average of 6.70% per year.

Appendix E

Single Equivalent Cash-flow-adjusted Expectation

The graph below illustrates the System’s projected benefit cash flows. The darker blue bars represent the present values (as of June 30, 2020) of each year’s projected benefits, discounted at the investment return expectation during years 1-10 and during years 11-30 (and beyond), to illustrate the effect in terms of current dollars.

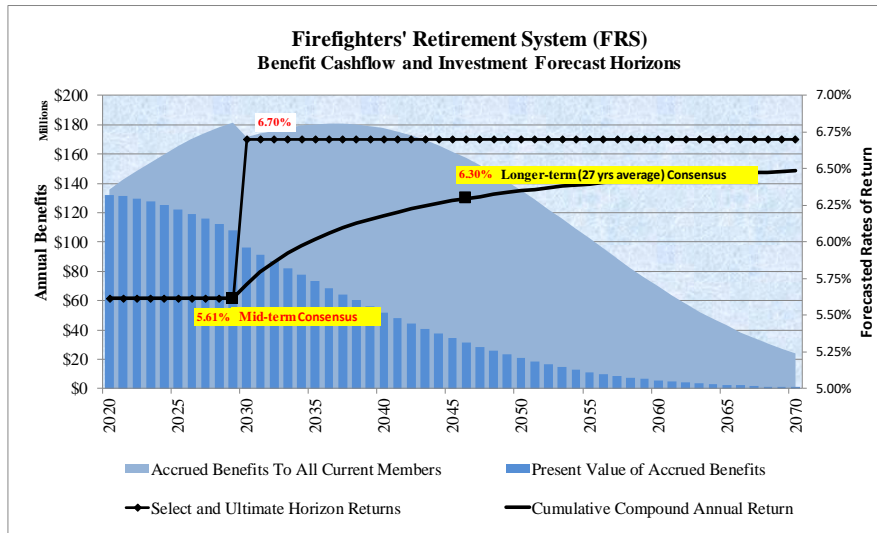


Much of the System’s projected benefits will be paid with current System assets, which are expected by a consensus average to earn only 5.61% during the next 10 years. The separate forecast of returns for years 1-10 (5.61%) and years 11-30 (6.70%) is what actuaries often call “select and ultimate” return forecasts.

However, since an actuarial valuation typically uses a single return assumption over the entire period, it is necessary to reflect the select and ultimate periods of return in a single equivalent return assumption. Therefore, it is necessary to measure the earnings generated by the System’s assets from the valuation date through each year when the benefits are expected to be paid.

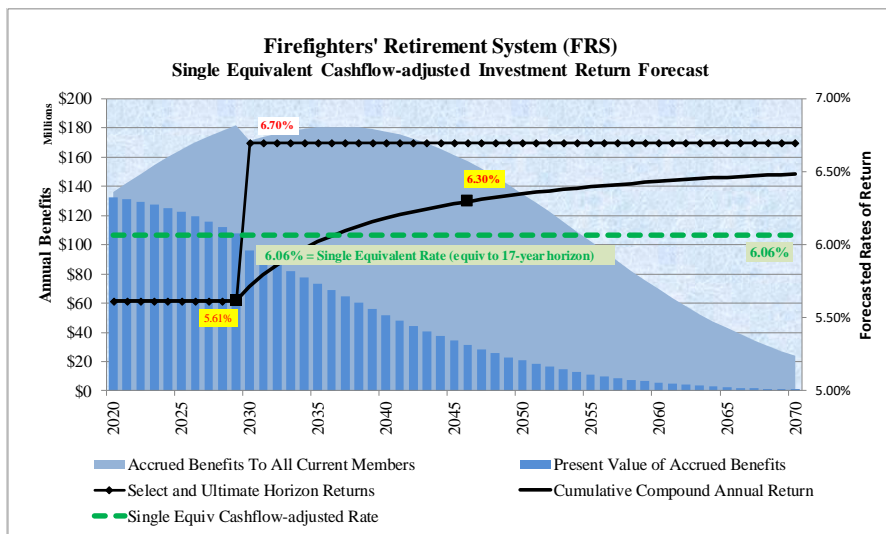
The blended rate is always between the years 1-10 mid-term consensus average (5.61% in this case) and the years 1-27 long-term consensus average (6.30% in this case).

Consider the following graph, with the consensus average forecasts superimposed over the projected benefits and their present values.



Under these forecasts, notice the significant amount of benefits (and their present values) that are expected to earn only 5.61% while still in the fund (years 1-10). Notice also, that even the benefits paid thereafter would earn only 5.61% during the next 10 years. *The lower expected earnings in the next 10 years should be incorporated into the development of a final return assumption, somewhere between the mid-term and longer-term forecasts.*

A straight long-term forecast does not appropriately recognize benefit cash flow demands on the system. Recognizing the System’s own timing and magnitude of its benefit demand cash flows and the different earnings expectations over years 1-10 versus years 11-27, the single equivalent net investment return on all assets used to pay these benefits is 6.06% – between the mid-term and longer-term forecasts.



We tested this same procedure with projected benefits for all active members (not just their current accrued benefits). The result was very little difference in the answer.

Appendix F

Relevant 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 G

Qualifications and Caveats

This Comprehensive Actuarial Review was prepared to fulfill the requirements of R.S. 11:127(C) to the Public Retirement Systems' Actuarial Committee (PRSAC) for 2020 and is intended for use by PRSAC and those designated or approved by PRSAC. This Comprehensive Actuarial Review may be provided to parties other than PRSAC only in its entirety and only with the permission of PRSAC. The Louisiana Legislative Auditor is not responsible for unauthorized use of this Comprehensive Actuarial Review.

This Comprehensive Actuarial Review should not be relied on for any purpose other than the purposes described herein. This Comprehensive Actuarial Review assumes the continuing ability of MPERS to collect the contributions necessary to fund this Plan. A determination regarding whether or not MPERS is actually willing and able to do so in the future is outside our scope of expertise and was not performed.

The findings in this Comprehensive Actuarial Review are based on data and other information as of June 30, 2020 and forecasts published for 2020. This Comprehensive Actuarial Review was based upon information furnished by MPERS, the System's investment consultant, the System's actuary and by numerous external inflation and investment forecasters. We checked for internal reasonability and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by outside parties.

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

At the time of this writing, we consider the 2020 forecasts of the future inflation and capital market assumptions (including future investment returns) from the subject matter experts to be suitable for development of a "most appropriate" net return assumption for the 2020 actuarial valuation. There has been considerable uncertainty about the economy and a lot of volatility in the markets. But for now, the robust process and results presented herein seem most appropriate.

This Comprehensive Actuarial Review was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation. We performed tests to ensure that the model reasonably represents that which is intended to be modeled. We are relying on the GRS actuaries and Internal Software, Training, and Processes Team who developed and maintain the model.